

Bond defaults and bond restructuring in Germany

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Dissertation von Lucas Valentin Peter

Erstgutachter: Prof. Dr. Dirk Schiereck Zweitgutachterin: Prof. Dr. Britta Eileen Hachenberg

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List of abbreviations

2SLS	Two-stage least squares
AG	Aktiengesellschaft
AR	Abnormal return
BV	Besloten vennootschap met beperkte aansprakelijkheid
CAR	Cumulative abnormal return
CDS	Credit default swap
CIO	Chief Insolvency Officer
CRO	Chief Restructuring Officer
DIP	Debtor-in-possession
DIU	Deutsche Investoren Union
Е	Expected
e.g.	Exempli gratia/for example
e.V.	eingetragener Verein
EBIT	Earnings before interest and taxes
ESUG	Gesetz zur weiteren Erleichterung der Sanierung von Unternehmen
et al.	Et alia/and others
EUR	Euro
EURm	Million Euro
FAZ	Frankfurter Allgemeine Zeitung
GmbH	Gesellschaft mit beschränkter Haftung
GmbH & Co. KG	Gesellschaft mit beschränkter Haftung & Compagnie Kommanditgesellschaft
IDW	Institut der Wirtschaftsprüfer
i.e.	Id est/that is
InsO	Insolvenzordnung
OLS	Ordinary least squares
р.	Page
pp.	Pages
R	Return
S6	Standard 6

SdK	Schutzgemeinschaft der Kapitalanleger
Sec.	Section
SMEs	Small and medium-sized enterprises
St. dev.	Standard deviation
U.K.	United Kingdom
U.S.	United States
VIF	Variance inflation factor
WVD	World'Vest Base

1 General introduction

The German credit market has been subject to significant changes in recent years, from both the regulatory and market perspectives. The regulatory environment changed with the reform of the German Bond Act in 2009; the reformed act provides broad and proactive restructuring measures and contains collective action clauses. These clauses are designed to solve the inherent problems of bond restructuring and provide a flexible framework for amending bond terms. The German Insolvency Code was reformed in 2012, and new debtor-in-possession (DIP) management rules were introduced. The reform was intended to facilitate the access of corporate borrowers to the DIP procedure, a self-governing procedure in which the debtor remains in control of its assets and operations. The new rules were introduced to stimulate more timely bankruptcy filings to help preserve value for creditors.

After the 2008–09 global financial crisis, German small and medium-sized enterprises (SMEs), especially those in the subprime segment, saw their access to bank credit diminish. In response, German exchanges introduced bond market segments with relatively low entry barriers for issuers. These "mini-bond markets" specifically targeted and attracted retail investors by offering attractive coupon yields, low denominations per bond, and issuers with well-known brand names. Due to their poor institutional set-up, these market segments faced challenging times shortly after their introduction in 2010, and a disproportionately high share of issuers either declared bankruptcy or conducted bond restructurings, both of which led to losses for investors.

This dissertation attempts to link the recent regulatory and market-driven developments in the German credit market using three empirical studies. These three studies are based on hand-collected datasets of bond issuers who either defaulted on their bonds by declaring bankruptcy under the German Insolvency Code or restructured their bonds under the German Bond Act. The studies are interlinked through the "Financial Restructuring Process Model", which is similar to the models used by Bulow and Shoven (1978) and Asquith, Gertner, and Scharfstein (1994), where equity holders, banks, and bondholders stake claims against troubled issuers' assets. As banks have better insights about and perform more intense monitoring of their debtors than bondholders, private negotiations between banks and issuers with financial difficulties occur at the beginning of the restructuring process. The public bond restructuring process in which issuers attempt to restructure bond terms by majority bondholder consent does not start until private negotiations between banks and issuers have concluded. If an issuer fails to either successfully complete bank negotiations or convince bondholders to approve amendments to bond terms, an insolvency filing is necessary.

This dissertation's three studies address separate parts of the Financial Restructuring Process Model individually. Chapter 2 focuses on the private part of the model, which relates to all activities that lead to either the start of the bond restructuring process or bankruptcy filing. It analyzes the determinants for beginning the bond restructuring process and the benefits of restructuring for bondholders by examining the following research questions:

Research question 1: What are the determinants to launch a bond restructuring process under German bond regulations when an issuer faces bankruptcy?

Research question 2: How does the decision to conduct a bond restructuring process benefit bondholders?

Chapter 3 explains the public part of the model, examines the different elements of the bond restructuring process as regulated under the German Bond Act of 2009, and focuses on how retail investors impact successful bond restructuring efforts. This is especially relevant because retail investors were deeply involved in the introduction of mini-bond segments and have played an increasingly significant role in this bond market segment. The following research questions are addressed:

Research question 3: How effective is the German Bond Act when issuers attempt to amend bond terms or restructure bonds?

Research question 4: How do retail investor bond holdings impact the likelihood of successfully conducting bond restructurings?

Chapter 4 addresses the new DIP rules introduced in the reform of the German Insolvency Code of 2012. This reform was intended to facilitate earlier insolvency filing by corporate debtors and higher recovery rates for creditors. The following research question is addressed from a bond market perspective:

Research question 5: Has the redesigned German Insolvency Code achieved its main goals?

Figure 1.1 presents a structural overview of the Financial Restructuring Process and its subdivision into the three studies, while Section 2.3.1 provides a detailed explanation of the model. Each of the three empirical studies is composed of an introduction, which outlines the research motivation, a brief explanation of the relevant legal provisions in Germany, review of related studies, derivation of the research hypotheses, description of the dataset analyzed

description of the empirical strategies and results robustness tests, and a conclusion and discussion on the results. Summary information for each default or restructuring case is provide in each chapter's Appendix.

This dissertation is relevant for academics and practitioners alike. First, it describes the bargaining dynamics between multiple types of creditors; a wide range of papers using U.S. data exist for this topic, but it is an under-researched area in Germany. Second, it investigates the practicability of bond restructuring under the reformed German Bond Act of 2009 and explicitly focuses on how the rational apathy of retail investors impacts bond restructuring. As examining the rational apathy of retail investors has primarily focused on equity markets, it provides a unique approach and dataset for tackling this issue in the bond market. Third, the dissertation extends existing research on assessing the reformed DIP management rules of the German Insolvency Code, an issue which has been debated since the introduction of the law in 2012. Finally, the dissertation extends the body of research concerned with recent developments in the German bond market, especially the so-called mini-bond markets. By focusing on default and restructuring events, which are the most sensitive parts of a bond's lifecycle, the dissertation complements the existing body of research in this field.



Figure 1.1: Financial Restructuring Process Model

2 Determinants and benefits of the bond restructuring process in Germany

2.1 Introduction

Schneekoppe GmbH & Co. KG, the long-established and well-known supplier of health and lifestyle food, filed for bankruptcy and defaulted on its EURm 10.0 bond on August 8, 2014; this event surprised investors, as the company had given no indication of financial difficulties until then. Consequently, the bond's price dropped from about 101% on the previous day to only approximately 12% one week after the announcement. By contrast, when the retail fashion company Laurèl GmbH declared bankruptcy on November 11, 2016, the price of its EURm 20.0 bond dropped from about 15% to approximately 9%. Investors were aware of this issuer's adverse financial condition, as it had publicly initiated a restructuring of its bond in August 2015. The bankruptcy routes for both issuers differ significantly. For instance, Schneekoppe did not publicly attempt to prevent bankruptcy and gave no warning signals to investors. In contrast, Laurèl tried to fend off bankruptcy for more than one year by restructuring its bond, thus giving investors substantial time to adjust to the situation.

Broadly, corporate borrowers and bond issuers can deal with financial difficulties and the need to readjust their financing structure by either restructuring out of court or in a formal bankruptcy setting. It is generally recognized that an out-of-court restructuring is less costly, therefore, debtors and creditors should avoid bankruptcy (see, e.g., for the U.S., Gilson, John, and Lang, 1990; Franks and Torous, 1994; for Germany, Jostarndt and Sautner, 2010). Legislation in Germany provides a flexible and issuer-friendly mechanism for out-of-court bond restructuring: the German Bond Act¹ allows issuers to put bond term amendments to a vote by bondholders and enables holistic bond restructuring. Successful votes are also binding on outvoted or non-voting bondholders and safeguard issuers from collective action problems, which are well-documented for bond restructuring in the U.S. (Franks and Torous, 1994, p.353; Roe, 1987, pp.236–239).² Given these advantages for an out-of-court bond restructuring in

¹ The "Gesetz über Schuldverschreibungen aus Gesamtemissionen" (SchVG) was renewed in 2009 and significantly enhanced the toolkit for restructuring bonds. The predecessor law "Gesetz, betreffend die gemeinsamen Rechte der Besitzer von Schuldverschreibungen" from 1899 was less flexible and comprehensive; however, it also gave issuers the opportunity to amend bond terms after a binding vote of bondholders. The analysis in this chapter will not distinguish between the old and new laws.

 $^{^2}$ The U.S. bond restructuring process is regulated by the Trust Indenture Act of 1939 and only allows amending bond terms with the consent of all bondholders (Sec. 316 Trust Indenture Act). This rule amplifies collective action problems and makes bond term amendments in the U.S. virtually impossible. Therefore, bond restructuring in the U.S. takes the form of distressed exchanges.

Germany, it seems puzzling that some German issuers (such as Schneekoppe GmbH & Co. KG) refuse to attempt out-of-court bond restructuring and instead file for bankruptcy directly.

The German bond market, especially the market for so-called "mini-bonds," has been subject to substantial criticism by both academics and practitioners, regarding, for example, rating inflation (Mietzner, Proelss, and Schweizer, 2017) and low investor protection standards (von Randow, 2017). To add to the ongoing discussion regarding investor protection in the German bond market, we examine how bond restructuring processes - prior to bankruptcy filings benefit bondholders, even if bond issuers later file for bankruptcy. Hence, this chapter examines the following research questions: What are the determinants for launching a bond restructuring process under German bond regulations when an issuer faces bankruptcy? How does the decision to conduct a bond restructuring process benefit bondholders? We address these questions empirically by investigating a hand-collected dataset of German bond issuers who filed for bankruptcy between 2005 and January 2018. First, we examine determinants that impact the likelihood that a bond restructuring process will be conducted prior to bankruptcy filing. We find that private interactions between banks and issuers are an important determinant of the bond restructuring process. In addition, banks are willing to support issuers during the bond restructuring process when their potential losses from a bankruptcy filing are high. Second, we examine abnormal bond returns around the start of the bond restructuring process and the bankruptcy filing date. Bonds display statistically significant and negative abnormal returns at the start of a restructuring process. On the one hand, this can be interpreted as the removal of information asymmetries between investors and issuers, when information about issuers' adverse financial situation is revealed to the market. On the other hand, the negative abnormal returns may indicate that bondholders are apprehensive about losses during the bond restructuring process. Bond returns around bankruptcy filing dates are significantly less negative for issuers who conduct bond restructuring processes prior to bankruptcy filing than for issuers who do not restructure. We attribute this to the "surprise risk" of non-restructuring issuers and conclude that the bond restructuring process adds value for bondholders, even if issuers eventually declare bankruptcy. We also compare recovery rates of bonds that were subject to the bond restructuring processes prior to bankruptcy filing and bonds that were not restructured and find no statistically significant difference. Hence, we find no evidence that the pre-bankruptcy bond restructuring process has negative effects for bondholders.

To our knowledge, this is the first study to examine bond restructuring events in Germany on a scale that goes beyond anecdotal evidence. In response to Boehm's (2017, p.23) call for research, we discuss the influence of bank debt on the restructuring choice in Germany. We

also demonstrate that the bond restructuring process can be regarded as a tool for removing information asymmetries between issuers and investors, thereby benefiting bondholders. We use a sample comprising German mini-bond issuers, most of which are not stock-listed, to extend the literature by including event studies around default events of non-public companies. To date, most research on default events has focused on publicly traded companies in the U.S. (see e.g., Betker, 1998; Wang, 2011; Jiang, Li, and Wang, 2012).

This chapter is structured as follows. Section 2.2 describes the current situation in the German bond market and the legal regulations for the bond restructuring process. Section 2.3 explains the Financial Restructuring Process Model with the key parties involved in the restructuring process and introduces the different literature streams related to this study. Section 2.4 develops testable hypotheses, and Section 5 details the dataset and descriptive statistics. Section 2.6 introduces the empirical strategy and findings, while Section 2.7 describes our robustness tests. Finally, Section 2.8 presents the study conclusions.

2.2 The German corporate bond market

2.2.1 Financing of German corporations since the global financial crisis

Traditionally, German corporations have relied on bank loans as their primary source of external financing.³ In the aftermath of the 2008–09 global financial crisis, banks became increasingly reluctant to lend to corporations, especially SMEs, due to the exhausted post-crisis capital buffers and tighter capital requirements regulations (Deutsche Bundesbank, 2012, p.22–25). Consequently, to diversify their financing sources and reduce dependence on external bank financing, German corporations focused on the bond market, which resulted in an increased volume of corporate bond issues (see Figure 2.1). In 2010, German exchanges introduced new bond segments⁴ with low entry barriers (such as a minimum issuance volume of only EURm 10.0) and weaker regulatory requirements (such as financial reporting prepared according to German GAAP instead of IFRS), which attracted many SME issuers. These so-called "minibond segments" were designed to specifically address private investors by, for example, issuing bonds with a denomination of only EUR 1,000 per unit (Achleitner and Volk, 2013, p.159). Although our dataset also includes bonds not issued in mini-bond segments, the issuers are

³ Germany is generally regarded as a "bank-based financial system" (Schmidt, Hackethal, and Tyrell, 1999, p.51)

⁴ Bondm (Stuttgart), Entry Standard (Frankfurt), Mittelstandsmarkt (Dusseldorf), m:access (Munich), and Mittelstandsbörse Deutschland (Hamburg-Hannover).

mainly from the German SME sector. We dedicate one part of the literature review to this bond market segment (see Section 2.3.2.1).



Figure 2.1: Volume of corporate bond issues in Germany

This figure presents the issue volume of German corporate bonds between 2007 and 2018. Issue volume is in EUR bn.

Source: Statista

2.2.2 Regulation of bond restructuring in Germany

German legislation provides an issuer-friendly bond restructuring framework. The German Bond Act, which was reformed in 2009, allows amending bond terms with the consent of a majority of bondholders during bondholder meetings (Sec. 5 (1), German Bond Act). Resolutions regarding the amendment of major bond terms (such as the principal amount, coupon, and maturity) require a qualified majority of at least 75% of the participating voting rights (Sec. 5 (4), German Bond Act) with a quorum of at least 50% of the outstanding bond capital. If the first meeting fails to reach the required quorum, a second meeting can be scheduled with a lower quorum of 25% (Sec. 15 (3), German Bond Act). Ultimately, this means that in the second bondholder meeting, issuers can amend major bond terms with the consent of no more than 18.75% of all outstanding bond capital. This approach to bond restructuring is not new, as the previous Act from 1899 provided similar mechanisms; however, the new law significantly broadens the restructuring measures to include tools such as reducing the principal amount ("haircut") and debt-to-equity swaps (Sec. 5 (3) No. 3 and No. 5, German Bond Act). It also allows for proactive bond restructuring, whereas the old law required the issuer's

looming bankruptcy (Wilken, Schaumann, and Zenker, 2015, pp.4–11). The German regulation also attempts to mitigate the problem of the "non-cohesive nature" of bondholders, as described by Bulow and Shoven (1978, pp.438-9). The authors claim that the dispersed nature of bondholders makes direct negotiations with issuers unfeasible. In Germany, bondholders can elect and appoint a joint representative through majority resolution, and this representative can be "authorized to assert certain rights of the noteholders, the individual noteholders shall not be entitled to assert such rights on their own" (Sec. 7 (2), German Bond Act). This means that the joint representative can directly negotiate with the issuer's management regarding the proposed bond term amendments and is also entitled to represent bondholders during bankruptcy procedures. With this set of rules in place, Germany offers a more flexible environment for issuers than the U.S., where the Trust Indenture Act of 1939 regulates the bond restructuring process and provides fewer restructuring measures and stricter consent thresholds (for a comparison of the different regulatory regimes, see Lürken and Pickerill, 2011). Especially, the holdout problem, which makes bond restructurings more complicated in the U.S. (Gilson et al., 1990, p.322; Asquith et al., 1994, p.641; for a detailed legal perspective, see Roe, 1987), is a minor issue under the German Bond Act, as the German law provides collectively binding effects of bondholders' majority decisions. In recent times, bond issuers defaulted or restructured their bonds and applied the German Bond Act (both old and new) multiple times to deal with financial difficulties, especially after the introduction of the mini-bond segments in 2010 (see Figure 2.2).

Figure 2.2: Number of bonds in restructuring and default

This figure presents the number of German corporate bonds in restructuring and defaults between 2004 and January 2018. Mini-bond segments are Bondm (Stuttgart), Entry Standard (Frankfurt), Mittelstandsmarkt (Duesseldorf), m:access (Munich), and Mittelstandsbörse Deutschland (Hamburg-Hannover). The year 2018 includes one issuer that filed for bankruptcy in January.



Source: Authors' own dataset

2.3 Theoretical model and literature review

2.3.1 Financial Restructuring Process Model

In this chapter's first analysis, we examine the determinants of a bond restructuring process. For this purpose, we compare a set of bond issuers who conducted a bond restructuring process and later filed for bankruptcy to bond issuers who directly filed for bankruptcy without attempting to restructure their bonds. For a comparable sample of issuers, we consider the outcome of the financial restructuring process as given and restrict our analysis to bankrupt bond issuers by disregarding issuers who successfully restructured to avoid bankruptcy.⁵ To explain the drivers of the bond restructuring process before filing for bankruptcy, we develop the Financial Restructuring Process Model and introduce the relevant players involved in the process.⁶ We subdivide the financial restructuring process into a private part, where banks and

⁵ A detailed analysis of the determinants of successful or unsuccessful bond restructuring processes is the subject of Chapter 3 of this dissertation.

⁶ See Figure 1.1 for a graphical representation of the Financial Restructuring Process Model.

issuers negotiate, and a public part, which is the actual bond restructuring process.⁷ We explain the assumptions regarding the players involved and introduce the different parts of the financial restructuring process in chronological order.

The model includes three parties or "classes of claimants" (Bulow and Shoven, 1978, p.438) on the assets of an issuer: equity holders, banks, and bondholders. We assume that the management acts in the best interests of equity holders (i.e., their interests are aligned) and tries to avoid bankruptcy, as equity holds the residual claim on the issuer's assets, which is effectively worthless in case of a bankruptcy. In addition, we assume the existence of information asymmetries between the issuer and creditors regarding the financial situation. The situations of the two debt claimholders differ: bondholders are dispersed, while bank debt is concentrated. This gives banks an advantage over bondholders in terms of generating information for monitoring (banks can access information more easily than bondholders) and bargaining power during the financial restructuring process (see, e.g., Berglöf and von Thadden, 1994; Becker and Josephson, 2016). Both debt claims are renegotiable, as the German Bond Act explicitly allows bond terms to be renegotiated (see Section 2.2.2). Banks attempt to avoid write-downs on their loans and seek to improve their position vis-á-vis other investors (e.g., by demanding additional collateral, shareholder capital contributions, haircuts, or debt-to-equity swaps of bondholders), while bondholders try to avoid losses on their bonds.

At the beginning of the process, the issuer's management either recognizes the need for restructuring the liabilities by itself or is approached by banks; this triggers the financial restructuring process. The management assesses the prospect for a successful out-of-court solution for the company's financial distress. If a successful solution seems unlikely, the issuer files for bankruptcy. If an out-of-court solution is viable, the issuer drafts a restructuring concept and enters into bank negotiations. When one of their borrowers faces financial distress, German banks usually engage actively and try to facilitate workouts outside of bankruptcy (Brunner and Krahnen, 2008, p.416). During the initial private negotiations, banks gain comprehensive insights into the issuer's financial situation, which reduces information asymmetries. Banks now hold a strategic option: they can either liquidate the issuer when they are at an advantage in a bankruptcy setting, or they can postpone the liquidation to gain more information about the issuer's prospects (Kahl, 2002, p.136). The parties negotiate over the restructuring concept, which also includes contributions by other claimholders, and later try to convince bondholders to contribute. In earlier theoretical works on bankruptcy decisions and financial restructuring,

⁷ In Section 2.5, we explain the data sources for our observations of the Financial Restructuring Process Model.

this initial agreement between banks and equity holders is called a "coalition" (Bulow and Shoven, 1978, p.440; White, 1989, p.133). For our investigation, the private part of the financial restructuring process or formation of the coalition occurs before the bond restructuring process, which is consistent with practitioners' observations (Wilken et al., 2015, p.17). If bank negotiations are successfully completed, the issuer calls for a bondholder meeting, in which the bond restructuring measures are put to a vote by bondholders. If the first bondholder meeting fails to reach a quorum, which means that too little bond capital is represented at the meeting, a second meeting can be scheduled (Sec. 15 (3), German Bond Act). For simplicity, we assume that if the second meeting fails to produce an agreement, banks may consider liquidating the issuer, who then must file for bankruptcy. If the bond is successfully restructured, but the issuer still faces financial difficulties, the entire process begins anew.

The Financial Restructuring Process Model is similar to the versions described by Bulow and Shoven (1978) and Asquith et al. (1994), but the public part differs: stricter bond restructuring regulations in the U.S. do not entail binding votes and significantly limit the available bond restructuring measures. Therefore, bond restructuring processes in the U.S. are usually conducted through exchange or tender offers, in which issuers offer bondholders a debt tender offer for retiring their old bonds in exchange for a combination of new bonds, equity, or cash (see, e.g., Gilson et al., 1990; Asquith et al., 1994; Chatterjee, Dhillon, and Ramirez, 1995; Altman and Karlin, 2009). However, in our model, a successful vote in one of the bondholder meetings has a binding effect on all outstanding bonds; hence, exchanging old bonds for new ones is not necessary. As the bond restructuring process in Germany is more convenient than that in the U.S., we are particularly interested in understanding why financially troubled issuers attempt or do not attempt to restructure their bonds.

2.3.2 Literature review

Our research is based on four distinct streams of literature. We devote Section 2.3.2.1 to the latest research on the German bond market and debt restructuring in Germany. In Section 2.3.2.2, we review research that is mostly from the U.S., which deals with debt restructuring of bonds and the motivation of issuers to restructure debt out of court. In Section 2.3.2.3, we discuss selected research on the ongoing discussions about the design of default models and explain their implications in the context of our investigation of bond returns around the bond restructuring process and bankruptcy filings. Finally, in Section 2.3.2.4, we review the literature on the determinants of bond recovery rates and bond returns around the default events.

2.3.2.1 Bond market and debt restructuring in Germany

As noted earlier, some research has been conducted on the recent developments in the German bond market, especially the so-called mini-bonds and their flaws.⁸ According to existing research, the mini-bond market can be characterized as a market for opaque issuers who issue bonds with inflated ratings to unsophisticated investors, who are poorly secured by low investor protection standards. Mietzner et al. (2017) examine 135 mini-bond issues between 2010 and 2015 and find that credit rating agencies provided issuers with highly favorable ratings, causing rating inflation. The default risk of mini-bond issues was significantly underestimated, and mini-bond defaults exceeded the historical default probabilities implied by the (highly favorable) credit ratings. Von Randow (2017) complains that mini-bonds offer poor investor protection standards but exhibit higher default rates than other European high-yield markets. Investors have been unable to adequately capture the risk of mini-bonds, which are essentially subordinated debt instruments that are often subject to first-loss tranches in a case of bond issuer default. For a sample of 64 mini-bond issues between 2010 and 2012, Heß and Umber (2013) show that more than half of the issues failed to collect the desired issue volumes. The authors attribute this phenomenon, which is largely unknown in some mature capital markets, to lack of or poor support by issuing agents such as investment banks. Feihle and Lawrenz (2017) find that mini-bond issuers display inferior post-issue operating performance compared to a control sample of SMEs and attribute this to adverse project quality and poor use of the funds raised. Finally, Hermann (2017) and Herrmann and Stolper (2017) examine mini-bond investors, specifically focusing on private investors. Using a sample of 18 mini-bonds whose issuers filed for bankruptcy, Hermann (2017) shows that private investors hold a significantly larger share of bankrupt bond issues than solvent issues. The author attributes this finding to the informational disadvantages of private investors compared to professional institutional investors. Herrmann and Stolper (2017) find that highly visible mini-bond issuers (i.e., issuers with strong brand recognition or high media visibility) carry significantly lower risk premiums. They conclude that familiarity with issuers reduces the perceived risk of investments for private investors.

We next review research studies that examine private debt restructuring in Germany. Brunner and Krahnen (2008) use private information obtained from major German banks to empirically examine 95 distressed lending relationships and focus on the drivers of successful private workouts. They find that banks engage regularly and intensely in their borrowers'

⁸ All bankrupt issuers in the different mini-bond segments are subjects of our study and are included in our dataset.

workouts. Smooth coordination among banks is crucial for a successful private workout, which is facilitated by the formation of bank pools. Jostarndt and Sautner (2010) examine the drivers of successful debt restructurings by publicly listed companies in Germany. They find that the probability of a failed debt restructuring (i.e., issuer bankruptcy) increases with "bargaining inefficiencies" (information opacity of debtors and creditor coordination problems) and the "institutional biases" against workouts in the German bankruptcy law. Their study confirms that creditor coordination in the form of bank pools increases the likelihood of a successful workout.

We contribute to research on the German bond market and debt restructuring. The existing research on mini-bonds has focused on pricing at the time of issuance, the role of credit rating agencies in bond mispricing, the role of issuance agents in successful placement, and the behavior of private investors and their misperceptions of risk. We extend this research stream by explicitly focusing on the inglorious end of a bond lifecycle, namely restructuring and bankruptcy events. Investors are very sensitive to these events, and therefore, we address these issues for a better understanding of the motivation, drivers, and benefits of the bond restructuring process in Germany.

2.3.2.2 Bond restructuring and the motivation for out-of-court restructuring

This chapter also relates to the literature on public debt restructuring, the motivation for outof-court debt restructuring settlements and avoiding bankruptcy. We briefly review the central papers. The two aspects relevant for our study are generally agreed upon. First, out-of-court restructuring is less costly than a formal restructuring process in a bankruptcy setting. Second, it is more difficult to restructure bond debt than bank debt. Jensen (1989) conceptually shows that troubled debt restructuring is less costly in an out-of-court setting than in formal Chapter 11⁹ procedures. Gilson et al. (1990) confirm this claim by investigating the incentives given to 169 distressed companies to restructure debt privately rather than choose Chapter 11. They find that shareholders have an advantage in out-of-court restructuring, and companies are more likely to restructure debt privately when they have more intangible assets, a proxy for higher bankruptcy costs. The concentration of bank loans and lower information asymmetries increases banks' bargaining and the probability of successful debt workouts. Frank and Torous (1994) examine 45 distressed exchanges and 37 Chapter 11 cases and find that out-of-court restructuring procedures significantly improve bondholders' recovery rates. In fact, the authors

⁹ Chapter 11 is a "debtor-in-possession" insolvency procedure in the U.S. that allows the debtor to reorganize its business and restructure debt while continuing business operations.

observe that most Chapter 11 cases attempt to restructure out of court before they file for formal bankruptcy. Overall, they provide further evidence for the claim that out-of-court debt restructuring is a less costly alternative during financial distress than Chapter 11.

Asquith et al. (1994) examine 102 financially distressed U.S. high-yield bond issuers and show how these companies deal with distress. Private and public debt restructurings are the main tools for dealing with financial distress. Private debt restructurings are triggered by a covenant breach or missed interest payment and are resolved through direct negotiations between banks and issuers. Banks rarely terminate loans but rather choose to either tighten or loosen loan conditions by either increasing the interest rates or extending loan durations, but rarely take haircuts. Asquith et al. (1994) find that the cost of an out-of-court restructuring is rather low, while Chapter 11 is costly due to the direct (expenses for advisors and other fees) and indirect (loss of customers and employees, influence of bankruptcy courts on operating decisions) bankruptcy costs. Overall, restructuring public debt appears difficult due to the challenge of dispersed bondholders taking collective action and the subsequent inconvenience in the process of renegotiating bond terms. Several studies emphasize the difficulty of restructuring bond debt, since dispersed bondholders find it difficult to coordinate (see, e.g., Gernter and Scharfstein, 1991; Berglöf and van Thadden, 1994; Bolton and Scharfstein, 1996; Bolton and Freixas, 2000; Hege and Mella-Barral, 2005). In contrast, Robert and Sufi (2009) show that long-term bank debt contracts are frequently renegotiated. The authors examine a sample of 1,000 credit agreements of publicly listed U.S. companies and show that major loan terms, such as maturity, principal amount, or interest rate, were renegotiated for 90% of contracts with durations longer than one year. However, such renegotiations are rarely the result of financial distress. Using a sample of defaults from international issuers, Becker and Josephson (2016) show that banks have bargaining advantages over bondholders in out-of-court restructurings due to their concentrated holdings, bondholders' unwillingness to become informed, and the resulting inability to engage in restructurings.

This chapter extends this stream of research by adopting a different approach to examining the decision and motivation to restructure out of court. We use the Financial Restructuring Process Model and focus on the decision to conduct a public debt restructuring process after private negotiations have been initiated between issuers and banks. Unlike prior research, we do not ask what drives successful debt restructuring, but only what influences the decision to either conduct or not conduct out-of-court public debt restructuring. We expect to gain insights into the dynamics of the different groups involved in the restructuring process.

2.3.2.3 Assumptions regarding credit model design and risky debt pricing

To examine how the restructuring process impacts bond prices and its potential benefits for bondholders, we rely on theoretical work regarding credit risk model design and risky debt pricing by focusing specifically on the assumptions regarding information asymmetries and information diffusion. Broadly, credit risk models can be subdivided into structural- and reduced-form models. Merton (1974) develops structural-form models by proposing that a company defaults when the value of its assets falls below a certain threshold, namely the face value of its outstanding debt. The model rests on the assumptions that the company's value consists of equity and a single zero-coupon bond, default can only occur at the bond maturity date, and the company's asset value is transparent to investors, due to the absence of information asymmetries. The model is refined and extended by removing some of the strict assumptions: Black and Cox (1976) allow more complex debt structures including covenant-protected and subordinated bonds; Geske (1977) includes interest-paying debt instead of zero-coupon bonds; Vasicek (1984) distinguishes between long- and short-term debt; and, finally, several researchers allow a company to default not only on the debt at maturity but also throughout its duration (see, e.g., Kim, Ramaswamy, and Sundaresan, 1993; Hull and White, 1995; Longstaff and Schwartz, 1995). All structural models show that changes in company value are the result of a "diffusion process," implying that company value develops incrementally, while sharp and sudden drops in company value are impossible, and companies therefore never default "by surprise." In addition, in the absence of information asymmetries, the company's asset valuation is transparent to investors. Reduced-form models (developed by Jarrow and Turnbull, 1995; Jarrow, Lando, and Turnbull, 1997; Duffie and Singleton, 1999, and others), allow for information asymmetries between issuers and investors and assume that debt default can happen at any time over the course of the duration. Development of company value is seen as unpredictable and the outcome of a Poisson process; thus, company value is not transparently observable to investors (Jarrow and Protter, 2006).

To explain bond price reactions around restructuring and bankruptcy events, we add two important assumptions to the structural- and reduced-form models. First, as in Duffie and Lando (2001), we consider that bondholders have incomplete information about issuers; therefore, the fair value of assets is not perfectly transparent. In addition, we assume that issuers can default any time and by surprise, for example, in response to new and adverse information. Zhou (2001) and Wong and Kwok (2003) explicitly model company value as a "jump-diffusion process" to explain the decline in bond prices around default events, while Covitz and Han (2004) find empirical evidence for negative "jumps" in bond prices following adverse information, such as

issuers' product liability and regulatory and environmental problems, which could trigger financial distress. These assumptions seem to be realistic for our dataset, as most issuers are small, and their stocks are not publicly listed. This means that information asymmetries can be considerable, for example, due to lagged financial information or poor accounting data. Moreover, with the existence of jumps, we attempt to explain bond price developments around different bond event dates.

2.3.2.4 Empirical analysis of bond recovery rates

In recent years, empirical analysis of bond recovery rates and returns around default events has received considerable interest, with a special focus on data from the U.S. Existing research explains recovery rates through a combination of bond seniority and collateralization, industry sectors, bond default rates in the economy, and the design of the bankruptcy process. The financial data of bond issuers are used as control variables.

Altman and Kishore (1996) analyze more than 696 defaulted bonds between 1971 and 1995 and find a positive correlation between bond recovery rates and debt seniority. In addition, recovery rates vary significantly across industries: public utilities and issuers from the chemicals and petroleum industry enjoy the highest bond recovery rates, whereas producers of wood, paper, and leather products and issuers from sectors such as hospitality (lodging) and healthcare (hospitals and nursing facilities) exhibit the lowest recovery rates. Varma and Cantor (2005) examine a sample of 1,084 Moody's rated bonds and loans from corporate issuers in the U.S. and Canada who defaulted between 1983 and 2003. The sample consists of a broad variety of default events, ranging from grace period defaults to Chapter 11 and Chapter 7¹⁰ bankruptcv events. The study attempts to uncover the drivers of recovery rates using the seniority of the debt claim, the type of default event, company-specific characteristics, industry effects, and macroeconomic factors. Overall, seniority and collateralization are the two most important drivers of recovery rates. Hu and Perraudin (2002) use 958 Moody's rated international bonds that defaulted between 1971 and 2000 and find that bond default rates and recovery rates are negatively correlated. Altman, Brady, Resti, and Sironi (2005) analyze the association between aggregate default and recovery rates of corporate bonds for a sample of bond defaults between 1982 and 2002. The key finding is that aggregated recovery rates are driven by the supply of and demand for defaulted securities. This means that during periods when there is a high number of defaults, recovery rates are depressed, and vice versa. Altman (2006) confirms the

¹⁰ Chapter 7 is an insolvency procedure in the U.S. which attempts to liquidate the debtor.

inverse relationship between recovery rates and the probability of bond default, while Mora (2012) analyzes the macroeconomic drivers of bond recovery rates and finds that recovery rates vary across debt instruments and industry sectors. However, the finding of an inverse correlation between recovery rates and default rates is more important, as both are strongly dependent on the state of the overall economy and the business cycle. These studies criticize traditional models that treat the probability of default and the recovery rate as independent, such as the credit default swap (CDS) models of investment banks. Studying a sample of 249 public debt defaults that occurred between 1982 and 1991, Betker (1998) examines excess returns of the bonds and shares of defaulted issuers. The sample includes both issuers that went bankrupt and those that achieved out-of-court workouts. The results show that bankruptcy is more costly than out-of-court solutions and that equity holders experience better returns than bondholders during a workout, which is attributable to equity's greater option value. Wang (2011) presents an empirical analysis of the recovery rates of 424 U.S. bonds when issuers filed for Chapter 11 and focuses on the impact of hedge fund involvement in the post-bankruptcy restructuring process. The author finds that senior bonds realize large returns during the restructuring phase, whereas junior bonds suffer. In addition, unsecured creditors lose more when the length of the restructuring process is extended. Hedge fund involvement in the restructuring process through acquisition of large stakes of the defaulted bonds and active involvement in creditors' committees - results in higher returns for bondholders. Covitz and Han (2004) explore a structural model with frictions to explain why bond recovery rates are exceptionally low, when recovery rates in a frictionless world should be close to the nominal value of bonds. The study finds that frictions such as default delays and jumps in corporate valuation reduce recovery rates below nominal bond values.

In this chapter, we focus specifically on the effectiveness of the restructuring process prior to a bankruptcy filing in preserving bondholder value and use a sample of bond defaults from the German bond market, which is a unique approach in the literature on bond defaults. In contrast to default studies using U.S. data (e.g., Betker, 1998; Wang, 2011), where sample issuers are listed companies, most of the issuers in our dataset are non-publicly listed SMEs. Examining non-publicly listed mini-bond issuers is a new technique in the context of bond default events.

2.4 Hypotheses development

Based on the German corporate bond market, the Financial Restructuring Process Model, and the literature review, we formulate the following testable hypotheses. We distinguish between the determinants of the bond restructuring process and the potential benefits for bondholders. The dataset under review allows us to connect the different streams of literature and our theoretical model.

2.4.1 Determinants of the pre-bankruptcy bond restructuring process

For hypothesis development regarding determinants of the bond restructuring process, we make assumptions based on the Financial Restructuring Process Model. We assume that the bond issuer and its shareholders have an incentive to avoid bankruptcy and settle the restructuring process in an out-of-court setting. This is consistent with empirical research and the finding that shareholders have an advantage in an out-of-court restructuring process compared to a formal bankruptcy setting (Gilson et al., 1990; Frank and Torous, 1994). We disregard possible information asymmetries and conflicts of interest between shareholders and managers and assume that their interests are aligned. Banks have lower monitoring costs and better insights into the issuer than dispersed bondholders, as banks are large creditors and enjoy economies of scale in gathering information (Becker and Josephson, 2016, p.2819). We assume that private interactions between bond issuers and banks are a prerequisite to conducting a public bond restructuring process and test this assumption. The first testable hypothesis is as follows:

Hypothesis 1: Interactions between issuers and banks during the private part of the financial restructuring process increase the likelihood of conducting a bond restructuring process.

To specifically address bargaining dynamics during the financial restructuring process, we focus on the outcomes of the private negotiations between banks and issuers. During these negotiations, banks hold the option to liquidate the issuer. According to existing literature, financial restructuring is more likely when the debtor is highly leveraged and banks consequently have more to lose (Jensen, 1989; Jostarndt and Sautner, 2010). Therefore, the second hypothesis is as follows:

Hypothesis 2: Companies with more leverage are more likely to conduct a bond restructuring process after private interactions with banks.

2.4.2 Benefits of pre-bankruptcy bond restructuring for bondholders

The second set of testable hypotheses focuses on the bondholder benefits that arise from the bond restructuring process, even though bond issuers later file for bankruptcy. As explained above, we assume that bond issuers in our dataset display information asymmetries, due to, for example, lagged accounting information (since many are not publicly listed), consistent with Duffie and Lando (2001). As bondholders do not exert intensive monitoring (see, e.g., Berglöf and von Thadden, 1994), the financial difficulties of opaque bond issuers may remain undetected for a considerable time. However, the call for a bondholder meeting at the beginning of a bond restructuring process draws the attention of bondholders. With a considerable part of the information asymmetries eliminated, bondholders can now readjust their risk assessments of issuers, which should lead to widening credit spreads and plummeting bond prices. This argument is consistent with bond prices, which move in jumps (see Zhou, 2001; Wong and Kwok, 2003; Covitz and Han, 2004). Therefore, the third hypothesis is as follows:

Hypothesis 3: Bonds of issuers who later file for bankruptcy display significantly negative abnormal returns around the start of the bond restructuring processes.

The pre-bankruptcy bond restructuring process is valuable for investors as it removes information asymmetries and facilitates bondholders' ability to better assess an issuer's adverse financial situation. This is not possible for bonds of issuers who directly file for bankruptcy without attempting to restructure. Information about an adverse financial situation is more transparent for issuers who initiate a bond restructuring process prior to filing for bankruptcy. The corresponding bonds should perform better around the bankruptcy filing dates than bonds of issuers who do not conduct a restructuring process. Therefore, the fourth hypothesis is as follows:

Hypothesis 4: Abnormal bond returns are higher (less negative) for issuers who conduct a bond restructuring process prior to bankruptcy filing versus issuers who do not attempt to restructure.

We consider that the bond restructuring process could have an adverse impact on investors. Lengthy negotiations between issuers and bondholders may delay a bankruptcy filing because issuers try "to avoid incurring the costs associated with default and/or bankruptcy" (Covitz and Han, 2004, p.7). This "bankruptcy delay" could be value destroying for bondholders, as it allows the management to continue running the potentially bankrupt issuer. In addition,

continuing the bond restructuring process, that is, delaying bankruptcy and continuing to negotiate with bondholders, may also be costly, as issuers must incur direct costs such as fees for financial and legal advisors. Therefore, the alternative hypothesis is as follows:

Hypothesis 4': Bonds of issuers who conduct a restructuring process prior to bankruptcy filing display lower post-bankruptcy recovery rates than bonds of issuers who do not restructure.

2.5 Dataset and variable definitions

2.5.1 Sample selection and data sources

We combined multiple data sources to create a hand-collected dataset of bond issuers who filed for bankruptcy and had at least one bond issued on German exchanges. We obtained part of the sample of bankrupt mini-bond issuers from BondGuide, which is a leading information service for mini-bonds in Germany, and supplemented this sample with an in-depth keyword search on Genios¹¹ to obtain other bankrupt bond issuers. We used documents provided by bundesanzeiger.de for information on the bond restructuring process. Overall, we sourced information on 108 bonds of 74 issuers who filed for bankruptcy between 2005 and January 2018. We obtained financial data for publicly listed issuers from World'Vest Base (WVD) and the Infront Analytics database; data for non-listed issuers were sourced from Amadeus. We supplemented financial accounting data, which are not available in these databases, with data obtained from publicly available annual reports on bundesanzeiger.de or company websites. Information on bonds and bond price trading data were obtained from bond issue prospectuses and Bloomberg. We excluded three issuers with four bonds due to lack of historical financial data,¹² which reduced the dataset to 70 issuers with 104 bonds. For the analysis (Section 2.6), we use several issuer- and bond-specific variables, which are derived from issuers' financial data and multiple other sources (see Appendix 2.1 for our data sources). This further reduces the number of observations, depending on which variable is used in specific analyses. Given the relatively small sample size, we decided to use the largest possible number of observations

¹¹ We focused on the well-established German language newspapers Frankfurter Allgemeine Zeitung (FAZ), Handelsblatt, Börsen-Zeitung, and business magazines Capital, WirtschaftsWoche, and FINANCE Magazin.

¹² Enterprise Holdings Ltd. (two bonds), Exer D GmbH, and MBB Clean Energy AG.

for each analysis that we run, instead of the least common factors, which would result in a sample of only 56 issuers with 71 bonds.

2.5.2 Summary statistics

With the introduction of the mini-bond segments in 2010, the number of bond issuer bankruptcy events increased sharply and peaked between 2012 and 2016 (Table 2.1). Since then, the number of bankruptcy events have decreased, attributable to the improved quality of mini-bond issues in recent years (Hedtstück, 2017).

Table 2.1: Bankrupt issuers and bonds over time

This table reports the number of issuers, number of bonds, and nominal amount of bond issue size included in the dataset. Issue size is shown in EURm. One issuer declared bankruptcy in January 2018.

Year	Bonds		Issuers (number)						
	Mini-bonds	3	Other bond	s	Total		Mini-	Other	T- (- 1
	Number	Issue size	Number	Issue size	Number	Issue size	bonds	bonds	Total
2005	0	0	1	104	1	104	0	1	1
2006	0	0	1	62	1	62	0	1	1
2008	0	0	2	9	2	9	0	2	2
2009	0	0	4	497	4	497	0	3	3
2010	0	0	4	48	4	48	0	3	3
2011	0	0	7	482	7	482	0	3	3
2012	4	142	19	1,453	23	1,596	4	6	10
2013	10	400	8	904	18	1,304	8	7	15
2014	11	303	0	0	11	303	10	0	10
2015	3	48	2	13	5	61	3	2	5
2016	15	863	2	1	17	865	9	2	11
2017	8	856	2	526	10	1,382	5	0	5
2018	1	3	0	0	1	3	1	0	1
Total	52	2,616	52	4,099	104	6,715	40	30	70

Table 2.2: Industry classification of sample issuers and bonds

This table reports the industry classification of the issuers and bonds included in the dataset. Industry classification is shown according to own industry classifications, as a consistent classification system is not available for this sample of issuers. Issue size is shown in EURm.

	Bonds						Issuers (nur	mber)		
	Mini-bond	ls	Other bonds Total				Mini-	Other	T- (-1	
	Number	Issue size	Number	Issue size	Number	Issue size	bonds	bonds	TOTAL	
Agriculture	- 2	2 342	0	0	2	342	1	0	1	
Construction	3	3 153	0	0	3	153	3	0	3	
Finance, Insurance, Real Estate	3	3 95	16	912	19	1,007	3	5	8	
Manufacturing	25	5 886	23	2,308	48	3,194	16	14	30	
Retail Trade	2	2 60	2	519	4	579	2	2	4	
Services	3	3 106	7	45	10	152	3	6	9	
Transportation & Public Utilities	8	8 901	2	28	10	929	6	1	7	
Wholesale Trade	6	5 73	2	287	8	360	6	2	8	
Total	52	2,616	52	4,099	104	6,715	40	30	70	

A major part of bankrupt issuers is from the manufacturing sector, which is a typical allocation for the German SME sector in general (Table 2.2). With an average size of only EURm 60.0, the bond issues examined are rather small, but still larger than the average size of approximately EURm 43.5 of the mini-bond issues in Mietzner et al. (2017). This is because our sample also includes other bond issuers with issue sizes of up to EURm 492.5 per issue.¹³ With an average time-to-maturity of 5.3 years, the sample is similar to Mietzner et al.'s (2017) bonds, which average 5.1 years. The same holds for the average coupon, which is 7.4% for our mini-bonds, while Mietzner et al.'s (2017) mini-bond sample has an average coupon of 7.3%. We also collected information regarding the collateralization and mezzanine structures of bonds and find that mini-bonds are usually unsecured, while other bonds are more often collateralized or mezzanine capital (see Table 2.3).

¹³ The largest bonds were issued by Global PVQ Netherlands Besloten vennootschap met beperkte aansprakelijkheid (BV) (formerly Q-Cells International Finance BV) with an issue size of EURm 492.5, while Solarworld AG, and IVG Immobilien AG issued EURm 400.0 each.

Table 2.3: Descriptive statistics of sample issuers and bonds

This table presents the descriptive statistics (mean, standard deviation, minimum, and maximum) for all bonds in the sample and those in the subsamples of mini-bonds and other bonds, if the data items are available. All variables, except the dummy variables "Collateralization" and "Mezzanine," are winsorized at the 2.5% level on both sides.

	Mini-bo	nds	Other bonds					Total							
	Number	Mean	St. dev.	Min.	Max.	Number	Mean	St. dev.	Min.	Max.	Number	Mean	St. dev.	Min.	Max.
Issue size (EURm)	52	50.3	58.6	3.0	275.0	52	73.0	99.5	0.8	325.4	104	61.7	82.5	0.8	325.4
Time-to-maturity (years)	52	4.9	0.9	2.0	7.0	52	5.8	2.3	2.0	10.5	104	5.3	1.8	2.0	10.5
Coupon (%)	52	7.4	0.7	5.6	9.0	52	6.4	1.8	1.6	9.0	104	6.9	1.4	1.6	9.0
Collateralization (dummy)	52	0.1	0.3	0.0	1.0	51	0.3	0.4	0.0	1.0	103	0.2	0.4	0.0	1.0
Mezzanine (dummy)	52	0.0	0.2	0.0	1.0	52	0.3	0.5	0.0	1.0	104	0.2	0.4	0.0	1.0

2.5.3 Variable definitions

2.5.3.1 Explained variables

The empirical analysis in Section 2.6 explains the determinants of the pre-bankruptcy restructuring process, and the benefits for bondholders that arise from this process. Therefore, we define several explained variables, which are introduced in the following section.

2.5.3.1.1 Start of the pre-bankruptcy bond restructuring process

In the first part of the analysis, we study the determinants of launching a bond restructuring process with the intent of settling financial difficulties in an out-of-court setting. For this purpose, we subdivide the sample into issuers who conduct a bond restructuring process prior to bankruptcy filing and issuers who filed for bankruptcy directly and hence chose the formal bankruptcy setting. We label the first subsample as "Process issuers" or "Process bonds," and the second subsample as "Non-process issuers," or "Non-process bonds." We define Process issuers as follows: For the basic analysis, we group issuers who initiated a restructuring process no later than 30 trading days prior to bankruptcy filing into Process issuers and Process bonds subsamples. This grouping is necessary to create consistent subsamples for the analyses in Sections 2.6.2.2.2 and 2.6.2.2.3, where we examine and compare the bond prices and returns of Process bonds to Non-process bonds, around 30 trading days before and after the issuer filed for bankruptcy. Only three issuers began a bond restructuring process in the 30 trading days

prior to bankruptcy filing.¹⁴ However, two of these issuers only announced their intentions for bond restructurings by sending invitation letters for bondholder meetings, but no bondholder meetings were held because the bankruptcy filings interrupted the processes. We run the main analysis with the Process issuers sample of firms who initiated restructuring no later than 30 days prior to bankruptcy filing. In Section 2.7, as a robustness test, we report the analysis using the Process issuers sample that includes those who started the bond restructuring process up to one day prior to bankruptcy filing.

2.5.3.1.2 Cumulative abnormal returns

To examine the announcement effects around the start of the bond restructuring process and bankruptcy filing date, we calculate market-adjusted returns. For this purpose, we employ the event study methodology used in Betker (1998) and calculate the cumulative abnormal returns (CARs). We define CAR as

$$CAR_{i,a,b} = \left[\sum_{t=a}^{b} (AR_{i,t})\right], \text{ where } AR_{i,t} = R_{i,t} - E[R_{i,t}|\mathbf{\Omega}_{i,t}]$$
 [2.1]

As in Betker (1998), we use a high-yield bond index to estimate the market return and the Barclays Pan-European High-Yield Index as a benchmark, since Germany does not have a specific high-yield bond index. We set the model estimation window between 240 and 31 trading days before the bankruptcy filing and used a 61-day window around the bankruptcy filing date (30 days before and after bankruptcy filing, including the filing day) to calculate the return.

2.5.3.1.3 Recovery rates

For recovery rates we use recovery of face value, as defined in Guo, Jarrow, and Lin (2008):

$$B^d_{\mathbf{\tau}} = \mathbf{\delta}_{\mathbf{\tau}} F, \qquad [2.2]$$

where F is the face value of the bond (usually 100) and δ_{τ} is the recovery rate (as a percentage). Recent papers use different time measures for the recovery rate: Varma and Cantor (2005) measure based on "30-day post default" prices, Mora (2012) uses "roughly 30 days," and Hu and Perraudin (2002) use "one month after default." For consistency with our event study methodology, we use the bond price 30 trading days after the bankruptcy filing announcement.

¹⁴ German Pellets GmbH (12 trading days), Penell GmbH (14 trading days), and Rickmers GmbH (28 trading days).

Use of a post-bankruptcy bond trading price could be criticized as an imperfect measure of the recovery rate, as it may not equal the final amount bondholders receive at the end of the bankruptcy process. However, this measure is readily available for most bonds and can be compared among bonds and issuers in a straightforward way. By contrast, the outcomes of (often) lengthy bankruptcy processes are difficult to uncover and are not easily comparable, as repayments to investors in bankruptcy processes occur in various periods. Existing research finds that many investors sell their securities after default events (Covitz and Han, 2004, p.5); therefore, post-bankruptcy trading prices are perceived to be good indicators of recovery rates. Moreover, Cantor and Varma (2005) find that the 30-day trading price serves as a good indicator of the ultimate recovery, since it closely matches the average ultimate recovery.

2.5.3.2 Explanatory variables

2.5.3.2.1 Proxies for bank involvement

To study bank involvement in the financial restructuring process and its impact on the decision to launch a bond restructuring process, we examine the private part of the Financial Restructuring Process Model. According to this model, bank negotiations are conducted prior to the bond restructuring process and are not public. We define several variables as proxies for bank involvement that can be used in the econometric analysis. We define a dummy variable that equals one if the issuer has bank debt outstanding prior to the bankruptcy filing and zero otherwise. We further define the "share of bank debt" as the relative amount of bank debt to total debt.¹⁵ In addition, we carefully examine the documents around the time of the bond restructuring process on bundesanzeiger.de, available company documents such as issuers' annual reports, and run a news search¹⁶ to find evidence of direct negotiations between bond issuers and their respective banks prior to bankruptcy filing; we define a dummy variable accordingly. In addition, we define a dummy variable when we find evidence that the issuer prepared a restructuring concept (see Appendix 2.2 for summary information of each bankruptcy case in our sample). For the latter dummy variable, we assume that preparation of a restructuring concept is directly related to bank involvement in the run-up to the bankruptcy event. In Germany, it is common for banks to push debtors that are in financial difficulties to

¹⁵ Calculated as "Total financial debt" minus "Nominal amount of bond debt" over "Total financial debt."

¹⁶ We focus on the well-established German language newspapers FAZ, Handelsblatt, and Börsen-Zeitung, and business magazines such as Capital, WirtschaftsWoche, and FINANCE Magazin.

call for financial or legal advisors to support them in preparing a restructuring concept. The preparation of such a document is even regulated by the Institute of German Auditors¹⁷ and is often a prerequisite for banks to participate in financing financially distressed debtors.¹⁸

2.5.3.2.2 Proxies for the impact of the bond restructuring process

We use two variables to test the impact of the bond restructuring process on abnormal returns around the bankruptcy filing date and on bond recovery rates. First, we use the dummy variable described in Section 2.5.3.1.1, which equals one if the issuer has started the bond restructuring process no later than 30 days prior to bankruptcy filing. The second variable is the duration of the bond restructuring process prior to bankruptcy filing, expressed in calendar days. The start of the process is the date of the invitation letter for the first bondholder meeting, as disclosed on bundesanzeiger.de. The end date is the day of bankruptcy filing.

2.5.3.2.3 Company- and bond-specific control variables

We include several company-specific variables. First, we control for the possible impact of information asymmetries on the decision to conduct a bond restructuring process. Mietzner et al. (2017, p.385) claim that stock-listed companies are "less prone to asymmetric information." Therefore, as a proxy for information asymmetries, we define a dummy variable that equals one if the bond issuer is stock-listed and zero otherwise. Second, we use several financial variables to control for the quality of the issuers' assets: the natural logarithm of total assets serves as a proxy for company size and, therefore, the complexity of a potential restructuring process or the company's viability for restructuring, as in Betker (1998) and Wang (2011). We use return on assets, defined as earnings before interest and taxes (EBIT) to total assets, as a proxy for profitability, as in Becker and Josephson (2016). To account for the issuer's indebtedness, we use the equity and leverage ratios, defined as total equity and total financial debt over total assets, respectively, as in Mietzner et al. (2017). We control for the tangibility of the issuers' balance sheets with the ratio of property, plant, and equipment plus investments to total assets,

¹⁷ The "Institut der Wirtschaftsprüfer" (IDW) issued Standard IDW S6, which regulates the outline of a restructuring concept. Although the IDW restricts application of IDW S6 to certified public accountants, banks and courts also accept restructuring concepts following IDW S6 that are authored by management consultants. We identified advisors for 14 of the 33 restructuring concepts prepared before bankruptcy filing. The concepts were advised by certified public accountants in only five of the 14 cases (EY three cases, and KPMG and MSW one case each).

¹⁸ See verdict IX ZR 65/14 from May 12, 2016 for a recent ruling by the German Federal Supreme Court regarding this issue.

as in Varma and Cantor (2005), and the ratio of intangible assets to total assets as a proxy for the issuer's potential inability to post additional collateral during times of financial distress, which is also used in Mietzner et al. (2017). A low level of tangible assets combined with a high level of leverage can be interpreted as a higher loss potential for creditors in a bankruptcy when the issuer is liquidated. This is because hard (i.e., tangible) assets can serve as valuable collateral for creditors during bankruptcy processes. Third, we control for the seniority of bonds and construct dummy variables for Collateralized or Mezzanine bonds. The omitted category represents senior unsecured bonds.

2.6 Empirical strategy and results

To test the hypotheses, we use several analytical methods. First, we compare the differences between Process issuers and Non-process issuers based on univariate analysis (Section 2.6.1). Second, using a multivariate Probit regression analysis (Section 2.6.2.1), we examine the drivers of the bond restructuring process prior to bankruptcy. Third, we employ event studies to examine bond price reactions around the bond restructuring and bankruptcy dates (Section 2.6.2.2.1), examine abnormal returns around the bankruptcy filing dates (Section 2.6.2.2.2), and finally examine recovery rates after bankruptcy filings using multivariate ordinary least squares (OLS) regressions (Section 2.6.2.2.3). The different analytical methods and results are explained below.

2.6.1 Univariate analysis

For an impression of the fundamental differences between Process issuers and Non-process issuers, Table 2.4 presents an in-sample comparison of the two subsamples. All financial variables were winsorized at the 2.5% level before calculating the means to prevent outliers from distorting the calculation results. Panel A of Table 2.4 shows the descriptive statistics for the fundamental financial data that were extracted from the issuers' last available annual data prior to bankruptcy filing, while Panel B presents an overview of the non-financial dummy variables.
Table 2.4: Univariate comparison of Process issuers and Non-process issuers

This table reports the mean and median differences of fundamental and other variables between Process issuers and Non-process issuers. Process issuers initiate the bond restructuring process for at least one bond 30 days prior to bankruptcy filing. Differences between means are tested using t-tests, differences between medians are tested using Wilcoxon–Mann–Whitney tests. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. All variables, except the dummy variables "Listed issuer," "Bank negotiations," and "Restructuring concept" are winsorized at the 2.5% level on both sides.

	Process issuers				1	Non-proce	ss issuers			
	Number	Mean	Median	St. dev.	Number	Mean	Median	St. dev.	Dif. mean	Dif. median
Panel A: Financial data										
Total assets (EURm)	32	242.5	69.6	408.8	38	515.4	157.5	891.2	-272.9	-87.8
Return on assets	31	-15.1%	-12.5%	19.4%	38	-5.3%	0.1%	12.8%	-9.8% **	-12.6% **
Leverage	32	59.4%	58.8%	19.5%	38	47.2%	41.4%	22.7%	12.2% **	17.5% **
Equity ratio	32	2.5%	2.8%	18.2%	38	10.7%	16.6%	24.6%	-8.2%	-13.8% **
Intangible asset ratio	32	11.0%	3.6%	18.6%	38	7.4%	2.0%	12.5%	3.5%	1.6%
Tangibility ratio	32	29.7%	28.9%	23.7%	38	32.2%	29.7%	23.7%	-2.5%	-0.8%
Total bank debt (EURm)	32	83.6	6.0	164.7	38	206.8	15.0	475.8	83.4	-9.0
Share of bank debt	32	34.6%	32.7%	29.6%	38	40.2%	37.5%	30.2%	-5.6%	-4.8%
Panel B: Other data										
Listed issuer (dummy)	32	0.63	1.00	0.49	38	0.42	0.00	0.50	0.20 *	1.00
Bank negotiations (dummy)	26	0.69	1.00	0.47	37	0.57	1.00	0.50	0.12	0.00
Restructuring concept (dummy)	26	0.81	1.00	0.40	37	0.32	0.00	0.47	0.48 ***	1.00 ***

Process issuers are smaller, significantly less profitable, and display higher leverage and lower equity ratios compared to Non-process issuers. Both groups are unprofitable (as evidenced by a negative return on assets) and have single-digit to low double-digit equity ratios. This is not surprising, because the issuers are financially distressed and eventually file for bankruptcy. The sample issuers are less profitable compared to the mini-bond issuers sampled by Mietzner et al. (2017), who find a mean return on assets of 3.1%. This is also not surprising, as their sample contains issuers who did not file for bankruptcy. Our sample issuers are, therefore, rather similar to the companies sampled by Jostarndt and Sautner (2010), who find mean and median return on assets of -28% and -7%, respectively, for their subsample of issuers who went into formal bankruptcy.¹⁹ More Process issuers entered into bank negotiations and prepared restructuring concepts prior to bankruptcy filing. This provides us with the first

¹⁹ Jostarndt and Sautner (2010) define return on assets as earnings before interest, taxes, depreciation, and amortization over total assets, while we use EBIT over total assets. Despite this difference, the general interpretation holds, that both the formal bankruptcy subsample and our sample companies display negative operating profitability, on average.

evidence of intense bank involvement prior to Process issuers filing for bankruptcy. Please note that information for the dummy variables Bank negotiations and Restructuring concept were obtained from an in-depth analysis of news research. We could not obtain return on assets for one issuer. For 7 of the 70 issuers, we were unable to obtain sufficient information about prebankruptcy filing bank negotiations or advisor-assisted preparation of restructuring concepts to make a well-founded assessment regarding these variables. Therefore, we use 63 data points for this analysis.

2.6.2 Results from multivariate analysis and event studies

2.6.2.1 Determinants of the pre-bankruptcy bond restructuring process

We use a Probit regression model to expand the univariate analysis and determine the issuer characteristics and bank involvement variables that influence the decision to launch a bond restructuring process prior to bankruptcy filing. In this set of regressions, the dependent variable equals one if the issuer launched a bond restructuring process no later than 30 trading days prior to bankruptcy filing. For each of the following regression models, we work with standard error estimates that are robust to heteroscedasticity by using Huber–White standard errors. We check for multicollinearity by calculating the variance inflation factors (VIFs), which are denoted in the table descriptions of certain tables. We ensure that the maximum VIF for items in each table stays below the critical value of 10, as recommended by Wooldridge (2016, p.86). The final Probit regressions take the following form:

$$Pr(y=1|x) = \Phi \{\beta_0 + \beta_1(\text{Equity ratio}) + \beta_2(\text{Return on assets}) + \beta_3(\text{Tangible asset ratio}) + [2.3]$$

$$\beta_4(\text{Intangible asset ratio}) + \beta_5(\text{Leverage ratio}) + \beta_6(\text{Total assets}) + \beta_7(\text{Publicly listed issuer}) + \beta_9(\text{Bank involvement variable}) + e_i\}$$

Table 2.5 shows the results. Model (1) is the base case regression, which only includes issuer-specific data, while Models (2) to (7) include variables to test the influence of bank involvement during the financial restructuring process. The coefficient of the leverage ratio is positive and significant in all models, which indicates highly leveraged issuers have a higher likelihood of conducting a bond restructuring process. This is consistent with the theoretical predictions of Jensen (1989) and the empirical work of Jostarndt and Sautner (2010), who find that higher leverage increases the likelihood of a (successful) workout. The coefficient of total assets is significantly negative, which means that the larger and more complex the issuers, the

less likely bond restructuring processes will be conducted. The dummy variable for stock listing is significantly positive in all models, which shows that stock-listed issuers are more likely to conduct a bond restructuring. Together with the negative coefficient of total assets, we make the following interpretation. In times of financial stress, restructuring more complex but less transparent issuers is perceived as futile, which results in bankruptcy filings without seeking bondholder agreements. This finding is consistent with Jostarndt and Sautner (2010) regarding successful financial restructurings.

Following this discussion of the control variables, we now focus on analyzing the bank involvement variables included in Models (2) to (7) of Table 2.5. In Models (2) and (3), the coefficients of the dummy variable for the existence of bank debt and share of bank debt relative to total financial debt are negative, yet insignificant. The mere presence of bank debt seems to be enough to impact the decision to conduct a bond restructuring process. This is surprising, as one would expect that banks may be interested in avoiding bond issuer bankruptcy because it is generally considered costlier than an out-of-court restructuring (see, among others, Gilson et al., 1990).

The coefficients of the dummy variables for Bank negotiations and preparation of a restructuring concept prior to bankruptcy filing in Models (4) and (5) are positive and significant. Direct private interactions between issuers and banks seem to positively drive the launch of a bond restructuring process, whereas the mere presence of bank debt is not sufficient to push issuers to conduct a public bond restructuring process. We also construct interaction variables, combining the share of bank debt with the dummy variables for Bank negotiations and Restructuring concept in Models (6) and (7). Both interaction variables are positive, yet only the latter is significant. Overall, our findings suggest that direct interactions between issuers and banks prior to bankruptcy filing positively impact the decision to conduct a bond restructuring process, which supports Hypothesis 1.

Table 2.5: Probit model for launching the bond restructuring process

This table reports the results from the Probit regression model for issuer characteristics and bank involvement variables. The dependent variable is a dummy, which equals one when the restructuring process starts no later than 30 days prior to bankruptcy filing, and zero when the process has not started. The Huber–White heteroscedasticity-consistent standard errors are shown in parentheses below the coefficients, and the marginal effects are shown in italics below the standard errors. All independent variables, except the dummy variables, are winsorized at the 2.5% level on both sides. The number of observations varies due to data availability. Investigating the variance factors (VIFs) reveals no multicollinearity, as the mean VIF is 1.74 and the maximum VIF is 3.24. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent variables: Dummy variable for bond restructuring process start								
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)		
Constant	0.8452	1.0075	0.8198	1.5127	1.9680	1.3674	1.7546		
	(1.4579)	(1.4492)	(1.5111)	(1.8111)	(2.1078)	(1.7903)	(1.7904)		
	0.3328	0.3966	0.3227	0.5755	0.7068	0.5243	0.6695		
Equity ratio (%)	1.3446	1.3628	1.3372	1.1036	2.1419	1.3787	1.6246		
	(0.9773)	(0.9699)	(0.9907)	(1.0359)	(1.4399)	(1.0603)	(1.1297)		
	0.5294	0.5365	0.5264	0.4199	0.7693	0.5286	0.6199		
Return on assets (%)	-2.3439 *	-2.2975 *	-2.3378 *	-2.0884 **	0.0102	-1.6773	-1.2075		
	(1.2094)	(1.2041)	(1.2279)	(1.2337)	(1.1624)	(1.1855)	(1.1958)		
	-0.9229	-0.9044	-0.9203	-0.7945	0.0037	-0.6431	-0.4608		
Tangible asset ratio (%)	-0.0629	-0.1411	-0.0567	-0.0897	-0.9086	-0.5151	-0.5998		
	(0.9130)	(0.9488)	(0.9197)	(0.9238)	(1.1703)	(0.9047)	(0.9322)		
L. (-0.0248	-0.0556	-0.0223	-0.0341	-0.3263	-0.1975	-0.2289		
Intangible asset ratio (%)	(1.2684)	(1.2776)	(1.2897)	-0.6341	(1.6062)	-0.7948	-0.7588		
	(1.2084)	(1.2770) 0.1432	(1.2007)	(1.8079)	(1.0902)	(1.3782)	(1.3014)		
Leverage ratio (%)	3 1661 ***	3 1231 ***	3 1712 ***	39437 ***	4 8811 ***	3 3888 ***	3 3300 ***		
	(1.0093)	(1.0098)	(1.0073)	(1.1420)	(1 5703)	(1.0682)	(1.0874)		
	1.2466	1.2294	1.2485	1.5004	1.7531	1.2993	1.2707		
Total assets (log)	-0.2941 **	-0.2762 *	-0.2910 *	-0.4432 ***	-0.5603 ***	-0.3566 **	-0.3881 **		
	(0.1446)	(0.1482)	(0.1539)	(0.1817)	(0.2089)	(0.1730)	(0.1665)		
	-0.1158	-0.1087	-0.1146	-0.1686	-0.2013	-0.1367	-0.1481		
Listed issuer (dummy)	0.8277 *	0.8520 **	0.8308 *	0.9907 **	1.0973 **	0.8785 **	0.9038 **		
	(0.4231)	(0.4229)	(0.4245)	(0.4469)	(0.4824)	(0.4286)	(0.4296)		
	0.3259	0.3354	0.3271	0.3769	0.3941	0.3369	0.3449		
Bank debt (dummy)		-0.3695							
		(0.6719)							
		-0.1455							
Share of bank debt (%)			-0.0452						
			(0.6353)						
			-0.0178	1.0720 **					
Bank negotiations (dummy)				1.0720 **					
				(0.4164) 0.4078					
Restructuring concept (dummy)				0.4078	2 1676 ***				
neonaotaning concept (aanini,)					(0.5176)				
					0.7785				
Share of bank debt × bank neg. du	ummy					1.0229			
						(0.6916)			
						0.3922			
Share bank debt × restr. concept of	dummy						1.3286 **		
							(0.6678)		
							0.5070		
McFadden R ²	0.2152	0.2183	0.2152	0.2486	0.4221	0.2080	0.2241		
Observations with $Dep = 0$	38	38	38	37	37	37	37		
Observations with Dep = 1	31	31	31	26	26	26	26		

In a second analysis of the private part of the financial restructuring process to test Hypothesis 2, we closely examine the outcome of negotiations between banks and issuers. For this purpose, we form a subsample of the 39 issuers who entered bank negotiations. Next, we test the fundamental characteristics of issuers who launched a bond restructuring process thereafter. As this subsampling could be subject to sample selection bias, we employ a two-stage Probit model with sample selection.²⁰ We estimate two (simple) selection equations, which take the following forms:

$$Pr(y=1|x) = \Phi\{\beta_0 + \beta_1(\text{Listed issuer}) + \beta_2(\text{Log total bank debt}) + e_i\}$$
[2.4]

$$Pr(y=1|x) = \Phi\{\beta_0 + \beta_1(\text{Listed issuer}) + \beta_2(\text{Log total assets}) + e_i\}$$
[2.5]

We use Equation [2.4] for Model (1) in Table 2.6 and Equation [2.5] for Model (2). The dependent variable is a dummy variable that equals one if the issuer entered bank negotiations prior to bankruptcy filing and zero otherwise. Model (1) serves as an input for the outcome equations of Table 2.7, while Model (2) will be used for the robustness tests in Section 2.7. We use the Listed issuer dummy variable to test for the impact of information asymmetries on the decision to enter bank negotiations. The amount of bank debt can either be a proxy for the issuer's size and complexity or the potential bank losses in a bankruptcy setting. The amount of total assets is a proxy for issuer size or complexity. The outcome equation takes the following form, with λ_i being the Inverse Mills ratio based on Model (1) of Table 2.6:

$$Pr(y=1|x) = \Phi\{\beta_0 + \beta_1(Leverage) + \beta_{2-5}(Financial Variables) + \lambda_i + e_i\}$$
[2.6]

Table 2.6 shows the results of the selection equation. The start of bank negotiations is strongly driven by the issuer's amount of bank debt and total assets. The issuer's stock listing does not significantly impact the decision. This shows that the issuer's size and amount of bank debt play significant roles. Banks seem to have greater interest in negotiations with financially distressed issuers when their stakes are high, that is, the issuer's bank debt is high.

²⁰ See Proof 2.1 for a general explanation of the two-stage Probit model with sample selection.

Table 2.6: Probit selection model for determinants of bank negotiations

This table reports the results of the Probit selection model of the determinants of bank negotiations. The dependent variable is a dummy and equals one if the issuer entered bank negotiations and zero otherwise. Huber–White heteroscedasticity-consistent standard errors are shown in parentheses below the coefficients, and marginal effects are shown in italics below the standard errors. The variables for Total bank debt and Total assets are winsorized at the 2.5% level on both sides. Investigating the variance inflation factors (VIFs) reveals no multicollinearity, as the mean VIF is 1.13 and the maximum VIF is 1.14. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent variables: Dummy va	riable for Bank negotiations
Independent variables	(1)	(2)
Constant	-2.4152 ***	-4.7789 ***
	(0.7469)	(1.4389)
	-0.9575	-1.8367
Listed issuer (dummy)	-0.3600	-0.1921
	(0.3863)	(0.3656)
	-0.1427	-0.0738
Total bank debt (log)	0.3070 ***	
	(0.0824)	
	0.1217	
Total assets (log)		0.4409 ***
		(0.1269)
		0.1695
McFadden R ²	0.2531	0.1501
Observations with $Dep = 0$	24	24
Observations with Dep = 1	39	39

Table 2.7 shows the Probit outcome model of the determinants for launching a bond restructuring process after bank negotiations. The coefficients for the leverage ratio are positive and significant at the 1% level in each of the five models. This gives a strong indication that negotiations between banks and issuers are more likely to be successful when the companies are highly leveraged, which is generally consistent with our expectations and existing literature (e.g., Jensen, 1989; Jostarndt and Sautner, 2010). Banks stand to lose more with highly leveraged issuers and are interested in settling financial difficulties out of court; therefore, to solve financial difficulties with bondholders, they push the issuer to start the bond restructuring process. The significantly negative coefficients of tangible assets in all models correspond with our previous finding regarding the relationship between bankruptcy costs and successful bank negotiations. Overall, based on our results, we find support for Hypothesis 2.

Table 2.7: Probit outcome model for determinants of bond restructuring after bank negotiations

This table reports the results of the Probit regression model of the determinants of the bond restructuring process after bank negotiations. The dependent variable is a dummy, which equals one if the issuer launched a bond restructuring process 30 days prior to insolvency filing and zero otherwise. These 39 issuers are a subsample of the overall sample and consist of issuers that negotiated with banks. The Inverse Mills ratio is calculated based on Model (1) of Table 2.6. Huber–White heteroscedasticity-consistent standard errors are shown in parentheses below the coefficients, and the marginal effects are shown in italics below the standard errors. All independent variables are winsorized at the 2.5% level on both sides. Investigating the variance inflation factors (VIFs) reveals no multicollinearity, as the mean VIF is 1.62 and the maximum VIF is 2.27. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent variables: Dummy variable for bond restructuring process start											
Independent variables	(1)	(2)	(3)	(4)	(5)							
Constant	-2.8264 **	-2.9747 **	-2.7354 **	-2.4829 **	-3.1230 ***							
	(1.2938)	(1.1907)	(1.1885)	(1.1390)	(1.0940)							
	-1.0900	-1.1265	-1.0561	-0.9279	-1.0296							
Leverage ratio (%)	5.7737 ***	5.5906 ***	5.7397 ***	5.0804 ***	4.3543 ***							
	(1.8868)	(1.7394)	(1.7578)	(1.5217)	(1.3522)							
	2.2266	2.1171	2.2161	1.8985	1.4356							
Tangible asset ratio (%)	-3.1200 **	-2.6066 **	-2.5520 *	-2.1225 *								
	(1.3800)	(1.3059)	(1.3167)	(1.2614)								
	-1.2032	-0.9871	-0.9853	-0.7932								
Equity ratio (%)	2.9291 **	2.3621 *	1.1052									
	(1.4654)	(1.3190)	(1.3137)									
	1.1296	0.8945	0.4267									
Return on assets (%)	-4.3185 ***	-3.9056 **										
	(1.7507)	(1.6975)										
	-1.6654	-1.4790										
Intangible asset ratio (%)	-2.6961											
	(2.0460)											
	-1.0398											
Inverse Mills Ratio	0.6711	0.6759	0.7081	0.8950	1.6588							
	(1.1527)	(1.1125)	(1.0738)	(1.0348)	(1.0270)							
	0.2588	0.2559	0.2734	0.3345	0.5469							
McFadden R ²	0.3454	0.3269	0.2666	0.2532	0.2073							
Observations with $Dep = 0$	21	21	21	21	21							
Observations with $Dep = 1$	18	18	18	18	18							

2.6.2.2 Bondholder benefits of the pre-bankruptcy bond restructuring process

2.6.2.2.1 Market reaction around the start of the restructuring process and bankruptcy filing

To investigate how the start of a bond restructuring process impacts bondholders, we examine abnormal bond returns close to the crucial dates of the bond restructuring process. For this purpose, we calculate the CAR of the different bonds, as explained in Section 2.5.3.1.2. For the main analysis, we used the established subsamples of Process issuers/bonds and Non-process issuers/bonds. The first subsample represents all the issuers who launched a bond restructuring process no later than 30 days prior to bankruptcy filing and their respective bonds.

Table 2.8: Bond price effects around the start of the bond restructuring process

This table presents the cumulative abnormal returns (CARs) of the bond price reactions around the start of the restructuring process. Issuers started the restructuring process no later than 30 trading days before the bankruptcy filing. The t-test statistics are provided in parentheses below the CARs. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Process start 30 trading days before insolvency filing											
	N = 23											
Event windows	Mean	Median	St. dev	Fraction < 0								
[-1;1]	-0.087055 ** (-2.0763)	-0.028608 (1.5968)	0.201079	0.57								
[-3;3]	-0.152882 ** (-2.2923)	-0.115195 ** (2.4788)	0.319857	0.74								
[-5;5]	-0.123012 (-1.5410)	-0.099899 (1.5055)	0.382841	0.65								
[-10;10]	-0.134444 (-1.5134)	-0.076551 (1.2014)	0.426054	0.70								
[-30;30]	-0.293701 ** (-2.7779)	-0.384710 *** (2.7830)	0.507051	0.78								

Table 2.8 presents the results of the analysis for the market reaction around the start of the bond restructuring process for Process bonds. Both mean and median CARs are negative for all event windows and are statistically significant in the [-1;1], [-3;3], and [-30;30] event windows. On the one hand, these abnormal negative returns could be interpreted as the removal of information asymmetries between bondholders and issuers, which exist due to the opaqueness of the issuers. On the other hand, the abnormal negative returns could be an expression of fear

of the bondholder's potential losses during the announced bond restructuring process. Regardless, this finding suggests that the start of the bond restructuring process creates transparency. It is valuable because it reveals insights into the financial difficulties of issuers and issues a "warning signal" to bondholders. With the announcement of the bond restructuring process, bondholders can adjust their expectations accordingly, which drives prices down. These findings support Hypothesis 3.

Table 2.9: Bond price effects around the bankruptcy filing

This table presents the cumulative abnormal returns (CARs) of the bond price reactions around the insolvency filing dates. Process bonds are bonds of issuers who started the restructuring process no later than 30 trading days before the bankruptcy filing, and Non-process bonds are bonds of issuers who did not start the restructuring process before the insolvency filing. The differences between means are tested using t-tests, and the differences between medians are tested using Wilcoxon–Mann–Whitney tests. ***, ***, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

		Process	s bonds			Non-proc	ess bonds					
Event window	Number	Mean	Median	St. dev	Number	Mean	Median	St. dev	Dif. me	an	Dif. med	lian
[-1;1]	26	-0.3500	-0.2915	0.3426	49	-0.4557	-0.1370	0.6318	0.1058		-0.1545	
[-3;3]	26	-0.4070	-0.3183	0.4975	49	-0.6303	-0.3871	0.7268	0.2233		0.0688	
[-5;5]	26	-0.3821	-0.2820	0.5099	49	-0.7818	-0.7198	0.7120	0.3996	**	0.4378	**
[-10;10]	26	-0.4230	-0.2731	0.6015	49	-0.8865	-0.8607	0.8573	0.4635	**	0.5877	***
[-30;30]	26	-0.5127	-0.5395	0.5581	49	-1.1279	-1.0686	0.8966	0.6151	***	0.5291	***

In Table 2.9 we compare the abnormal returns of Process bonds and Non-process bonds around the bankruptcy filing dates.²¹ Notably, Process bonds display significantly better (less negative) returns around the bankruptcy filing dates than Non-process bonds in the [-5;5], [-10;10], and [-30;30] days event windows. This suggests that starting the bond restructuring process and the corresponding removal of information asymmetries is valuable for bondholders, as it prevents Process bonds from experiencing surprise risk or negative jumps (Covitz and Han, 2004) and larger price drops around the bankruptcy filing dates. We regard this as the second positive aspect of the bond restructuring process.

²¹ Please note that the difference between the sample of 23 bonds in Table 2.8 and the 26 Process bonds in Table 2.7 is due to missing bond price data around the start of the bond restructuring process for three bonds of two issuers (RINOL Aktiengesellschaft and Solarworld AG).

2.6.2.2.2 Determinants of abnormal returns around bankruptcy filing dates

We expand the analysis of abnormal bond returns around bankruptcy filing dates and examine the corresponding company-, bond-, and process-specific drivers. For this purpose, we estimate a set of OLS regressions. CARs serve as the dependent variable, whereas the start of the bond restructuring process 30 days prior to bankruptcy filing and the process duration ("process variables") serve as explanatory variables. In addition, we use a set of issuer-specific financial and bond variables. The final OLS regression takes the following form:

Cumulative abnormal return =
$$\beta_0 + \beta_1$$
(Collateralization dummy) + β_2 (Mezzanine [2.7]
dummy) + β_3 (Listed issuer dummy) + β_4 (Equity ratio) +
 β_5 (Intangible asset ratio) + β_6 (Tangible asset ratio) +
 β_7 (Return on assets) + β_8 (Total assets) +
 β_9 (Leverage ratio) + β_{10} (Process variable) + e_i

We present the regression results in Table 2.10. Model (1) includes only the bond- and issuer-specific control variables; this model's predictive power is weak, with a low adjusted R^2 value. The coefficients of the equity ratio are significantly positive in Models (1) and (3), which indicates that the market distinguishes between issuers with stronger or weaker balance sheets. In addition, in Models (1) and (3), the coefficients of return on assets are negative, indicating that bonds of issuers with better profitability display more negative returns around the bankruptcy filing dates. This suggests that bondholders of better performing companies are less aware of the issuer's adverse financial situation and fail to accordingly adjust their expectations and bond prices prior to bankruptcy filing. In Models (2) and (3), we include the process variables. Both models display higher adjusted R² values, which indicates an increase in the predictive power of the models. The coefficients for the Process start dummy and Process duration variables are positive and (weakly) statistically significant. This indicates that the abnormal bond returns around the bankruptcy filing dates are positively related to the start and duration of the bond restructuring process. Bondholders of Process bonds seem to be better informed about the issuer's adverse financial condition when a bond restructuring process was started prior to bankruptcy filing, and these bondholders were able to adjust bond prices accordingly. In Model (4) we substitute the Process variables with the bond trading price 30 days before the bankruptcy filing date. The coefficient of this variable is negative and statistically significant at the 1% level. This shows that when bond prices are higher prior to bankruptcy filing, abnormal returns around the bankruptcy filing dates are more negative.

Table 2.10: Ordinary least squares model for CARs around bankruptcy filing on bond level

This table presents the cross-sectional analysis of the cumulative abnormal returns of bankrupt issuers' bonds from 30 trading days prior to and 30 trading days after filing for bankruptcy at the bond level. The values for the independent financial variables are winsorized at the 2.5% level on both sides. Investigating the variance inflation factors (VIFs) reveals no multicollinearity, as the mean VIF is 2.15 and the maximum is 3.54. Huber–White heteroskedasticity-consistent standard errors are shown in parentheses below the coefficients. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent	variables: CARs of b	onds around bankrup	otcy filing
Independent variables	(1)	(2)	(3)	(4)
Intercept	0.1426	-0.8093	0.0117	0.9473
	(1.2549)	(1.3058)	(1.2513)	(0.9633)
Collateralization (dummy)	0.3009	0.3028	0.1898	0.4783 **
	(0.2300)	(0.2112)	(0.2260)	(0.2137)
Mezzanine (dummy)	-0.4157	-0.2358	-0.3375	-0.8012 **
	(0.3980)	(0.4078)	(0.4302)	(0.3253)
Listed issuer (dummy)	-0.1850	-0.3202	-0.2779	-0.1796
	(0.2742)	(0.2789)	(0.2874)	(0.2378)
Equity ratio (%)	0.8867 **	0.6203	0.8729 **	0.2810
	(0.3920)	(0.4435)	(0.4178)	(0.3538)
Intangible assets ratio (%)	-0.0340	0.3875	0.1478	-0.0131
	(0.9575)	(0.9771)	(0.9413)	(1.0382)
Tangible asset ratio (%)	0.6818	0.4379	0.4921	-0.1893
	(0.4922)	(0.5230)	(0.5280)	(0.6096)
Return on assets (%)	-1.2836 **	-0.5987	-1.2206 **	-0.1039
	(0.5472)	(0.5885)	(0.5454)	(0.7337)
Total assets (log)	-0.0915	-0.0061	-0.0768	-0.0534
	(0.1040)	(0.1126)	(0.1045)	(0.0852)
Leverage ratio (%)	-0.4757	-0.6944	-0.4702	
	(0.6500)	(0.6563)	(0.6627)	
Process start (dummy)		0.5870 **		
		(0.2301)		
Process duration (days)			0.0005 *	
			(0.0003)	
Bond price t-30 days				-0.0141 ***
				(0.0050)
Adj. R ²	0.0567	0.1294	0.0686	0.2173
Number of observations	69	69	69	69

Based on the results of Tables 2.8 and 2.9, we reach the following conclusion. Process bonds experience negative abnormal returns around the start of the bond restructuring process (Table 2.8), either because of the issuer's dissemination of negative information or because bondholders become fearful of suffering losses during the restructuring process; bond prices drop accordingly. Before the bankruptcy filing, bond prices of Process bonds are lower and,

therefore, experience less negative abnormal returns than Non-process bonds (Table 2.9). Therefore, the coefficient of the bond price 30 days before bankruptcy filing is significantly negative in Model (4) of Table 2.10. These findings support Hypothesis 4.

2.6.2.2.3 Determinants of bond recovery rates

In the final set of regressions, we estimate another OLS model that includes the bond recovery rates 30 trading days after the bankruptcy filing date as the explained variable and a set of bond, issuer, and process variables as explanatory variables. The final OLS regression takes the following form:

Recovery rate =
$$\beta_0 + \beta_1$$
(Collateralization dummy) + β_2 (Mezzanine dummy) + [2.8]
 β_3 (Listed issuer dummy)+ β_4 (Equity ratio) +
 β_5 (Intangible assets ratio) + β_6 (Tangible assets ratio) +
 β_7 (Return on assets) + β_8 (Total assets) + β_9 (Leverage ratio) +
 β_{10} (Process variable) + e_i

We report the results in Table 2.11. In Model (1), we only include bond- and issuer-specific variables. In line with the absolute priority rule, bond recovery rates are higher for collateralized bonds and lower for mezzanine bonds, as indicated by the positive and negative coefficients for the Collateralization and Mezzanine dummy variables. These findings are consistent with Altman and Kishore (1996) and Varma and Cantor (2005). These results indicate that bondholders appreciate the value of collateralized bonds, which rank above senior bonds, and penalize mezzanine bonds, which rank below senior unsecured bonds. The dummy variable for the issuer's stock listing is significantly positive, which indicates that investors value the greater transparency of insolvent bond issuers and assign higher bond recovery rates accordingly. The coefficient of total assets is significantly negative, which indicates that investors expect lower recoveries from larger bankruptcies as the bankruptcy process may be more complex. The coefficients of intangible and tangible assets are negative, which can indicate the poor asset quality of the issuers in our dataset. Overall, the market seems to have a negative perception of the (tangible and intangible) asset quality of the sample issuers.

Table 2.11: Ordinary least squares model for recovery rates after bankruptcy filing

This table presents the cross-sectional analysis of recovery rates of bankrupt issuers' bonds 30 days after bankruptcy filing at the bond level. The values for the independent financial variables are winsorized at the 2.5% level on both sides. Investigating the variance inflation factors (VIFs) reveals no multicollinearity, as the mean VIF is 2.03 and the maximum is 3.05. Huber–White heteroskedasticity-consistent standard errors are shown in parentheses below the coefficients. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent	variable: Bond recove	ery rates after bankrup	tcy filing
Independent variables	(1)	(2)	(3)	(4)
Intercept	30.7624 ***	28.3415 ***	30.9267 ***	30.0815 ***
	(8.0490)	(7.9331)	(8.1270)	(8.3194)
Collateralization (dummy)	8.6215 ***	8.7143 ***	8.7613 ***	8.4268 ***
	(1.8890)	(1.8597)	(2.0618)	(1.8719)
Mezzanine (dummy)	-8.5847 ***	-8.2847 ***	-8.6482 ***	-8.1057 ***
	(1.7085)	(1.6553)	(1.7542)	(1.8606)
Stock-listing (dummy)	4.3182 **	3.8592 *	4.4598 **	4.5347 **
	(1.9060)	(2.2340)	(2.1415)	(1.9161)
Equity ratio (%)	-8.2227	-8.9199 **	-8.2177 **	-7.1507 *
	(3.7680)	(3.5622)	(3.8621)	(3.8279)
Intangible assets ratio (%)	-15.0395 **	-14.0421 *	-15.2278 **	-15.4917 **
	(7.3984)	(7.4946)	(7.5322)	(7.1716)
Tangible asset ratio (%)	-8.2190 **	-8.8645 **	-7.9369 *	-7.1404 *
	(3.8608)	(4.3392)	(4.1183)	(4.2302)
Return on assets (%)	11.0022 **	12.4795 **	10.9575 **	9.1980 *
	(4.7207)	(5.3082)	(4.7636)	(5.2380)
Total assets (log)	-1.1816 *	-0.9519	-1.2030 *	-1.2937 *
	(0.6587)	(0.7039)	(0.6616)	(0.6515)
Leverage ratio (%)	-4.4308	-5.2406	-4.4083	-3.8917
	(4.4867)	(4.4212)	(4.5259)	(4.4733)
Process start (dummy)		1.5037		
		(2.4164)		
Process duration (days)			-0.0007	
			(0.0023)	
Bond price t-30 days				0.0210
				(0.0265)
Adj. R ²	0.3222	0.3176	0.3126	0.3161
Number of observations	78	78	78	78

In Models (2) to (4) we supplement Model (1) with the process variables used in Section 2.6.2.2.2. Adding these variables does not improve the model's predictive power (adjusted R^2 is slightly lower compared to Model (1)), nor are the coefficients of the process variables statistically significant. This indicates that the bond restructuring process prior to bankruptcy filing does not drive bond recovery rates down and therefore does not negatively impact bondholders. Based on these findings, we reject the alternative Hypothesis 4'.

2.7 Robustness tests

We run robustness tests to validate our results. Referring to Section 2.6, we modify our analysis. Broadly, we apply the following modifications to our regressions and abnormal return calculations, if appropriate. We exclude the two largest issuers by asset size (IVG Immobilien and Arcandor), as our results may be distorted by these issuers. We also modify the classification of Process issuers/bonds. For the purpose of the robustness test, Process issuers/bonds start the bond restructuring process (up to one day) before the bankruptcy filing date. In addition, we run selected regressions at the issuer level instead of at the bond level. Overall, the results of these robustness tests are quite similar to the main analysis in Section 2.6, which reinforces our confidence that our results are not subject to any form of bias.

As a robustness test for the univariate comparison of Process and Non-process issuers in Table 2.4, we repeat the analysis with the adjusted subsample of Process issuers, which now includes three issuers who initiated the bond restructuring process less than 30 trading days before the bankruptcy filing date; the results are found in Appendix 2.3. For the Probit analysis concerning the start of the bond restructuring process (Table 2.5), we exclude the largest issuers, namely IVG Immobilien and Arcandor. Furthermore, we run the Table 2.5 regressions with the adjusted subsample of Process issuers, where we reclassify three issuers who started the bond restructuring process less than 30 trading days before the bankruptcy filing date as Process issuers. We show the results of these robustness tests, which are highly similar to those in Table 2.5, in Appendices 2.4 and 2.5. The robustness test for Table 2.7 is based on the Inverse Mills ratio derived from Model (2) of Table 2.6 and is shown in Appendix 2.6. The results are highly similar to the original regression results in Table 2.6. Overall, these results are encouraging regarding our assessment of Hypotheses 1 and 2. For Table 2.8, we repeat the comparison of the subsample's abnormal returns to those of the reclassified subsample of three issuers with four bonds who started the bond restructuring process (up to one day) before the bankruptcy filing) and present the results in Appendix 2.7. The abnormal returns around the start of the bond restructuring process are even more significant in this analysis, which assures us that our assessment of Hypothesis 3 is correct. We do not run a robustness test for Table 2.9 with a reclassified subsample of Process bonds because the price effects of the four bonds that started the bond restructuring process less than 30 trading days prior to bankruptcy filing would be distorted, as the start of the bond restructuring process and bankruptcy filing would be chronologically very close to each other. For a robustness test of the results in Tables 2.10 and 2.11, we calculate the dependent variables at the issuer level, using a par-debt value-weighting approach as in Varma and Cantor (2005). This method reduces the sample size; however, the results, depicted in Appendices 2.8 and 2.9, are similar to our original analysis. We are, therefore, confident that we made the correct assessment regarding Hypotheses 4 and 4'.

2.8 Summary and conclusion

Formal bankruptcy or an in-court settlement of a company's financial difficulties is usually regarded as a costly choice compared to an out-of-court restructuring of a troubled company's debt. German legislation for bond restructuring provides an issuer-friendly framework for out-of-court bond restructuring. However, some German bond issuers refuse to launch bond restructuring processes and file for bankruptcy directly, thus choosing the more costly restructuring option without assessing the less costly restructuring approach. Using a unique hand-collected sample of all available bankrupt bond issuers between 2005 and 2018, we found that direct interactions between banks and bond issuers before bankruptcy events are a major driver for launching a bond restructuring process. This provides evidence for the important role of banks as a valuable monitoring and governance element in the German debt market. We also found that the higher the loss potential for investors during a bankruptcy, measured by the degree of leverage and tangible assets, the more likely that banks will facilitate a bond restructuring process prior to bankruptcy filing after negotiating directly with the issuer.

The German bond market has been denounced in recent years for low investor protection standards and lack of investment professionalism. Although the bond restructuring process could not prevent the bankruptcy of the issuers considered in our sample, it served as a tool for bondholders to mitigate the surprise risk by improving abnormal returns around bond bankruptcy filing dates when the bonds were earlier subject to a restructuring process. Since the recovery rates of Process and Non-process bonds are not significantly different, our analysis of bond recovery rates found no evidence of negative effects caused by launching a bond restructuring process; Process bonds even display higher recovery rates. This could be distorted, as our analysis did not include the recovery rates of all investors, such as equity investors and private debt investors. Including private debt recovery rates was not possible due to limited data availability. However, a combined analysis of bond and equity recovery rates, as in Betker (1998), would be conceivable. As the number of stock-listed issuers in our sample was quite small (only 36 of 73 issuers), we did not include a corresponding analysis. A study with a larger sample size is left as an approach for further research.

3 Impact of retail investors on bond restructuring

3.1 Introduction

During periods of corporate debtors' financial distress, bondholders face disadvantages visá-vis creditors such as banks who have concentrated debt positions; this is due to the dispersed nature of bond debt and the difficulty of coordinating and representing bondholders (see Gertner and Scharfstein, 1991; Berglöf and van Thadden, 1994; Bolton and Scharfstein, 1996; Bolton and Freixas, 2000). These difficulties result in bondholder problems in terms of collective action and collective representation (Schmidtbleicher, 2010, p.41). Compared to the Trust Indenture Act of 1939 in the U.S., the German Bond Act offers issuer-friendly rules for bond restructuring (Lürken and Pickerill, 2011, p.355) and allows bondholders to amend bond terms through majority votes in up to two successive bondholder meetings. The German law also addresses the major problems bondholders face during the restructuring process. On the one hand, collective action problems are addressed through the low quorum requirements of bondholder meetings, collectively binding bondholder votes on bond term amendments, permission for proxy votes, and introduction of votes without meetings. On the other hand, collective representation problems are addressed through appointment of a joint representative, who can be either elected by bondholder vote or designated in the bond terms (Schulenburg, 2017, p.71). Beginning in 2010, the German exchanges created bond market segments²² that explicitly targeted retail investors by, for example, allowing minimum denominations of only EUR 1,000 per bond (Achleitner and Volk, 2013, p.159). Retail investors are especially prone to coordination problems, as they are less sophisticated, act irrationally (e.g., Grinblatt and Han, 2005), and usually hold minuscule security investments,²³ which make it even less attractive for them to become informed about a bond issuer's situation and participate in bond restructuring attempts (Becker and Josephson, 2016, p.2819).

The current body of empirical research provides ample evidence about bond restructuring with a focus on data from the U.S. (Gilson et al., 1990, Asquith et al., 1994, Franks and Torous, 1994) and the behavior of institutional investors, such as hedge funds (Wang, 2011). In contrast, bond restructuring events with a focus on Germany and the impact of retail investors have not

²² Bondm (Stuttgart), Entry Standard (Frankfurt), Mittelstandsmarkt (Dusseldorf), m:access (Munich), and Mittelstandsbörse Deutschland (Hamburg-Hannover).

²³ According to Deutsche Bundesbank (2019), the mean and median portfolios of German households have a volume of EUR 43,700 and EUR 9,900, respectively.

been studied intensively. To our knowledge, a detailed economic analysis of the German Bond Act and bondholder meetings in Germany has not yet been conducted.

In this chapter, we address these research gaps by analyzing the determinants of successful bond restructuring attempts in Germany. Our research is based on a hand-collected database of 139 bondholder meetings of 47 bond issuers. This dataset is combined with retail investor bond holding data obtained from the "Securities Holdings Statistics" database of Deutsche Bundesbank.²⁴ First, we analyze the success of different bondholder meetings and bond restructuring events. As quorum requirements are relatively moderate and issuers' autonomy in amending bond terms in bondholder meetings is high, we expect bond term amendments to be easily feasible and such restructuring attempts to be predominantly successful. Second, we focus on retail investor bond holdings. Due to severe problems coordinating retail investors, we expect them to complicate the aspired bond term amendments and be "stumbling blocks" in the restructuring process. Therefore, our research questions are as follows: How effective is the German Bond Act when issuers attempt to amend bond terms or restructure bonds?²⁵ How do retail investors' bond holdings impact the likelihood of successfully conducting bond restructurings?

Our findings can be summarized as follows. First, most attempts to amend bond terms are unsuccessful in the first meeting, but finally gain approval during the second meeting. Bond restructuring attempts are generally successful when considering both first and second bondholder meetings together. Second, a higher proportion of retail investor bond holdings significantly lowers bondholder meeting participation rates. The higher the percentage of retail investors, the less likely bondholder meetings will reach a quorum. Most importantly for a bond issuer, a higher percentage of retail investor bond holdings lowers the probability of conducting successful bond restructuring attempts. This means that, despite the issuer-friendly regulations of the German Bond Act, the rational apathy of retail investors can still impede bond restructuring attempts and may therefore complicate the financial restructuring of issuers.

This chapter complements academic literature on the German bond market, debt restructuring, and retail investor behavior in several ways. It adds to the ongoing discussion regarding the recent developments and flaws in the German bond market, especially following the introduction of mini-bond segments. We add to this stream of literature by presenting evidence that the German Bond Act provides an issuer-friendly framework for amending bond terms; however, retail investor bond holdings make these amendments more difficult. In

²⁴ The data are based on Bade, Flory, Gomolka, and Schönberg (2019).

²⁵ Bond term amendment and bond restructuring are used interchangeably in this chapter.

addition, we shed light on the under-researched area of bond restructuring in Germany, where the focus of research is primarily restructuring bank debt (see, e.g., Brunner and Krahnen, 2008; Jostarndt and Sautner, 2009). Finally, we complement existing research on retail investor behavior in the bond market, which has focused predominantly on the stock market (Nili and Kastiel, 2016).

The remainder of this chapter is structured as follows. Section 3.2 elaborates on the legal environment of bond restructuring under the German Bond Act. Section 3.3 provides a review of central papers on bond restructuring in the U.S., retail investor behavior, the German bond market, and debt restructuring in Germany, and explains how our study extends these literature streams. Based on the literature review, Section 3.4 develops our research hypotheses. Section 3.5 introduces the dataset and variable definitions, while Section 3.6 presents our empirical strategy and results. Section 3.7 offers robustness tests for our findings, and Section 3.8 concludes the chapter.

3.2 Restructuring bonds under the German Bond Act

In this section, we review the collective action and representation problems of bond restructuring and explain how the German Bond Act attempts to solve these issues. Collective action problems can be subdivided into holdout and holdup problems and the rational apathy of bondholders (Vogel, 2011, pp.115–116). Generally, holdout problems in bond restructuring arise in the following setting: A bond issuer faces financial difficulties and attempts to amend bond terms to avoid bankruptcy. Bondholder group A refuses to consent to the proposed bond term amendments, while bondholder group B makes the proposed concessions. Both bondholder groups enjoy the benefits of avoiding the issuer's bankruptcy, but only bondholder group B incurs the costs, while group A exploits group B. It is the dominant strategy of each bondholder group to not consent to the bond term amendments to avoid being exploited (for a detailed description of the holdout problem, see Roe, 1987, pp.236-239; Schmidtbleicher, 2010, pp.43–54). Holdup problems arise when a single bondholder is in a stronger position visá-vis large bondholders or the issuer, and can demand separate compensation for participating in amending bond terms, a process that offers these bondholders the potential for blackmail (Cagalj, 2013, p.146). Finally, rational apathy of bondholders occurs when the cost of becoming informed and engaging in a bond restructuring process outweighs its benefits (Schmidtbleicher, 2010, pp.61–63). Investors who hold small shares of bonds are potentially prone to rational apathy, as they face low economies of scale in becoming informed (Becker and Josephson, 2016, p.2819). The collective representation problems in bond restructuring arise due to the

dispersed and anonymous nature of bondholders, who are not only unknown to the issuer but also to each other; these problems make negotiations between the issuer and bondholders ineffective (Schmidtbleicher, 2010, p.63).

The German Bond Act addresses these issues through a variety of measures. Holdout and holdup problems are addressed through collective action clauses or collectively binding the effects of majority consent in bondholder meetings (see Sec. 4, German Bond Act). For a material amendment of bond terms, the law sets relatively low requirements for majority consent votes. Issuers can call for a first bondholder meeting, which requires a quorum of 50% of outstanding bond capital,²⁶ while a second bondholder meeting, which can be called if the first bondholder meeting fails to reach the required quorum, only needs 25% of bond capital to constitute a quorum (Sec. 15 (3), German Bond Act). Material bond term amendments (according to Sec. 5 (3) No. 1–9, German Bond Act) must obtain approval rates of 75% of the participating bond capital, while other voting items require only 50% approval rates (Sec. 5 (4), German Bond Act). Thus, during a second bondholder meeting, only 18.75% of total bond capital is sufficient to amend material bond terms (Lürken and Pickerill, 2011, p.358).²⁷ Collectively, the binding effect of majority consent in bondholder meetings (bond term amendments are binding for outvoted or non-voting bondholders (Sec. 5 (2) No. 1, German Bond Act) mitigates the free riding and blackmail potential of small bondholders vis-á-vis larger bondholder groups or the issuer and reduces collective action problems to a large extent (Schulenburg, 2016, pp.78–79). The law also provides measures to mitigate the rational apathy of bondholders by including proxy votes (Sec. 14, German Bond Act) and allows a vote without a meeting (Sec. 18, German Bond Act), which is virtual voting without a personal meeting of the bondholders (Kirchner, 2011, p.318). These measures are included to lower both the indirect costs bondholders incur to get informed (e.g., through transferring voting rights to an investor's representative) and direct costs for travel to bondholder meeting destinations (Kirchner, 2011, p.318). Finally, the problem of collective representation is addressed through the appointment of a joint representative (Sec. 7, German Bond Act), who can be designated and empowered to act on behalf of the bondholders through majority consent (Sec. 5 (1) No. 1, German Bond Act). Both the rights and authority of the joint representative are entitled by a majority vote of bondholders (Sec. 7 (2) No. 1, German Bond Act).

 $^{^{26}}$ This quorum requirement is high, when compared to the regulations in the German Corporation Act, Sec. 133 (1), which does not specify a quorum requirement but only states that a simple majority is required to make decisions in shareholder meetings.

²⁷ Appendix 3.1 provides an overview of the approval rate and quorum requirements in bondholder meetings according to the German Bond Act of 2009.

With the redesign of the German Bond Act in 2009, the available tool kit of restructuring measures was broadened, for example, by introducing the haircut (Sec. 5 (3) No. 3, German Bond Act) and debt-to-equity swap (Sec. 5 (3) No. 5, German Bond Act). A proactive bond restructuring was authorized, whereas according to Sec. 11 (1) of the German Bond Act of 1899, the issuer's looming bankruptcy was required to conduct a restructuring (Vogel, 2011, p.112). Nevertheless, the old law also includes features to overcome the problems of bond restructuring, such as low quorum requirements (Sec. 11, German Bond Act 1899). This chapter focuses exclusively on bondholder meetings held according to the redesigned law of 2009, as quorum requirements, especially for the second meeting, were altered and are not directly comparable to those in the old law.²⁸

Overall, existing research, legal researchers, and practitioners consider the German Bond Act of 2009 a decent and issuer-friendly tool for amending bond terms, (e.g., Lürken and Pickerill, 2011, p.357), especially in comparison to the U.S. Trust Indenture Act of 1939. The U.S. law requires a higher quorum, so virtually all bondholders must agree to amended bond terms (Lürken and Pickerill, 2011, p.355). This means that bond term amendments are rarely possible, and bond restructuring is mostly conducted through distressed exchanges, where bondholders can swap their old bonds for new ones, which are more often senior, to give bondholders the required incentive to tender their bonds (Gilson et al., 1990, p.322).

3.3 Literature review

3.3.1 Bond restructuring

This chapter relates to several streams of research, which are introduced as follows. First, it complements the existing research on bond restructuring. This stream has focused primarily on the U.S., with theoretical papers by Roe (1987) and Coffee and Klein (1991), who emphasize how the Trust Indenture Act of 1939 creates holdout problems for bond restructuring and how bond issuers can circumvent these issues. According to Sec. 316(b) of the Trust Indenture Act, the lack of collectively binding majority bondholder votes causes these problems and may contribute to unnecessary bankruptcies when troubled bond issuers fail to convince bondholders to participate in the bond restructuring (Roe, 1987, pp.236–237). Coffee and Klein (1991) show how issuers can use coercion techniques to pressure bondholders to participate in bond

²⁸ According to the German Bond Act of 1899, there are no quorum requirements for the second bondholder meeting, while the new German Bond Act of 2009 requires a 25% quorum to amend material bond terms.

restructurings. When collectively binding majority votes are missing, bond issuers use exchange or tender offers to alter the capital structure or debt terms. By either overstating the risk of insolvency, which creates higher cost for debtors than an out-of-court restructuring (see, e.g., Jensen, 1989, Gilson et al., 1990; Asquith et al., 1994), or by offering bonds with higher seniority in exchange for old bonds, which makes the remaining bonds less valuable, issuers convince bondholders to participate in the restructuring and circumvent the disadvantages of the Trust Indenture Act regulations (Coffee and Klein, 1991, pp.1211–1212). Chatterjee et al. (1995) examine the relationship between holdout problems and coercive techniques and find that less financially distressed issuers experience severe holdout problems and must use stronger coercion to convince bondholders to participate. Gilson et al. (1990, p.338) find that a successful out-of-court restructuring of troubled debtors is more likely when the financing structure of issuers is less complex, for example, when the share of bank debt is higher, and the total number of debt contracts is lower. The authors conclude that the holdout problem is more severe when a higher number of bondholders and more heterogeneous claimholders are involved. Asquith et al. (1994, p.642) examine a sample of restructuring cases and find that when issuers face holdout problems with dispersed bondholders during exchange offers, they rely on coercive techniques, such as an offer of the most senior securities. Examining tender offers and premiums on bonds in the U.S., Mann and Powers (2007) find that tender offer participation rates are higher when premiums increase. In addition, issuers must offer higher premiums when more restrictive bond covenants are in place. Danis (2016) examines the relationship between bondholder participation rates in distressed exchanges and the existence of CDS. The author finds that bondholder participation rates are lower when CDSs are traded on the respective bond, which in turn exacerbates the holdout problem.

This chapter complements this stream of research by examining a dataset of bond issuers who restructured their bonds according to the German Bond Act. As the German regulations differ from the U.S. Trust Indenture Act (the German law provides for collectively binding majority votes and very low quorum requirements), holdout and holdup problems should be greatly mitigated. Therefore, German issuers should find it convenient to amend bond terms and restructure bonds.

3.3.2 Behavior of retail investors

In this chapter, we examine the role of retail investors during German bond issuers' bond restructuring attempts. Section 3.2 describes bondholders as generally prone to several flaws such as holdout or holdup problems and rational apathy. Retail investors may be particularly

prone to rational apathy, which in turn may be especially harmful for bond restructuring attempts, as the German Bond Act requires that issuers reach quorum thresholds in bondholder meetings to amend bond terms and restructure bonds.

Black (1990, pp.584–591) uses a simple model to show that larger shareholders with economies of scale in becoming informed (e.g., because they vote on similar issues at multiple companies) are more likely to vote on shareholder approvals for governance changes. Small shareholders have low abilities and no economies of scale in becoming informed, so they remain uninformed and do not vote at all or vote with management. Retail investors usually hold tiny stakes in public companies and, therefore, have limited influence in corporate decision-making, resulting in low incentives to become informed and vote their shares. Instead, these investors rely on large shareholders to monitor management and effectively vote their shares, which is a form of free riding by small investors (Nili and Kastiel, 2016, pp.57–60). Recent evidence from shareholder meetings in the U.S. shows that retail investor shareholder meeting participation rates are significantly lower than the participation rates of institutional investors. ProxyPulse (2018, p.4) shows that retail investor participation rates in shareholder meetings has averaged 28% between 2014 and 2018, while institutional investor participation rates are significantly lower than the participation rates in shareholder meetings has averaged 90% for this period.

Beginning in 2010, German exchanges created new bond market segments, which were particularly designed to attract retail investors. Herrmann (2017) shows that retail investors held disproportionately higher shares of the bonds of bankrupt bond issuers in these market segments. The author attributes this to the inability of retail investors to properly distinguish issuer quality. Herrmann and Stolper (2017) find that highly visible mini-bond issuers (issuers with strong brand recognition or high media visibility) carry significantly lower risk premiums. They conclude that familiarity with issuers reduces retail investors' perceived risk of an investment.

In this chapter, we connect and complement these two research streams. We acknowledge that retail investors are less active in corporate voting, as corroborated by academic research and shareholder meeting data. The German Bond Act requires quorums in bondholder meetings to successfully amend bond terms. When retail investors hold a large share of bonds, bond restructuring and bond term amendments can become difficult. Therefore, we take a different, yet innovative, approach in this chapter to investigate the impact of retail investors on corporate financial issues. By analyzing a detailed, hand-collected database of bondholder meetings in Germany, we examine how retail investors impact the ability of German corporate bond issuers to amend bond terms and successfully restructure bonds.

3.3.3 The German bond market

This chapter also contributes to the ongoing discussion regarding recent developments and flaws in the German bond market, especially the flaws associated with the mini-bond markets. Mietzner et al. (2017) state that rating agencies, who found themselves in fierce competition for business, issued highly favorable ratings in part for financially weak mini-bond issuers, causing rating inflation. Mini-bond ratings significantly understated the real default rates of these issuers. Compared to other European high-yield bond markets, mini-bonds contained very weak investor protection mechanisms such as protective credit covenants and displayed high default rates (von Randow, 2017, p.160). Furthermore, Heß and Umber (2013) observe that many mini-bond issuers failed to attract the desired issue volume, a phenomenon that is unknown in more mature market segments, where capital market placements are usually oversubscribed. The authors attribute this to the lack of or poor support by issuing agents such as investment banks. Feihle and Lawrenz (2017) find poor post-issuance operating performance of mini-bond issuers compared to a control sample of SMEs and conclude that this is driven by adverse project quality and poor usage of the funds raised.

In summary, the current research on mini-bonds has focused on pricing at the time of issuance, the role of credit rating agencies in mispricing bonds, the role of issuance agents in successful placement, and the post-issue performance of mini-bond issuers. As mentioned in Section 3.3.2, some research has been conducted on the role of retail investors in the mini-bond market (see Herrmann, 2017; Herrmann and Stolper, 2017). We extend this research by examining the most critical situation in the lifecycle of a bond, namely restructuring. Here, we explicitly focus on how retail investor coordination or collective action problems may complicate these situations.

3.3.4 Debt restructuring in Germany

This chapter also complements the research available on debt restructuring in Germany, and mainly focuses on the role of banks during private debt restructuring, emphasizing the importance of creditor coordination. Brunner and Krahnen (2008) examine the distressed lending relationships of German banks and focus on the drivers of successful private workouts. They find that banks frequently engage in financial restructurings of troubled debtors and show that smooth coordination among banks, which is facilitated by the formation of bank pools, is crucial for a successful private workout. Jostarndt and Sautner (2010) examine the drivers of successful debt restructurings of publicly listed companies in Germany. They show that

bargaining inefficiencies (i.e., the information opacity of debtors and creditor coordination problems) and the institutional biases of the German bankruptcy law against workouts are the main obstacles to successful debt restructuring. The paper confirms that creditor coordination in the form of bank pools is a key element for successful debt restructuring.

We contribute to the research on debt restructuring and creditor coordination in Germany by offering the first study to explicitly focus on bond restructuring and bondholder coordination in Germany.

3.4 Hypotheses development

Based on the German Bond Act and the literature review, we formulate testable hypotheses. Overall, we are interested in understanding the efficiency of the German Bond Act when issuers need to amend bond terms and restructure bonds. We examine how retail investor bond holdings impact the feasibility of the bond restructuring process. Our hypotheses are specifically tailored to the dataset under review and the German Bond Act regulations.

We assume that the German Bond Act regulations are issuer-friendly, given the collectively binding majority votes and, especially, the low quorum requirements, and expect issuers to be able to easily amend bond terms in bondholder meetings. We use three hypotheses to examine this assumption. First, we test how retail investor holdings and their rational apathy impact bondholder meeting participation rates.

Hypothesis 1: Bondholder meeting participation rates are negatively related to retail investor bond holdings.

Second, we specifically test the ability to constitute quorums in bondholder meetings and how retail investor bond holdings impact this ability. As mentioned above, to amend material bond terms, the German Bond Act requires a quorum of 50% of the bond capital in the first bondholder meeting and allows scheduling a second bondholder meeting with a required quorum of only 25% if the first meeting fails to successfully constitute a quorum. We hypothesize:

Hypothesis 2: The likelihood of producing a quorum in bondholder meetings is negatively related to retail investor bond holdings.

Finally, we examine how retail investor bond holdings impact issuers' ability to restructure bonds. As the German Bond Act offers issuers two chances to successfully restructure bonds,

we examine the first and second bondholder meetings together and focus on these "meeting sequences"²⁹ to explicitly test for the impact of retail investors. We hypothesize:

Hypothesis 3: The probability of a successful meeting sequence is negatively related to retail investor bond holdings.

3.5 Dataset and variable definitions

3.5.1 Sample selection and data sources

We used a hand-collected dataset of bondholder meetings that were conducted according to the German Bond Act of 2009. To collect this dataset, we ran an in-depth keyword search on bundesanzeiger.de, as issuers announce invitations for bondholder meetings on this platform. Overall, we found 216 bondholder meetings for 99 bonds and 70 issuers, which were held between 2010 and January 2018. We carefully examined the different invitation letters provided on bundesanzeiger.de and extracted meeting agendas and voting items. If bondholder meetings constitute a quorum, issuers need to disclose voting outcomes on bundesanzeiger.de (see Sec 17 (1), German Bond Act) or on their personal websites (see Sec 17 (2), German Bond Act). We supplemented the documents provided by bundesanzeiger.de with the official press releases of issuers and the documents provided by Schutzgemeinschaft der Kapitalanleger e.V. or Deutsche Investoren Union (DIU) e.V., which are German investor associations that provide proxy voting for retail investors in bondholder meetings and regularly report about these meetings. The information provided by these associations especially helped us collect bondholder meeting participation rates, as this information was only available in fragments in the official documents provided on bundesanzeiger.de. We focused on bondholder meetings that were convened to materially amend bond terms, and therefore required the mentioned quorum requirements of 50% and 25% in the first and second meetings, respectively, and an approval rate of 75% (Sec. 5 (4) No. 2, Sec. 15 (3) No. 1 and No 4., German Bond Act). We also included bondholder meetings that were called to conduct an opt-in from the old German Bond Act of 1899 into the German Bond Act of 2009; the new law explicitly allows for this (Sec. 24, German Bond Act) and requires the same quorum and approval rates as the above-

²⁹ A sequence means first and second bondholder meetings with the same meeting agenda or same voting items.

mentioned cases. This selection reduced our dataset to 139 meetings, 59 unique bonds, and 47 unique issuers.

3.5.2 Variable definitions

3.5.2.1 Explained variables

In our empirical analysis, we attempt to explain the determinants of successful bondholder meetings and bond restructurings. Our primary interest is in understanding how retail investors impact the probability of success in these situations. We use three variables, as follows. Given the quorum requirements of the German Bond Act, the first proxy or explained variable is the bondholder meeting participation rate. This variable is defined as the share of bond capital present during a bondholder meeting. The next variable is a dummy variable that equals one if the bondholder meeting constituted a quorum and zero otherwise. For this analysis, we distinguish between first and second bondholder meetings, with quorum requirements of bond capital of 50% and 25%, respectively. The third proxy is a dummy variable that focuses on the success of bond restructuring attempts. The variable equals one if an issuer achieved the aspired bond restructuring in either the first or second bondholder meeting. We label the combination of a first and subsequent second bondholder meeting as a meeting sequence.

3.5.2.2 Explanatory variables

We use issuer-, bond-, and bondholder meeting-specific explanatory variables. We test for the size of the bond and bond issuer using the bond issue size. We expect the issue size to be negatively related to all explained variables, as a larger bond is more broadly held. This should drive participation rates down, lower the probability of reaching a quorum, and reduce the likelihood of successfully restructuring a bond. We test for issuer balance sheet strength and profitability using the equity ratio and return on assets. We also define a set of dummy variables. The first dummy variable equals one if a bondholder meeting or meeting sequence was called to amend material bond terms ("Restructuring") and zero if bondholders voted on other measures, mainly the opt-in into the German Bond Act of 2009, and other voting items ("Non-restructuring").³⁰ However, it is important that both meeting types have the same quorum

 $^{^{30}}$ See Sec. 5 (3) No. 1–9 German Bond Act of 2009 for an overview of the different material bond term amendments.

requirements of 50% and 25% in the first and second meetings, respectively. Second, we define a dummy variable that equals one if the bondholder meeting is a second meeting and expect this dummy to be positively correlated with the participation rate and probability of reaching a quorum. In a second meeting, bondholders should be more aware of the importance of voting on their bonds, which should increase the participation rate, while reaching a quorum is considerably easier as the threshold is only 25% compared to 50% in the first meeting.

The explanatory variable of main interest is "retail investor bond holdings," which is the relative share of the nominal bond capital held by households or retail investors at the time of a bondholder meeting. These data are obtained from the Securities Holdings Statistics database of Deutsche Bundesbank. This database contains a holding data split of each security held by customers of German financial institutions. A basic distinction is made between retail investors and various institutional investor groups; for this chapter, we only work with the data for retail investors and do not focus on institutional investors. The data are available on a quarterly basis until 2012 and on a monthly basis beginning in 2013. For the purpose of our analysis, we use the data points for the quarter and month in which the bondholder meetings were conducted; for bondholder sequences, we use the month or quarter of the last meeting of the sequence. Detailed definitions of the different variables used are available in Appendix 3.2.

3.5.3 Summary statistics

3.5.3.1 Bondholder meetings

We introduce the data on which this chapter is based and provide an overview of the summary statistics in Table 3.1. Appendix 3.3 offers a detailed overview of the different bondholder meetings and bondholder meeting sequences. Overall, the sample consists of 139 bondholder meetings that were conducted under the German Bond Act of 2009 between 2010 and the beginning of 2018 and satisfied quorum requirements under Sec. 15 (3), German Bond Act. Most of these meetings were held between 2013 and 2017, the period in which several mini-bond issuers were restructured or defaulted on their bonds.

Table 3.1: Issuers, bonds, bondholder meetings, and meeting sequences over time

This table reports the number of issuers, bonds, bondholder meetings, and meeting sequences in the dataset that were held according to the German Bond Act of 2009 with voting items and quorum requirements according to Sec. 15 (3). The issuer, bond, and meeting sequence columns include double counts, as bonds and issuers held bondholder meetings and restructured bonds multiple times. Meeting sequences that took place over the course of two years were counted only in the last year.

Issuers		Bor	nds	Bondholde	r meetings	Meeting sequences		
Year	Number	% of sample	Number	% of sample	Number	% of sample	Number	% of sample
2010	1	1.4%	1	1.1%	2	1.4%	1	1.1%
2011	5	6.8%	7	7.7%	11	7.9%	7	7.7%
2012	6	8.2%	8	8.8%	9	6.5%	8	8.8%
2013	6	8.2%	11	12.1%	17	12.2%	11	12.1%
2014	12	16.4%	12	13.2%	18	12.9%	12	13.2%
2015	14	19.2%	16	17.6%	24	17.3%	15	16.5%
2016	16	21.9%	20	22.0%	32	23.0%	20	22.0%
2017	12	16.4%	13	14.3%	22	15.8%	14	15.4%
2018	1	1.4%	3	3.3%	4	2.9%	3	3.3%
Total	73	100.0%	91	100.0%	139	100.0%	91	100.0%

In Table 3.2, we subdivide the 139 bondholder meetings into first and second meetings and distinguish between Restructuring and Non-restructuring meetings. The sample of 139 bondholder meetings is split between 91 first bondholder meetings, of which only 34 constituted a quorum, and 48 second bondholder meetings, 40 of which constituted a quorum. This shows that although quorum requirements are low for the first bondholder meeting, bond restructuring attempts usually need a second bondholder meeting to achieve the required quorum.

Table 3.2: Types of bondholder meetings

This table divides the 139 bondholder meetings in the dataset into first and second meetings, and reports whether the meetings constituted quorums. Under Restructuring, we show bondholder meetings with major amendments of the financial bond terms according to Sec. 5 (3) No. 1–9 German Bond Act. Non-restructuring are bondholder meetings and other voting items that do not amend major bond terms but have voting provisions according to Sec. 15 (3) of the German Bond Act. The quorum threshold in the first bondholder meeting is 50% of the bond capital, while the threshold in the second meeting is 25% of the bond capital.

	First boi mee	ndholder ting	Second be mee	ondholder ting	All bondholder meetings		
	Number	% of sample	Number	% of sample	Number	% of sample	
Split between bondholder meeting types							
Restructuring	76	54.7%	42	30.2%	118	84.9%	
Quorum constituted	29	20.9%	36	25.9%	65	46.8%	
Quorum not constituted	47	33.8%	6	4.3%	53	38.1%	
Non-restructuring	15	54.7%	6	4.3%	21	15.1%	
Quorum constituted	5	20.9%	4	2.9%	9	6.5%	
Quorum not constituted	10	33.8%	2	1.4%	12	8.6%	
Total	91	65.5%	48	34.5%	139	100.0%	
Quorum constituted	34	24.5%	40 28.89		74	53.2%	
Quorum not constituted	57	41.0%	8	8 5.8%		46.8%	

In Table 3.3, we combine first and second bondholder meetings to construct meeting sequences. Overall, we identify 91 sequences, which we subdivide into Restructuring, Non-restructuring, "Successful," and "Not successful" sequences. Successful in this case is more narrowly defined than "Quorum constituted," as this classification requires that either the first or second bondholder meeting of the sequence constituted a quorum and bondholders approved the proposed voting items. The latter condition is usually not difficult to meet, as bondholder meeting approval rates are usually high (see Appendix 3.4 for a descriptive overview of bondholder meeting approval rates). Interestingly, the success rate of these sequences is high, as 71 of the 91 sequences or 78% were successful. In addition, 62 of the 75 Restructuring sequences were successful, indicating that issuers were highly successful in amending bond terms.

Table 3.3: Types of bondholder meeting sequences

This table divides the 91 bondholder meeting sequences in the dataset into sequences that include only one or two meetings. Under Restructuring, we show sequences with voting items for materially amending bond terms according to Sec. 5 (3) No. 1–9 of the German Bond Act. No-restructurings are sequences that included voting items other than to amend major bond terms but with voting provisions according to Sec. 15 (3) of the German Bond Act. A sequence is Successful when bondholders agreed to the main voting items. A sequence is Not successful when bondholders rejected the main voting items, the final meeting of the sequence did not constitute a quorum, or the final meeting was cancelled.

	Includes bondhold	only first er meeting	Includes a bondhold	llso second ler meeting	All bondholder meeting sequences		
	Number	% of sample	Number	% of sample	Number	% of sample	
Split between bondholder meeting see	quences						
Restructuring	33	36.3%	42	46.2%	75	82.4%	
Successful	28	30.8%	34	37.4%	62	68.1%	
Not successful	5	5.5%	8	8.8%	13	14.3%	
Non-restructuring	10	11.0%	6	6.6%	16	17.6%	
Successful	5	5.5%	4	4.4%	9	9.9%	
Not successful	5	5.5%	2	2.2%	7	7.7%	
Total	43	47.3%	48	52.7%	91	100.0%	
Successful	33	36.3%	38	41.8%	71	78.0%	
Not successful	10	11.0%	10	11.0%	20	22.0%	

Table 3.4 provides an overview of the 338 voting items brought forward in bondholder meetings, subdivided into Restructuring items, Non-restructuring items, Successful, and Not successful votes, and first and second bondholder meetings. Not surprisingly, it shows that bond restructurings are more often successful in second bondholder meetings (88 Successful vs. 21 Not successful voting items), while it seems to be difficult to restructure bonds in first bondholder meetings (68 Successful vs. 132 Not successful voting items). The same holds for Non-restructuring items, where 10 Successful voting items contrast with 11 Not successful voting items in the first meeting, while there were 7 Successful items compared to only 1 Not successful item in the second bondholder meeting. Based on these descriptive statistics, the German Bond Act of 2009 seems to enable an easy adjustment of bond terms and restructuring bonds.

Table 3.4: Voting items in bondholder meetings

This table reports the 338 voting items that were put to vote during bondholder meetings. Voting items were identified based on documents provided by bundesanzeiger.de. Under Restructuring items, we show major amendments of financial bond terms according to Sec.5 (3) No. 1–9 German Bond Act. Non-restructuring items are other voting items that do not amend major bond terms but have voting provisions according to Sec.15 (3) of the German Bond Act. Successful is a voting item that was approved by bondholders with the necessary voting majority and participation rate. Not successful is a voting item that was not approved by bondholders meeting participation rate was very low and failed to constitute a quorum.

	First bondholder meeting				Sec	ond bondh	older meeti	ng	All bondholder meetings					
	Succe	ssful	Not suc	cessful	Succe	ssful	Not suc	cessful	Successful		Not suc	cessful	To	tal
	Number	% of sample	Number	% of sample	Number	% of sample	Number	% of sample	Number	% of sample	Number	% of sample	Number	% of sample
Voting items														
Restructuring items	68	20.1%	132	92.3%	88	26.0%	21	6.2%	156	46.2%	153	45.3%	309	91.4%
Haircut	3	0.9%	6	4.2%	3	0.9%	1	0.3%	6	1.8%	7	2.1%	13	3.8%
Loan life adjustment	11	3.3%	21	14.7%	13	3.8%	3	0.9%	24	7.1%	24	7.1%	48	14.2%
Coupon adjustment	11	3.3%	18	12.6%	9	2.7%	3	0.9%	20	5.9%	21	6.2%	41	12.1%
Deferment agreement	6	1.8%	13	9.1%	7	2.1%	4	1.2%	13	3.8%	17	5.0%	30	8.9%
Foregone interest payments	3	0.9%	4	2.8%	3	0.9%	1	0.3%	6	1.8%	5	1.5%	11	3.3%
Debt-Equity swap	5	1.5%	8	5.6%	7	2.1%	0	0.0%	12	3.6%	8	2.4%	20	5.9%
Debt-Debt swap	1	0.3%	3	2.1%	3	0.9%	0	0.0%	4	1.2%	3	0.9%	7	2.1%
Abandonment of right of cancellation	4	1.2%	15	10.5%	10	3.0%	4	1.2%	14	4.1%	19	5.6%	33	9.8%
Authorization of joint representative to negotiate bond term amendments	3	0.9%	16	11.2%	12	3.6%	4	1.2%	15	4.4%	20	5.9%	35	10.4%
Other restructuring measures	21	6.2%	28	19.6%	21	6.2%	1	0.3%	42	12.4%	29	8.6%	71	21.0%
Non-restructuring items	10	12.8%	11	7.7%	7	2.1%	1	0.3%	17	5.0%	12	3.6%	29	8.6%
Authorization of joint representative for non-bond restructuring measures	3	3.8%	2	1.4%	1	0.3%	1	0.3%	4	1.2%	3	0.9%	7	2.1%
Opt-in German Bond Act 2009	7	9.0%	9	6.3%	6	1.8%	0	0.0%	13	3.8%	9	2.7%	22	6.5%
Total	78	23.1%	143	42.3%	95	28.1%	22	6.5%	173	51.2%	165	48.8%	338	100.0%

Based on intensive research of bondholder meetings, we uncover the participation rates of 80 bondholder meetings and provide the basic descriptive statistics in Table 3.5. The mean and median participation rates are 35.9% and 35.3%, respectively, while participation rates do not differ significantly between the first and second bondholder meetings. Only the standard deviation differs between the meeting types, where fluctuations in the participation rates are higher for first bondholder meetings. The participation rates are considerably lower than data from the U.S., where Mann and Power (2007) find mean and median participation rates for a sample of bond tender offers of 82.3% and 95.6%, respectively, while Danis (2016) finds mean and median participation rates of 55% and 56%, respectively, for a sample of distressed exchanges. Thus, it is obvious that only the low quorum requirements of the German Bond Act make bond term amendments or bond restructurings feasible in the German Bond market.

Table 3.5: Bondholder meeting participation rates

This table reports the mean, median, and standard deviation comparisons of bondholder meeting participation rates of 80 bondholder meetings. The differences between means are tested using t-tests, those between medians using the Wilcoxon–Mann–Whitney tests, and differences between the standard deviations are tested using the F-test. ***,**, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	First bondholde meetings	er Second bondholder	All bondholder meetings	
Number	46	34	80	
Mean	36.1%	35.5%	35.9%	
Median	37.0%	34.9%	35.3%	
St. Dev	19.7%	13.0%	17.0%	
Dif. Mean	0.7	7% not significant		
Dif. Median	2.2	2% not significant		
Dif. St. Dev	6.7			

Finally, Table 3.6 presents the descriptive statistics of retail investor bond holdings of bonds for which bondholder meetings have been conducted. The mean and median retail investor bond holdings in the 139 bondholder meetings in our dataset are 51.6% and 53.7%, respectively. Interestingly, retail investor bond holdings are higher in the second bondholder meeting than in the first bondholder meeting. This gives a first indication about the difficulties that high retail investor bond holdings may entail for bond issuers. In addition, the retail investor share of bond holdings in the dataset declined slightly after 2015.

Table 3.6: Bond holdings of retail investors in bondholder meetings

This table presents the mean and median retail investor bond holdings of the 139 bondholder meetings in the dataset. Each observation represents the share of retail investor bond holdings during a unique bondholder meeting. Retail investor bondholding data were obtained from the Securities Holdings Statistics database of Deutsche Bundesbank.

	First bondholder meeting		Second bondholder meeting			All bondholder meetings			
	Number	Mean	Median	Number	Mean	Median	Number	Mean	Median
2010	1	77.4%	77.4%	1	77.4%	77.4%	2	77.4%	77.4%
2011	7	49.4%	44.6%	4	75.9%	85.3%	11	41.1%	84.1%
2012	8	55.2%	55.2%	1	75.8%	75.8%	9	76.6%	75.8%
2013	11	65.1%	62.4%	6	64.4%	61.4%	17	52.0%	62.2%
2014	13	49.6%	53.0%	5	54.8%	56.3%	18	45.6%	54.3%
2015	16	43.5%	50.2%	8	49.9%	56.9%	24	57.3%	56.2%
2016	19	49.2%	52.2%	13	51.5%	52.3%	32	52.9%	52.3%
2017	14	46.2%	46.2%	8	45.6%	47.8%	22	56.1%	46.2%
2018	2	12.8%	12.8%	2	47.8%	47.8%	4	54.6%	24.2%
Total	91	49.8%	51.3%	48	55.1%	56.3%	139	51.6%	53.7%

3.5.3.2 Bonds and bond issuers

The descriptive statistics of bond issuers and bonds are presented in Table 3.7. We use financial data from the last available annual report published prior to the bondholder meeting. Panel A presents the fundamental descriptive statistics of bond issuers, which show that bond issuers are small, with mean and median total assets of EURm 219.2 and EURm 57.3, respectively. The profitability of the sample issuers is negative, with mean and median return on assets of -7.2% and -1.4%, respectively. This is not surprising, as many of the issuers call for bondholder meetings because their financial condition is weak or they face bankruptcy. In addition, the sample issuers also display relatively poor capital resources, with mean and median equity ratios of 11.2% and 11.6%, respectively, which complements the weak profitability finding.

Next, we focus on Panel B of Table 3.7 and discuss the fundamental characteristics of the sample bonds. Bonds are rather small, with mean and median sizes of only EURm 45.6 and EUR 22.0, respectively. This is consistent with expectations, as a major portion of the bond sample is from one of the mini-bond segments, where minimum issue sizes are only EURm 10.0. Another important point is the mean and median coupon sizes of 7.3% and 7.4%, respectively. Again, this is a result of the fact that many bonds are mini-bonds, where issuers had to attract retail investors with high coupon interest rates.

Table 3.7: Fundamental characteristics of sample issuers and bonds

This table reports the mean and median fundamental characteristics of the sample issuers and sample bonds. Variables for issuers' fundamental characteristics are calculated based on the last available annual report prior to the bondholder meeting. Variables for bond characteristics are calculated based on the time of issuance. All variables are winsorized at the 2.5% level on both sides.

Panel A: Fundamental characteristics of sample issuers							
	Mean	Median	St. Dev.	Min.	Max.	Number	
Total assets (EURm)	219.2	57.3	377	4.0	1,655.5	139	
Return on assets	-7.2%	-1.4%	15.3%	-52.3%	10.0%	139	
Equity ratio	11.2%	11.6%	17.4%	-42.5%	38.1%	139	
Panel B: Fundamental	characteristics Mean	of sample bo Median	nds St. Dev.	Min.	Max.	Number	
Issue size (EURm)	45.6	22.0	73.8	0.8	364.0	139	
Time-to-maturity	5.4	5.0	1.4	3.0	10.0	139	
Coupon	7.3%	7.4%	1.3%	4.0%	9.3%	139	

3.6 Empirical strategy and results

3.6.1 Determinants of participation rates and quorum constitution in bondholder meetings

Our first analysis is of the drivers of bondholder meeting participation rates. We use an OLS regression analysis to test the impact of different explanatory variables, with "bond holdings of retail investors" being the variable of major interest. For each of the following regression models, we work with standard error estimates that are robust to heteroscedasticity by using Huber–White standard errors. We check for multicollinearity by calculating the VIFs, which we denote in the table descriptions. We ensure that the maximum VIF for each table stays below the critical value of 10, which is recommended by Wooldridge (2016, p.86). The OLS regression takes the following form:

Participation rate (%) =
$$\Phi{\{\beta_0 + \beta_1(\text{bond holdings of retail investors}) + \beta_i x_i\}} + e_i$$
 [3.1]

 β_1 is the coefficient of retail investor bond holdings and $\beta_i x_i$ is a vector with a combination of issuer-, bond-, and bondholder meeting-specific variables.

Table 3.8: Ordinary least squares analysis of bondholder meeting participation rates

This table reports the results from the ordinary least squares regression model for bondholder meeting participation rates. The dependent variable is the participation rate (%) of the different bondholder meetings. Independent variables that are not dummy variables are winsorized at 2.5% level on both sides. Huber–White heteroscedasticity-consistent standard errors are given in parentheses below the coefficients. Investigating the variance inflation factors (VIFs) reveals no multicollinearity, as the mean VIF is 1.57 and the maximum VIF is 2.75. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent variables: Bondholder meeting participation rate (%)					
Independent variables	(1)	(2)	(3)	(4)	(5)	
Intercept	0.7090 ***	0.7813 ***	0.7823 ***	0.7839 ***	0.6177 ***	
	(0.0763)	(0.0613)	(0.0589)	(0.0575)	(0.0575)	
Bond holdings of retail investors (%)	-0.5737 ***	-0.5861 ***	-0.5868 ***	-0.5694 ***	-0.5378 ***	
	(0.0978)	(0.0960)	(0.0986)	(0.0942)	(0.1007)	
Bond issue volume (log)	-0.0638 ***	-0.0614 ***	-0.0570 ***	-0.0517 ***		
	(0.0164)	(0.0154)	(0.0133)	(0.0140)		
Second bondholder meeting (dummy)	0.0553	0.0510	0.0485			
	(0.0332)	(0.0339)	(0.0326)			
Equity ratio (%)	0.0477	0.0324				
	(0.1128)	(0.1116)				
Return on assets (%)	-0.0900	-0.0999				
	(0.1391)	(0.1391)				
Restructuring of bond terms (dummy)	0.0739					
	(0.0559)					
Year control dummies	YES	YES	YES	YES	YES	
Adj. R ²	0.3930	0.3898	0.4025	0.3924	0.3068	
Number of observations	80	80	80	80	80	

Table 3.8 shows the results. Model (1) uses the full set of available variables, while Models (2) to (5) eliminate one variable after the other until only our major variable, bond holdings of retail investors, remains in Model (5). The coefficients for bond holdings of retail investors are significantly negative at the 1% significance level in each model, with values from -0.54 to -0.59. This indicates that higher retail investor bond holdings negatively impact bondholder meeting participation rates. For each percentage of retail investor bond holdings, bondholder meeting participation rates decline by about 0.54 to 0.59 percentage points. In addition, the coefficients of bond issue volumes are significantly negative, which indicates that participation rates are lower if the bond issue is larger. Intuitively, this makes sense, as larger bonds are probably more broadly held, making it more difficult to assemble more widely spread bondholders to vote in bondholder meetings. The other bond- and meeting-specific variables are not significant. The dummy variable for the second bondholder meeting is positive, yet not

significant. This means that the analysis does not indicate that second bondholder meetings display significantly higher participation rates than first bondholder meetings. This finding is in line with the evidence from the descriptive statistics in Table 3.5, where we show that average participation rates are not statistically different between the first and second bondholder meetings. The dummy variable for restructuring bond terms is also not significant. This indicates that bondholders do not distinguish between Restructuring and Non-restructuring issues when deciding to attend a bondholder meeting. Last, issuer-specific variables are not significant, which indicates that bondholders do not distinguish between issuer qualities when they decide to attend and vote in bondholder meetings. Overall, given the significantly negative coefficients for retail investor holdings, we find strong evidence to support Hypothesis 1.

The next analysis concerns the probability of constituting a quorum during bondholder meetings. We use a Probit regression model to test for the impact of retail investor holdings. In this set of regressions, the dependent variable equals one if the meeting constituted a quorum and zero otherwise. The final Probit regression takes the general form:

$Pr(Quorum \ constitution=1|x_i) = \Phi\{\beta_0 + \beta_1(bond \ holdings \ of \ retail \ investors) + \beta_i x_i\} + e_i \quad [3.2]$

 β_1 is the coefficient of retail investor bond holdings, which is our main variable of interest, while $\beta_i x_i$ is a vector with a combination of bond-, issuer-, and bondholder meeting-specific variables. We use the same set of variables as in the previous analysis and report the results in Table 3.9. Retail investor bond holdings have a negative impact on the probability of a quorum being reached during bondholder meetings, with significantly negative coefficients in each of the models. This provides positive evidence for Hypothesis 2. In addition, the models display significantly negative coefficients for the bond issue volume, which indicates that the greater the bond issue volume, the more difficult it is to get bondholders to participate in bondholder meetings and to finally constitute a quorum. The different models also yield positive and highly significant coefficients for the second bondholder meeting dummy; this is, of course, not surprising, as these meetings benefit from the lower quorum requirement of only 25% of bond capital. Overall, the dummy variable for the second bondholder meeting has strong explanatory power, which can be seen when comparing the McFadden R^2 values of Model (3), where we include the dummy, and Model (4), where we renounce this variable. The McFadden R^2 decreases from 0.2703 in Model (3) to only 0.0811 in Model (4). In contrast to the results presented in Table 3.8, issuer characteristics have significant coefficients, as the coefficients for return on assets are significantly positive. This indicates that more profitable issuers find it easier to constitute quorums during bondholder meetings.
Table 3.9: Probit model of quorum constitution in bondholder meetings

This table reports the results of the Probit regression model for quorum constitution during bondholder meetings. The dependent variable is a dummy that equals one if the bondholder meeting constitutes a quorum and zero otherwise. The independent variables that are not dummy variables are winsorized at the 2.5% level on both sides. Huber–White heteroscedasticity-consistent standard errors are shown in parentheses below the coefficients, and marginal effects are shown in italics below the standard errors. Investigating the variance inflation factors (VIFs) reveals no multicollinearity, as the mean VIF is 1.50 and the maximum VIF is 2.13. ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

	Dependent variables: Dummy variable for quorum constitution									
Independent variables	(1)		(2)		(3)		(4)		(5)	
Intercept	0.9995		1.2931	***	1.1141	**	1.2625	***	0.6502 **	
	(0.6827)		(0.4866)		(0.5006)		(0.4691)		(0.3185)	
	0.3952		0.5113		0.4411		0.5012		0.2583	
Bond holdings of retail investors (%)	-2.0787	***	-2.1728	***	-1.8307	***	-1.2704	***	-1.2515 ***	
	(0.6371)		(0.6185)		(0.5914)		(0.4763)		(0.4525)	
	-0.7723		-0.8591		-0.7247		-0.5043		-0.4972	
Bond issue volume (log)	-0.2437	**	-0.2439	**	-0.2977	***	-0.2147	**		
	(0.1117)		(0.1117)		(0.1097)		(0.0988)			
	-0.0963		-0.0964		-0.1179		-0.0852			
Second bondholder meeting (dummy)	1.6678	***	1.6727	***	1.5595	***				
	(0.2938)		(0.2935)		(0.2926)					
	0.6594		0.6614		0.6174					
Equity ratio (%)	-0.9299		-0.9892							
	(0.9777)		(0.9698)							
	-0.3677		-0.3911							
Return on assets (%)	2.6613	**	2.5624	**						
	(1.1941)		(1.2155)							
	1.0523		1.0132							
Restructuring of bond terms (dummy)	0.2523									
	(0.4318)									
	0.0997									
Year control dummies	YES		YES		YES		YES		YES	
McFadden R ²	0.3030		0.3013		0.2703		0.0811		0.0546	
Observations with $Dep = 0$	65		65		65		65		65	
Observations with $Dep = 1$	74		74		74		74		74	

3.6.2 Determinants of successful bond restructuring attempts

In the final part of our analysis, we test Hypothesis 3 regarding the impact of retail investors on the probability of successful bond restructuring attempts. This is the most important analysis, as it provides direct evidence of whether retail investors impede a bond restructuring process. For this purpose, we no longer focus only on single bondholder meetings, but examine consecutive bondholder meetings of the same bond, or meeting sequences. We use a Probit model to examine the drivers of success in these meeting sequences, which takes the following form:

Pr(sequence success=1|x_i) = $\Phi{\{\beta_0 + \beta_1 \text{ (bond holdings of retail investors)} + \beta_i x_i\}} + e_i$ [3.3]

 $\beta_i x_i$ is a vector with bond-, bondholder meeting-, and issuer-specific variables, and β_1 is the coefficient of retail investor bond holdings. Table 3.10 shows the results. First, the McFadden R^2 values are considerably lower than those in Table 3.9, which indicates that the models in Table 3.10 have weaker predictive power. In addition, none of the bond- or issuer-specific variables displays statistically significant coefficients. For example, the coefficients of bond issue volume are insignificant, in contrast to the models in Tables 3.8 and 3.9, which report significantly negative coefficients for this variable. This is interesting and encouraging for issuers: by examining consecutive first and second bondholder meetings as connected observation units, there is no evidence that the issue volume has a significant impact on the probability of successfully conducting these meetings. The coefficients of restructuring bond terms and the proxies for the issuer's profitability and balance sheet strength are not significant; they do not seem to play a role here, which is by and large in line with previous findings in this chapter. Most importantly, for our analysis, the coefficients of retail investor bond holdings are significantly negative in Models (2) to (5), although only at the 5% level in Model (2) and the 10% level in Models (3) to (5). This provides evidence that retail investor bond holdings impede bond restructuring efforts. Observing the marginal effects of this variable, an increase in retail investor holdings of one percentage point reduces the probability of successfully conducting a bond restructuring attempt by about 0.3%. Overall, our findings provide evidence supporting Hypothesis 3.

Table 3.10: Probit selection model for successful restructuring sequences

This table reports the results from the Probit regression model for successful restructuring sequences. The dependent variable is a dummy variable which equals one if the restructuring sequence is completed successfully and zero otherwise. Huber–White heteroscedasticity-consistent standard errors are shown in parentheses below the coefficients, and marginal effects are shown in italics below the standard errors. Investigating the variance inflation factors (VIFs) reveals no multicollinearity, as the mean VIF is 1.98 and the maximum is 2.97. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent va	riables: Dummy va	riable for success	ful bondholder me	eting sequence
Independent variables	(1)	(2)	(3)	(4)	(5)
Intercept	1.0652	1.7797 ***	1.7139 **	1.7284 **	1.5164 ***
	(0.7351)	(0.6285)	(0.6801)	(0.7019)	(0.4388)
	0.2909	0.4905	0.4814	0.4850	0.4265
Holdings of retail investors (%)	-0.8275	-1.2460 **	-1.0380 *	-1.0266 *	-1.0236 *
	(0.6725)	(0.6334)	(0.6068)	(0.5671)	(0.5513)
	-0.2260	-0.3434	-0.2916	-0.2881	-0.2879
Bond issue volume (log)	-0.0398	-0.0419	-0.0746	-0.0731	
	(0.1442)	(0.1384)	(0.1374)	(0.1343)	
	-0.0109	-0.0115	-0.0209	-0.0205	
Second bondholder meeting (dummy)	0.0325	0.1324	0.0366		
	(0.3734)	(0.3563)	(0.3457)		
	0.0089	0.0365	0.0103		
Equity ratio (%)	-0.1921	-0.4511			
	(1.3705)	(1.4010)			
	-0.0525	-0.1243			
Return on assets (%)	2.1531	1.9137			
	(1.3617)	(1.3692)			
	0.5880	0.5275			
Restructuring of bond terms (dummy)	0.6995 *				
	(0.4038)				
	0.1910				
Year control dummies	YES	YES	YES	YES	YES
McFadden R ²	0.1405	0.1155	0.0944	0.0942	0.0903
Observations with $Dep = 0$	20	20	20	20	20
Observations with $Dep = 1$	71	71	71	71	71

3.7 Robustness tests

To test our main findings, we run robustness tests for each analysis in Tables 3.8, 3.9, and 3.10. For this purpose, we subdivide the observation period into two sections; the first section ranges from 2010 to 2015 and the second section ranges from 2016 to 2018. Both sections are roughly equally large in terms of the number of bondholder meetings and meeting sequences In Appendix 3.5, we report the robustness test for Table 3.8, where we test the drivers of the bondholder meeting participation rate. For both subsamples, our main variable of interest, bond holdings of retail investors, is significantly negative in each of the ten models. This makes us confident about our assessment of Hypothesis 1. In Appendix 3.6, we show the robustness test for Table 3.9, where we test the drivers of achieving a quorum in bondholder meetings. The first subsample with bondholder meetings between 2010 and 2015 yields the same results as our main analysis in Table 3.9, namely that the coefficients of retail investor holdings are significantly negative in each model. The other control variables also show results similar to those in Table 3.9: the coefficients of the second bondholder meeting dummy are significantly positive, while the coefficients of the issue volume are negative and significant. In contrast, for the second subsample in the period from 2016 to 2018, the coefficients for our main variable of interest are negative but not significant. Moreover, the control variable issue volume, which was significant in our main analysis and in the first subsample of the robustness test, is insignificant. A similar pattern is shown in Appendix 3.7, where we run the robustness test for Table 3.10. In the first subsample, the coefficients for retail investor holdings are significantly negative but are not statistically significant in the second subsample. The findings of the robustness tests in Appendices 3.6 and 3.7 indicate the difficulty of successfully conducting bondholder meetings to amend bond terms and restructure bonds, respectively, has diminished in the second observation period of 2016 to 2018. This could be driven by the learning effects of bond issuers and their financial and legal advisors who identified how to successfully conduct bond restructuring processes, despite significant retail investor holdings. Another explanation for these results could be that the share of retail bondholders declined slightly after 2015, and, therefore, their negative impact on bond restructuring diminished somewhat.

3.8 Summary and conclusion

This chapter analyzed how retail investors impact bond issuers' ability to amend bond terms during bondholder meetings that are regulated under the German Bond Act of 2009. This law was designed to broaden the available restructuring measures and address some of the well-known problems of bond restructuring, namely collective action and collective representation. By focusing on a hand-collected dataset of bondholder meetings, we showed that the German Bond Act is well-suited to counteract most of these problems, as most bond restructuring attempts in our dataset were ultimately successful.

However, we provided evidence of the rational apathy problems of retail investors and assume that these investors impede successful bond restructuring. First, we showed that retail investor holdings negatively impact bondholder meeting participation rates. Second, we found that retail investor holdings also negatively impact the probability of constituting quorums in bondholder meetings. Finally, we showed that retail investor holdings also negatively impact the ability to successfully deliver bond restructuring attempts. Therefore, we assume that the legal provisions of the German Bond Act do not completely resolve the rational apathy problem of bondholders during bond restructurings.

Our findings are especially relevant because mini-bond segments were launched on different German exchanges shortly after the introduction of the German Bond Act. Particularly, retail investors were attracted to subscribe to different mini-bond issues. Our analysis showed the negative effects of this unsophisticated investor group's market entry on the German bond market. In addition, our analysis is relevant for low-quality German debtors who face a tradeoff when determining how to tap the debt market. On the one hand, it is easier to convince unsophisticated retail investors to subscribe to low-quality bond issues, as shown by Hermann (2017). On the other hand, these issuers must be aware that, during financial difficulties, it is more difficult to successfully amend bond terms and save the issuer from financial distress when retail investors hold a large share of bonds. For these issuers, it might be advisable to take out loans from other more concentrated non-bank creditors, such as private debt funds.

4 Assessment of the reformed German debtor-in-possession management rules from a bond market perspective

4.1 Introduction

The seminal papers of La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997, 1998) examine the relationship between the extent of investor protection rights and the development of capital markets across 49 countries. They find a positive relationship between the depth and breadth of capital markets and investor protection rights. Most notable is the positive impact of creditor rights³¹ when corporate debtors face financial distress in terms of the size of the private and public corporate debt markets (La Porta et al., 1997, p.1145). Generally, a country's insolvency law is perceived to be the cornerstone of effective and stable capital markets (The World Bank, 2016, p.1). In recent decades, modern corporate reorganization procedures have attracted significant political attention and legislative efforts and have been introduced or redesigned in all major countries (The World Bank, 2004, p.71). For Germany, the earliest insolvency code was the "Konkursordnung" of 1877, which was complemented by the "Vergleichsordnung" in 1935. The 1877 law tilted heavily toward liquidation, while the latter aimed at preserving the debtor and reaching a settlement between creditors and debtors. In 1999, lawmakers transferred both codes into a consistent body of laws ("Insolvenzordnung" or InsO, hereafter) that focused more on reorganizing the troubled debtor by introducing an option for debtor-in-possession (DIP) management and an insolvency plan procedure. However, in practice, these two instruments played only a minor role in corporate reorganizations, while the German insolvency procedure continued to strongly focus on debtor liquidation.³² Hence, legislators once again reformed the German Insolvency Code to facilitate earlier bankruptcy filings, promote the reorganization of distressed debtors within a DIP management framework, safeguard jobs, and maximize creditor recovery rates (Bundesregierung der Bundesrepublik Deutschland, 2011, p.17). The redesigned law ("Gesetz zur weiteren Erleichterung der Sanierung von Unternehmen," ESUG, hereafter) was introduced in March 2012 and, since then, there have been questions about whether its central goals have been met (Kranzusch and Icks, 2018, p.1). This chapter examines the central questions regarding the success of the ESUG, that

³¹ Credit rights is defined as an index that consists of five variables: "No Automatic Stay on Assets," "Secured Creditors First Paid," "Restrictions for Going into Reorganization," "Management Does Not Stay in Reorganization," and "Legal Reserves Required as a Percentage of Capital" (La Porta et al., 1998, p.1136).

³² For a detailed review of the evolution of German insolvency law, see Sedlak (2016, pp.11-16).

is, if it facilitates earlier bankruptcy filings (Bundesregierung der Bundesrepublik Deutschland, 2011, p.40) and best serves "the collective satisfaction of a debtor's creditors," which is the insolvency procedure's central goal, according to Sec. 1 (1) InsO (Pape, 2019, p.1). Academics and practitioners have both conducted a variety of studies regarding the success of the ESUG (for an overview, see Section 4.3.1); however, a strictly market-focused study has not yet been completed. Therefore, this chapter's research question is: Has the redesigned German Insolvency Code achieved its main goals from a bond market perspective? In an attempt to fill this research gap, we analyze all German bond issuers that declared bankruptcy between the introduction of the new law in March 2012 and January 2018 and examine the fundamental differences between issuers that utilized the redesigned (preliminary) DIP management procedure (DIP issuers), issuers that used a "standard" insolvency procedure (Non-DIP issuers), and the recovery rates of the respective bonds.

We find mixed evidence for better quality of DIP issuers, which means we cannot support the new law's attainment of its first goal. We find that bond recovery rates are significantly higher for DIP bonds, after controlling for issuer- and bond-specific variables. However, this advantage diminishes after controlling for the endogeneity of DIP. Overall, we find only mixed evidence for the success of the redesigned law and recommend further research on this topic.

This chapter is structured as follows. Section 4.2 explains in detail the goals, design, and process sequence of the insolvency procedure under the new law, while Section 4.3 reviews previous studies regarding the success and failure of the ESUG and introduces the literature on creditor recovery rates in Germany and bond recovery rates in the U.S. Section 4.4 develops the testable hypotheses, while Section 4.5 describes the dataset and reports the descriptive statistics. Section 4.6 identifies the empirical strategy and findings, while Section 4.7 describes a selection of robustness tests. Finally, Section 4.8 summarizes and concludes the study.

4.2 German insolvency law

4.2.1 Insolvency procedure under the German insolvency code³³

We introduce the insolvency procedure under the German Insolvency Code and distinguish between the ordinary insolvency procedure and the DIP management procedure. The ordinary insolvency procedure starts with bankruptcy filing, either by the debtor or one of its creditors

³³ This section is based on Seagon (2014, pp.521–548 and 545–547), who gives a comprehensive summary of insolvency procedures under the German Insolvency Code (InsO).

(Sec. 13 (1), InsO). After the bankruptcy filing, in a phase that is termed the "Opening Procedure," the insolvency court appoints a provisional insolvency administrator who examines the reasons for bankruptcy filing under Sec. 17-19, InsO, and assesses the admissibility of the insolvency procedure. The final insolvency procedure will not start if the debtor's assets are insufficient to cover the cost of the procedure (Sec. 26 (1), InsO). During the Opening Procedure, the insolvency court can prohibit the debtor from making dispositions (Sec. 21 (2)) No. 2, InsO). In such a case, the provisional insolvency administrator is vested with the right to dispose off the debtor's assets and manage its operations (Sec. 22 (1), InsO). In the "final" insolvency procedure, which is opened about three months after the initial bankruptcy filing, the debtor's rights to dispose of assets and manage operations are fully and finally transferred to the insolvency administrator (Sec. 80 (1), InsO). The insolvency administrator reports the debtor's economic situation and presents different options for satisfying creditors, such as by maintaining the debtor as a whole or in part or through a transfer restructuring (Sec. 156 (1), InsO). During a creditor meeting, the creditors reach a decision regarding these options (Sec. 156, InsO). The insolvency administrator then either liquidates the debtor to realize the residual value of the assets or the insolvency is resolved through an insolvency plan or by transferring the debtor to a new investor, which is called transferring restructuring.

Under the DIP management procedure (regulated under Sec. 270–285, InsO), the incumbent management remains in control of the debtor's operations and assets and is only supervised by an insolvency monitor (Sec. 270c, InsO). Debtors can adopt two ways to reach the (final) DIP management stage of Sec. 270, InsO: either through the Opening Procedure (Sec. 270a, InsO) or "Preparations for Reorganization" (Sec. 270b, InsO). The Opening Procedure, which is the pre-stage to the final opening of the DIP management procedure, is started a few weeks later by the insolvency court. Under the Preparations for Reorganization in Sec. 270b InsO, the debtor has a maximum of three months to submit an insolvency plan (Sec. 270b (1), InsO). A certification by a commercial or legal advisor must be enclosed to confirm that the debtor faces "imminent insolvency or over-indebtedness, but that the debtor is not insolvent yet" (Sec. 270b (1) No. 3, InsO). If the insolvency plan convinces creditors, the final DIP management procedure is opened. There are several prerequisites to the successful application of DIP management: the application must be confirmed by the insolvency court (Sec. 270 (1) No. 1, InsO), the debtor and not a creditor must make the request (Sec. 270 (2) No. 1, InsO), there cannot be any circumstances that raise doubt that DIP management will place creditors at a disadvantage (Sec. 270 (2) No. 2, InsO), and finally, the request needs to be supported by the provisional creditors committee (Sec. 270 (3) No. 2, InsO). It is important to note that the insolvency court can repeal both rulings regarding Sec. 270a and Sec. 270b InsO at any time if there is any suspicion that DIP management may disadvantage creditors. Despite the rather debtor-friendly regulations, both preliminary procedures after Sec. 270a/b of InsO constitute extraordinary cases in corporate insolvency procedures, even after the introduction of the ESUG in 2012 (see Table 4.1).

Table 4.1: Number of corporate insolvency procedures in Germany between 2012 and2019

This table shows the number of bankruptcy filings and (preliminary) DIP management proceedings (Sec. 270a/b, InsO) of German corporations between 2012 and 2017.

Year	Bankruptcy filings Requested opening procedure		Requested preparations for
		(Sec. 270a InsO)	reorganization (Sec. 270b InsO)
2012	28,297	127	61
2013	25,995	209	60
2014	24,085	218	39
2015	23,123	187	32
2016	21,518	101	27
2017	20,093	154	32

Sources: Statista, Destatis, WBDat/INDat³⁴

4.2.2 Goals of the German insolvency law reform of 2012

The ESUG was introduced to address the shortcomings of the old 1999 insolvency code, which was biased toward liquidation over continuation of the debtor's business (Sedlak, 2016, p.17). The old code was also criticized for unfavorable, tedious, and costly process sequences, as the insolvency procedure interrupted the ordinary course of the debtor's business by removing the existing management and, moreover, could last for years (Sedlak, 2016, p.6). Due to these problems, bankruptcy filing was the last resort for many troubled debtors and was delayed until there was no other option and most of the remaining company value was destroyed (Bundesregierung der Bundesrepublik Deutschland, 2011, p.1). Some debtors even actively chose to avoid bankruptcy filing under the German regulation by relocating their "center of interest" to the U.K. to reorganize under the more "restructuring-friendly" British laws (the term "Sanierungstourismus" is often used, see, e.g., Sedlak, 2016, p.17). Finally, the old code also did not favor creditors, as it gave them only very limited scope for intervention, for example, regarding the selection of insolvency administrators (Bundesregierung der Bundesrepublik Deutschland, 2011, p.17).

³⁴ The number of Opening Procedures and requested Preparations for Reorganization is based on WBDat/INDat and obtained from Moldenhauer and Wolf (2018, p.10).

By providing better access to the DIP procedures, the ESUG offers debtors greater incentives to file for insolvency earlier (Sedlak, 2016, p.27). In this procedure, the existing management continues and is only accompanied by an insolvency monitor, who oversees the debtor but does not make any decisions on its behalf (see Sec. 2.1, Sedlak, 2016, p.41).³⁵ The ESUG aims to prevent regulatory arbitrage by facilitating restructuring and continuation of debtors through the introduction of broader restructuring measures, such as debt-to-equity swaps, to curtail the duration and strengthen the influence of creditors during the insolvency procedure (Bundesregierung der Bundesrepublik Deutschland, 2011, p.17). It also intends to lower the costs involved in the process, because the insolvency administrator, according to Sec. 12 (1), InsVV (Herbst, 2014, p.612).

This new set of legal provisions is intended to make a DIP bankruptcy filing more attractive for debtors and aims to finally improve creditor recovery rates through earlier bankruptcy filings (Bundesregierung der Bundesrepublik Deutschland, 2011, pp.17–18). Some commentators even perceive the application of a DIP procedure as a strong signal to the market that the existing management is confident that they can handle the insolvency procedure better than an insolvency administrator, primarily to preserve more value for investors (Herbst, 2014, pp.611–612).

4.3 Literature review

We discuss three distinct literature streams related to our research. First, we review studies focusing on the success of the redesigned German Insolvency Code of 2012.³⁶ Second, we review several papers that deal with the creditor recovery rates of distressed debt in Germany. Third, we review research on bond recovery rates, mainly with a focus on the U.S. market.

4.3.1 Success of the redesigned German insolvency law

More than seven years after the introduction of the ESUG, several studies have been compiled to assess the effectiveness of the redesigned insolvency code. In a multidisciplinary

³⁵ DIP management is not a new invention of the ESUG, as the old insolvency code of 1999 also provided rules for this (Sec. 270 a.F., InsO). However, the option was rarely applied, due to the greater uncertainties regarding the process sequence (Bundesregierung der Bundesrepublik Deutschland, 2011, p.17). In this regard, the ESUG created greater transparency in the application of rules.

³⁶ Please note that we focus on studies with a business or economic background and only briefly mention research from legal scholars.

study, Jacoby, Madaus, Sack, Schmidt, and Thole (2018) assess the ESUG on behalf of the German Federal Ministry of Justice and Consumer Protection, using a statistical analysis of all available insolvency cases between March 2012 and February 2018, a comprehensive survey of insolvency professionals, and an analysis from a legal perspective. They find that DIP procedures are only used in a small minority of all insolvency cases and primarily by larger debtors with more than 500 employees and annual sales of more than EURm 149 (Jacoby et al., 2018, p.8).³⁷ In addition, the researchers find that preliminary DIP management is frequently used in the opening procedure but is later converted into a standard insolvency procedure (Jacoby et al., 2018, p.8). Only 28% of all DIP procedures have been repealed according to Sec. 258 of InsO ("Termination of the Insolvency Procedure"), which means that only a minority of bankrupt companies successfully completed the insolvency procedure. In the second part of their analysis, Jacoby et al. (2018) compile a comprehensive survey of 825 German insolvency experts for their views on the effectiveness of the ESUG. The ESUG's different innovations received mixed feedback: according to most survey participants, the influence of creditors on the insolvency procedure has been strengthened, but the stigma of insolvency has been only slightly mitigated. It is noteworthy that different survey participants offered varying responses regarding the impact of the ESUG on insolvency culture: judges and judicial officers perceive the ESUG as considerably less positive than company owners, business consultants, or interim managers (Jacoby et al., 2018, p.36–40). In the third part of their study, Jacoby et al. (2018) analyze blind spots in the redesigned law from a legal perspective. The ESUG received mixed feedback once again. The preparation for reorganization in Sec. 270b InsO is criticized because it did not facilitate earlier bankruptcy filings by debtors (Jacoby et al., 2018, p.297). Often, DIP is chosen during the preliminary insolvency procedure only to be converted to a standard procedure later, which is criticized due to process disruptions and higher legal fees. In line with the survey results, a sharper definition of the entry requirements for the preliminary DIP procedure is requested (Jacoby et al., 2018, p.298). Some survey participants demanded clearer rules regarding if and when the DIP procedure should be suspended, which is not explicitly regulated in the code (Jacoby et al., 2018, p.50).

Several practitioners compile studies to examine the success of the ESUG. First, Moldenhauer and Wolf (2018, p.13) confirm that DIP procedures are primarily used for large debtors; 65% of the top-50 cases applied for either Sec. 270a or Sec. 270b InsO in 2017. In

³⁷ In this size category, 54 of the 174 cases were conducted based on DIP procedures, while only 233 of the 31,262 cases were conducted using DIP procedures in the size class of up to ten employees and up to EURm 2 annual sales.

nearly three-quarters of all large insolvencies, the debtor's management is replaced or complemented by a chief restructuring officer (CRO) or chief insolvency officer (CIO). In addition, large insolvency cases are more successful when it comes to opening the DIP procedure after the initial filing (Moldenhauer and Wolf, 2018, p.14). A study by the same authors in 2017 mentions that creditors must contribute through haircuts in 75% of all cases, in which 90% of these cases experience creditor losses of more than 50% (Moldenhauer and Wolf, 2017, p.18). Based on a survey of 350 insolvency experts, Hoffmann, Braun, Kremens, Himmel, Wiesinger, and Becker (2018, p.26) conclude that the ESUG has improved the general attractiveness of the German corporate insolvency law compared to the legal situation before the redesign. However, the survey participants call for further reform of the insolvency law and introduction of a pre-insolvency rehabilitation procedure. In their fifth ESUG study, Eschmann, Blatz, and Seagon (2018) compile a survey of 140 insolvency experts. They find that a general change in the "insolvency mindset" in Germany has not been fully achieved and additional steps must be taken to strengthen creditors' rights during the DIP procedure. Moreover, a larger number of stakeholders in the redesigned insolvency procedure has greatly increased the procedure's complexity. In its 2015 study, "Insolvenzen in Deutschland," Creditreform, the German credit agency, concludes that the ESUG's redesigned DIP procedure gains credence; however, it is almost exclusively used for larger insolvency cases (Bretz, 2015, p.13). Recovery rates in DIP procedures amount to around 10%, whereas recovery rates are only between 3% and 5% in the standard insolvency procedure. Creditors must inject new money into a distressed debtor in 60% of DIP procedures (Bretz, 2015, p.15).

By analyzing the annual releases of the World Bank's "Doing Business" series, we take another approach to gain insights into the evaluation of the redesigned law. Every year, business experts from 180 countries are approached to assess the "ease of doing business" in their respective countries. One subcategory is "Resolving insolvency;" a ranking of countries is prepared using a structured survey with a theoretical insolvency case of an individual hotel. The participating experts must assess the time required for their respective countries to resolve the insolvency case, cost for the estate, and the recovery rate for secured creditors. Before the introduction of the ESUG in 2012, Germany was consistently ranked below the top 30 countries in Resolving insolvency, but its rank and theoretical recovery rate improved significantly thereafter (see Figure 4.1). The German insolvency law reform was rewarded with significantly higher theoretical recovery rates, allowing Germany to become one of the top 20 countries, ranking above the U.S. in the 2014 Doing Business Report.³⁸ Regarding the redesigned German insolvency code, the World Bank concluded in its 2013 report that the country "strengthened its insolvency process by adopting a new insolvency law that facilitates in-court restructurings of distressed companies and increases participation by creditors" (The World Bank, 2013, p.138).

Figure 4.1: Doing Business – Resolving insolvency ranks and theoretical recovery rates

This figure presents the rankings (bubbles) and recovery rates (line chart) for Germany, the U.K., and the U.S. based on the World Bank's Doing Business Reports between 2007 and 2014. The recovery rates are based on expert assessments of secured creditors' recovery rates in a theoretical insolvency case of a hotel. The rankings are based on the recovery rate and other factors, such as time necessary to resolve insolvency and direct costs for insolvency (not shown here).



Source: International Bank for Reconstruction and Development/The World Bank

As described above, there is no specific study that examines the new law's effectiveness based on market data. Using hand-collected data of all German bond issuers who filed for bankruptcy between March 2012 and January 2018, this chapter attempts to fill this gap and extends the existing research on the effectiveness of the renewed German insolvency code.

4.3.2 Recovery rates of defaulted loans in Germany

This chapter examines the effectiveness of the redesigned German Insolvency Code from a bond market perspective. We use the recovery rates of bonds after bankruptcy filing to

³⁸ The classification scheme changed after 2014, indicating that beginning in 2015, the rankings are no longer comparable to the 2007–2014 rankings, and thus are not shown here.

determine how the bond market perceives the choice of the DIP management procedure. This approach seems new because, to the best of our knowledge, no study exists that explicitly examines either the recovery rates of insolvent German bond issuers or the connection between the bond market and the redesigned insolvency code. However, a large body of research deals with the recovery rates of German bank loans and other non-traded debt.

Using a sample of small, distressed companies from Germany, France, and the U.K., Davydenko and Franks (2008) study cross-country differences among these countries and the influence on bank loan recovery rates. After controlling for company, industry, collateral, and macroeconomic variables, the authors find that bank loan recovery rates are highest in the U.K. and lowest in France, while Germany ranks second. The subsample of 198 German companies in formal insolvency have mean and median recovery rates of 59% and 61%, respectively (Davydenko and Franks, 2008, p.582). In another comparative study, Blazy, Petey, and Weill (2011) compare the bankruptcy recovery rates among creditors in the U.K., Germany, and France in terms of cross-country differences, such as insolvency paths. The data are extracted from local insolvency courts in the three countries. In contrast to Davydenko and Franks (2008), this study finds that Germany and France have similar average recovery rates (about 21% on average), while the U.K. displays an average recovery rate of only 13.82%. For the subsample of 126 German bankruptcies, the study finds considerable differences between junior, senior, and new money claims (10%, 77%, and 79%, respectively). For bank loans of 120 German companies, Grunter and Weber (2009) show that recovery rates are positively related to their portion of the attached collateral, the creditworthiness of the borrower, and the intensity of the client relationship, while the rates are negatively related to company size. Overall, the researchers find mean and median recovery rates of 72% and 92%, respectively. Gürtler and Hibbeln (2013) study a large sample of 69,985 defaulted bank loans of both retail and small commercial creditors, in an attempt to improve loss given default estimates. For a subsample of 8,125 loans to commercial clients, the researchers find mean recovery rates of 76% and 9% for secured and unsecured loans, respectively. Ingermann, Hesse, Bélorgey, and Pfingsten (2016) examine the drivers of the recovery rates of defaulted bank loans granted to 909 retail commercial clients. The study emphasizes the important role of collateral value in bank loan recovery rates, especially for real estate loans. Overall, the study finds mean and median recovery rates of 58% and 59%, respectively. Table 4.2 provides an overview of the different studies reviewed for an understanding of the recovery rates in the German credit market.

Table 4.2: Overview of research studies on credit recovery rates in Germany

The table provides an overview of studies that examine the recovery rates of non-traded debt of financially distressed German companies.

Authors	Credit types	Period	Recovery rates
Franks and Davydenko	Distressed bank loans of 198 medium-sized firms	1984-2003	Mean/median of 59%/61% of total debt exposure at
(2008)	in formal bankruptcy		default
Grunert and Weber (2009)	120 companies with loans from a large German	1992-2003	Mean/median of 72%/92% workout recovery rates
	bank		
Blazy, Petey, and Weill	126 companies with data from bankruptcy courts	1999–2004	Mean of 21%, 10% for junior claims, 77% for senior
(2011)			claims, 79% for new money
Gürtler and Hibbeln (2013)	8,125 small commercial secured and unsecured	2006-2008	Mean of 76% for secured and 9% for unsecured
	bank loans		loans
Ingermann, Hesse, Bélorgey,	909 defaulted bank loans from retail and	2005-2010	Mean/median of 58%/59%
and Pfingsten (2016)	commercial clients		

4.3.3 Empirical analysis of bond recovery rates

In recent years, empirical analysis of bond recovery rates after default events has received considerable interest, with a special focus on data from the U.S. The bond data are retrieved mainly from data providers such as Moody's Default Risk Service, Standard & Poor's, or New York University's Salomon Center for the Study of Financial Institutions. The first available bond default data in these studies date to the 1970s, showing recovery rates ranging between approximately 30% and 50% on average, which depend on the seniority and collateralization of bonds, the industry affiliation of the issuers, and the general economic environment. We introduce these papers in chronological order. Fons (1994) uses data obtained from Moody's for 1970 to 1993 and finds that recovery rates vary in relation to bond seniority: between 65% for senior secured bonds and 16% for junior subordinated bonds. Altman and Kishore (1996) examine a sample of 696 bonds that defaulted between 1971 and 1995. While the mean and median recovery rates are around 41% and 36%, respectively, these rates vary significantly across industries: public utilities and issuers from the chemicals and petroleum industry enjoy the highest bond recovery rates, whereas wood, paper, and leather producers, and issuers from the lodging (hospitality) and hospital and nursing (healthcare) sectors showed the lowest recovery rates. Betker (1998) studies a sample of 211 issuers that defaulted between 1982 and 1991 and either filed for bankruptcy or achieved out-of-court workouts. The author finds that bond recovery rates are around 44% for issuers that defaulted and filed for bankruptcy simultaneously and 31% for issuers that defaulted prior to bankruptcy filing. Hu and Perraudin (2002) use a sample of 958 Moody's rated international bonds that defaulted between 1971 and 2000 and find that recovery rates are positively correlated to bond seniority, with recovery rates between 53% for senior secured and 33% for subordinated bonds. Covitz and Han (2004) examine a sample of 1,348 U.S. bonds defaulting between 1983 and 2002 and find mean and median recovery rates of 40% and 34%, respectively. The authors deploy a structural model with frictions to explain why bond recovery rates are exceptionally low, when in a frictionless world the recovery rates should be close to the nominal value of bonds. The study finds that insolvency costs and jumps in corporate valuation reduce recovery rates below nominal bond values. Varma and Cantor (2005) examine a sample of 1,084 Moody's rated bonds and loans from North American corporate issuers who defaulted between 1983 and 2003. The sample consists of a broad variety of default events, ranging from grace period defaults to Chapter 11 and Chapter 7 insolvency events. The study attempts to uncover the drivers of recovery rates using the seniority of the debt claim, type of default event, company-specific characteristics, industry effects, and macroeconomic factors. Overall, the mean and median recovery rates are 40% and 37%, respectively, while the most important drivers of recovery rates are seniority and collateralization. In addition, the paper also examines how the initial default event affects recovery rates and concludes that recovery rates for Chapter 11 filings are higher than those for Chapter 7 cases. Altman et al. (2005) analyze the link between aggregate default and recovery rates on corporate bonds for a sample of 1,300 bond defaults between 1982 and 2002. They find an average recovery rate of 37%, which is driven by the supply of and demand for defaulted securities. This indicates that when defaults are high, recovery rates are depressed and vice versa. Wang (2011) conducts an empirical analysis of recovery rates of 424 U.S. bonds whose issuers filed for Chapter 11 between 1996 and 2007 and focuses on the impact of hedge fund involvement in the post-insolvency restructuring process. The paper reports mean and median post-default trading prices of 32% and 26%, respectively, while ultimate recovery rates are 37% and 22%, respectively. Unsecured creditors lose more if the restructuring process takes longer. Hedge fund involvement in the restructuring process—through the acquisition of large stakes of the defaulted bonds and active involvement in creditors' committees-results in higher returns for bondholders. Mora (2012) analyzes the macroeconomic drivers of bond recovery rates for a sample of 4,422 U.S. bond issuers defaulting between 1970 and 2008. While the mean and median recovery rates are 39% and 31%, respectively, these rates vary across debt instruments and industry sectors. The author also finds an inverse correlation between the recovery and default rates, as both are strongly dependent on the state of the overall economy and the business cycle. Finally, in their latest annual global corporate default study based on a sample of 2,436 Moody's-rated bonds, Moody's Investors Services (2019) shows that international bond recovery rates vary between 67% for first lien bonds and 24% for junior subordinated bonds. Table 4.3 gives an overview of the different papers, their data sources, and time periods.

Table 4.3: Overview of research on bond recovery rates of defaulted bond issuers

Authors	Data source	Bond types	Period	Recovery rates
Fons (1994)	Moody's Default Risk	Bonds of 473 defaulted	1970-1993	Average recovery rates between 16% for junior
	Service	U.S. issuers		subordinated and 65% for senior secured bonds
Altman and Kishore (1996)	NYU Salomon Center	696 defaulted U.S.	1971-1995	Mean/median of 41%/36%
		bonds		
Betker (1998)	Standard & Poor's	Unsecured bonds of	1982-1991	Mean/median of 44%/31% for firms that defaulted
		211 U.S. firms		and filed for bankruptcy simultaneously, 31%/30%
				for firms which defaulted before bankruptcy filing
Hu and Perraudin (2002)	Moody's Default Risk	958 bonds of U.S. and	1971-2000	Mean recovery rates of 53%, 50%, 38%, 33% for
	Service	international issuers		senior secured, senior unsecured, senior
		-		subordinated, and subordinated bonds
Covitz and Han (2004)	Moody's Default Risk	1,348 U.S. non-	1983-2002	Mean/median of 40%/34%
	Services	financial straight bonds		
Varma and Cantor (2005)	Moody's Default Risk	1,084 bonds of North	1983-2003	Mean/median of 40%/37%
	Services	American issuers		
Altman, Brady, Resti, and	NYU Salomon Center	1,300 defaulted bonds	1982-2001	Weighted price after default/recovery
Sironi (2005)		primarily from the U.S.		rate of 37%
Wang (2011)	Bankruptcy Research	424 U.S. bonds whose	1996-2007	Mean/median for default trading price of 32%/26%,
	Database by LoPucki	issuers filed for		ultimate recovery of 37%/22%
	and BankruptcyData.com	Chapter 11		
Mora (2012)	Moody's Default Risk	4,422 defaulted bonds	1970-2008	Mean/median of 39%/31%
	Service	from the U.S.		-
Moody's Investors Services	Moody's Default Risk	2,436 Moody's rated	1983-2018	Issuer-weighted between 67% for frist lien bonds
(2019)	Service	international bonds		and 24% for junior subordinated bonds

This table provides an overview of studies that examine bond recovery rates in the U.S.

We focus on German bond issuers and specifically examine how the choice of an insolvency procedure impacts bond recovery rates. To our knowledge, this approach is new for the German bond market and an innovative approach to examining the success or failure of the redesigned German insolvency code.

4.4 Hypotheses development

Based on the formulated goals of the ESUG, the available options for filing for bankruptcy in Germany, and the literature review, we formulate testable hypotheses. These hypotheses aim to answer this study's research questions regarding the success or failure of the redesigned German Insolvency Code of 2012. In the first step, we examine the differences between bond issuers who filed for a (preliminary) DIP management procedure (Sec. 270a/b, InsO) to reach the final DIP stage of Sec. 270 InsO and issuers who filed for a standard insolvency procedure. As the ESUG aims to provide debtors with incentives to file for bankruptcy earlier to access the DIP procedure, we expect DIP issuers to be better quality, for example, in terms of profitability or balance sheet strength. Our first testable hypothesis is therefore:

Hypothesis 1: DIP issuers display better quality than issuers who file for standard insolvency procedures.

Our second hypothesis concerns the differences between the recovery rates of the two subsamples of issuers. We expect the recovery rates of DIP issuers to be higher, as the choice of the DIP procedure should be a credible signal to the market indicating the better prospects of the respective debtors. This hypothesis may be contentious: on the one hand, DIP issuers should enjoy the benefits of this procedure (lower fees, capitalization of knowledge of incumbent management); on the other hand, the management that bankrupted the issuers remains in control. We are aware of the potential reverse causality effects between issuer quality and recovery rates; however, we expect the benefits of DIP management to outweigh its disadvantages. In this analysis, we control for this aspect issue and hypothesize:

Hypothesis 2: The recovery rates of bonds of issuers who file for preliminary DIP management are higher after controlling for issuer quality.

4.5 Dataset and variable definitions

4.5.1 Sample selection and data sources

We used a hand-collected dataset of German bond issuers who filed for insolvency between March 2012 and January 2018 and had at least one bond issued on a German exchange. To compile the dataset, we combined multiple sources. We obtained one part of the sample of insolvent mini-bond issuers from BondGuide, which is a leading information service for mini-bonds in Germany. We supplemented this sample with an in-depth keyword search on Genios³⁹ to obtain other bankrupt bond issuers. Overall, we found 83 bonds of 56 issuers who filed for bankruptcy between March 2012 and January 2018. We eliminated issuers and bonds with missing financial data, bond price data, or incomplete bond information. The final sample comprises 46 issuers with 67 bonds. We collected financial data of publicly listed issuers from WVD of the Infront Analytics database; data of non-listed issuers were taken from Amadeus. We supplemented financial accounting data, which are not available on these databases, from publicly available annual reports on bundesanzeiger.de or company websites. Information on bonds and bond price trading data were obtained from bond issue prospectuses and from Bloomberg, respectively (see Appendix 4.1 for our data sources). Information regarding the insolvency procedure was obtained through an in-depth research of newspaper articles on

³⁹ We focus on the well-established German language newspapers FAZ, Handelsblatt, Börsen-Zeitung, and business magazines Capital, WirtschaftsWoche, and FINANCE Magazin.

Genios, official press releases of issuers, and documents from official insolvency announcements.⁴⁰ Appendix 4.2 summarizes the information of the different bankruptcy cases in the final dataset.

4.5.2 Summary statistics

The first subsamples are DIP issuers and DIP bonds, which consist of issuers and their bonds when issuers filed for Sec. 270a/b InsO and insolvency courts did not repeal the ruling within 30 trading days after the initial filing. The use of 30 trading days is necessary to secure a consistent approach regarding measurement of the recovery rate (see Section 4.5.3.1). In Figure 4.2, we show the allocation of bonds and issuers across different insolvency procedures.

Figure 4.2: Division of sample issuers and bonds into two subsamples

This figure presents the division of the total sample of 67 bonds and 46 issuers into the final subsamples of 39 DIP bonds, 27 DIP issuers, 28 Non-DIP bonds, and 19 Non-DIP issuers. Four issuers⁴¹ with seven bonds failed to receive confirmation for the preliminary DIP management procedure after the initial filing.



With 27 of 46 issuers and 39 of 67 bonds, the DIP subsample accounts for approximately 60% of the total sample. This distribution stands in sharp contrast to the overall population of insolvent companies, for which the DIP procedure is an exception (see Table 4.1). However, this finding is not surprising, as the sample issuers are large companies (compared to the overall

⁴⁰ Documents regarding insolvency announcements are obtained from <u>www.insolvenzbekanntmachungen.de</u>

⁴¹ German Pellets GmbH, Golden Gate AG, MIFA Mitteldeutsche Fahrradwerke AG, and MS "Deutschland" Beteiligungsgesellschaft mbH.

population of companies in Germany), with mean and median total assets of above EURm 250 (see Table 4.7). The distribution between DIP- and Non-DIP-issuers has been relatively constant over the years (see Table 4.4), indicating that troubled issuers did not have difficulty applying the redesigned DIP procedure during its ramp up.

Table 4.4: Bankrupt issuers and bonds over time

This table reports the number of issuers, number of bonds, and nominal amount of bonds in the dataset. The nominal amount is in EURm. One issuer was declared bankrupt in January 2018.

			Issuers (number)							
	D	IP	Non	-DIP	То	tal	DID	Neg DID	Tatal	
Year	Number	Issue size	Number	Issue size	Number	Issue size	DIP	Non-DIP	Total	
2012	10	544	6	474	16	1,018	5	3	8	
2013	6	417	5	334	11	750	4	6	10	
2014	7	185	4	119	11	303	6	4	10	
2015	1	30	2	18	3	48	1	2	3	
2016	7	474	8	389	15	863	6	3	9	
2017	8	856	2	526	10	1,382	5	0	5	
2018	0	0	1	3	1	3	0	1	1	
Total	39	2,506	28	1,862	67	4,368	27	19	46	

A major portion of the bankrupt issuers is from the manufacturing sector, which is typical distribution of the SMEs in the German economy (see Table 4.5).

Table 4.5: Industry classification of sample issuers and bonds

This table reports the industry classification of the issuers and bonds in the dataset. Industry classification is shown according to own industry classifications, as a consistent classification system is not available for this sample of issuers.

				Issuers (number)					
	D	οIP	Non	-DIP	Тс	otal	DID	Non DID	Total
	Number	Issue size	Number	Issue size	Number	Issue size	DIF	NOII-DIF	Total
Agriculture	2	342	0	0	2	342	1	0	1
Construction	0	0	2	53	2	53	0	2	2
Finance, Insurance, Real Estate	8	382	5	135	13	517	3	3	6
Manufacturing	16	494	13	1,297	29	1,791	12	6	18
Retail Trade	1	30	2	280	3	310	1	2	3
Services	1	80	2	26	3	106	1	2	3
Transportation & Public Utilities	6	837	2	64	8	901	4	2	6
Wholesale Trade	5	340	2	8	7	348	5	2	7
Total	39	2,506	28	1,862	67	4,368	27	19	46

With an average issuer size of only EURm 63.6, the sample bonds are relatively small (see Table 4.6). However, this is again not surprising, as an essential proportion of the bonds stems

from the recently introduced mini-bond market segments of the different German exchanges, which feature relatively low entry barriers, such as a minimum issue size of only EURm 10.0.

Table 4.6: Descriptive statistics of sample bonds

This table presents the descriptive statistics (mean, standard deviation, minimum, and maximum) for the total sample of bonds and for the subsamples of debtor-in-possession bonds and other bonds, provided data are available. All variables except the dummy variables are winsorized at the 2.5% level on both sides.

	DIP bon	DIP bonds					Other bonds				Total				
	Number	Mean	St. dev.	Min.	Max.	Number	Mean	St. dev.	Min.	Max.	Number	Mean	St. dev.	Min.	Max.
Issue size (EURm)	39	64.3	76.4	2.4	275.0	28	62.5	76.1	3.0	275.0	67	63.6	76.3	2.4	275.0
Time-to-maturity (years)	39	7.0	7.4	2.7	38.7	28	5.2	1.8	2.7	10.0	67	6.2	5.8	2.7	38.7
Coupon (%)	39	7.3	0.9	5.7	8.9	28	7.0	0.7	5.8	8.3	67	7.2	0.8	5.7	8.9
Collateralization (dummy)	39	0.1	0.3	0.0	1.0	28	0.4	0.5	0.0	1.0	67	0.3	0.4	0.0	1.0
Mezzanine (dummy)	39	0.1	0.2	0.0	1.0	28	0.0	0.3	0.0	1.0	67	0.1	0.2	0.0	1.0

4.5.3 Variable definitions

To empirically test our hypotheses, we define the explained and explanatory variables, which are introduced in the following subsections.

4.5.3.1 Explained variables

For recovery rates, we use recovery of face value, as defined in Guo et al. (2008), where F is the face value of the bond (usually 100), and δ_{τ} is the recovery rate (in percentage).

$$B^{d}_{\tau} = \delta_{\tau} F, \qquad [4.1]$$

Recent studies use different time measures for recovery rates: Varma and Cantor (2005) use "30-day post default" prices, Mora (2012) uses "roughly 30 days," and Hu and Perraudin (2002) use "one month after default" prices. We use 30-day trading bond prices after the announcement of the bankruptcy filing to maintain consistency with the methodology in Chapter 2 of this dissertation. Use of the post-insolvency bond trading price could be criticized as an imperfect measure of the recovery rate, as it may not match the final amount bondholders receive at the end of the insolvency process. However, this measure is readily available for most bonds and can be compared among bonds and issuers in a straightforward way. By contrast, the outcomes of (sometimes) lengthy insolvency processes are difficult to uncover and not easily comparable, as returns to investors in insolvency processes occur at varying times. Previous research finds

that many investors sell their securities after the default events (Covitz and Han, 2004, p.5); therefore, post-insolvency trading prices serve as good indicators of creditor recovery rates. Further, Cantor and Varma (2005) find that the 30-day trading price serves as a good indicator for ultimate recovery, since it closely matches the average ultimate recovery. Figure 4.3 compares the recovery rates: the recovery rates of DIP bonds are slightly higher than those of Non-DIP bonds, but without statistical significance.⁴² In comparison to the recovery rates in existing studies for Germany (see Table 4.2), the recovery rates in our sample are rather low. This is because existing studies primarily examine bank loans, which are often secured. In contrast, our sample bonds rank below bank debt in terms of seniority and, therefore, exhibit lower recovery rates.

In addition, our sample's recovery rates are considerably lower than the recovery rates in bond studies (see overview in Table 4.3), which yield about 40% on average. This may be due to poor investor protection standards for many of the bonds in our sample, which were issued on mini-bond segments (see van Randow, 2017) for an explanation regarding investor protection standards in mini-bond markets).



Figure 4.3: Recovery rates of sample bonds

In Figure 4.4, we show the average bond trading price around the issuers' bankruptcy filings and the average nominal trading volume. Bond prices decrease in the run-up to the filing date and drop significantly thereafter, while trading volumes spike. Around Day 5 after the bankruptcy filing, the average bond prices settle at approximately 10% of the nominal value and trading volumes return to pre-filing levels. Although we use bond recovery rates at 30 days

⁴² Differences between the means are tested using a t-test (test score of 0.4119), and differences between medians are tested using the Wilcoxon–Mann–Whitney test (test score of 0.4456).

after bankruptcy filing in our main analysis, we also examine recovery rates in five-day intervals between Day 10 until Day 50 post-bankruptcy filing as part of the robustness tests.



Figure 4.4: Average bond trading prices and volumes around bankruptcy filing

4.5.3.2 Explanatory variables

We include several issuer- and bond-specific variables. The issuer-specific variables are based on the last available annual reports before the bankruptcy filings (see Appendix 4.1 for variable definitions). First, we use several financial variables to control for the quality of the issuers' operations and assets. We use return on assets, defined as EBIT to total assets, as a proxy for profitability. To account for the strength of issuers' balance sheets, we use the equity ratio, defined as total book equity to total assets. To account for issuer indebtedness, we use the leverage ratio, defined as total financial debt over total assets. We control for the tangibility of the issuers' balance sheets with the ratio of property, plant, and equipment plus long-term financial investments to total assets. To account for issuer complexity, we use the natural logarithm of total assets and the ratio of intangible assets to total assets. A larger issuer with a greater proportion of intangible assets such as patents or brand values is more likely to be complex. We expect that a higher degree of complexity positively impacts the decision to conduct the DIP management procedure, as keeping incumbent management on board may be more valuable in this situation. Finally, we calculate the Altman Z-Score for each issuer based on Altman and Saunders (1998, p.1737), which is calculated as follows:

$$Z-Score = 6.56 \times X_1 + 3.26 \times X_2 + 6.72 \times X_3 + 1.05 \times X_4 + 3.25$$
[4.2]

 X_1 is the ratio of working capital to total assets, X_2 is the ratio of retained earnings to total assets, X_3 is the ratio of EBIT to total assets (return on assets), and X_4 is the ratio of the book value of equity to total liabilities. Overall, the lower the Z-Score, the higher the issuer's default probability. The Z-Score, therefore, serves as an additional measure of issuer quality. To explicitly control for bond seniority, we construct dummy variables for Collateralized or Mezzanine bonds. The omitted category represents senior unsecured bonds. In addition to financial variables, we also define a dummy variable, which equals one when the issuer employed a CRO shortly before or after the bankruptcy filing. A CRO is an experienced interim manager who is familiar with corporate crisis situations and is responsible for helping management handle the insolvency procedure. According to Herbst (2014, p.611), the appointment of a CRO can boost confidence vis-á-vis creditors that the company management is committed to implementing and executing the restructuring process.

4.6 Empirical strategy and results

4.6.1 Quality differences between DIP- and Non-DIP-bond issuers

4.6.1.1 Univariate comparison of financial variables of DIP- and Non-DIP-issuers

For an impression of the fundamental differences between DIP and Non-DIP issuers, we present an in-sample comparison of the two subsamples in Table 4.7. For the purpose of comparing the subsamples, we run statistical tests to compare the means and medians of the financial differences between the two subsamples. Overall, DIP issuers are larger, less profitable, more highly leveraged, have less equity, but display no difference in intangible and tangible assets compared to Non-DIP issuers. The statistical differences between the two subsamples are very weak. Only the mean difference in the equity ratio is weakly statistically significant at the 10% significance level. The average Altman Z-scores of the sample issuers range between 4.0 and 5.0, which is a bond rating equivalent of BB to B- (see Altman and Saunders, 1998, p.1737). Based on these scores, the sample bonds are from non-investment grade issuers, a fact that is not surprising, as the issuers later filed for bankruptcy. Again, we find no statistically significant differences between the subsamples based on the Altman Z-scores. This rough comparison of the two subsamples indicates there are no statistically significant differences in issuer quality between the DIP and Non-DIP issuers.

Table 4.7: Univariate comparison of DIP-issuers and Non-DIP-issuers

This table reports the mean and median differences in fundamentals and other data variables between DIP-issuers and Non-DIP-issuers. DIP-issuers filed for a debtor-in-possession bankruptcy proceeding, while Non-DIP issuers file for a standard bankruptcy procedure. Differences between means are tested using t-tests, and differences between medians are tested using Wilcoxon–Mann–Whitney tests. ***, ***, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. All variables are winsorized at the 2.5% level on both sides.

This table reports the mean and median differences of fundamental and other data variables between "DIP-issuers" and "Non-DIP-issuers". "DIP-issuers" filed for a debtor-in-poession bankruptcy proceedings, while "Other issuers" filed for a standard bankruptcy proceedings. Differences between mean are tested by t-tests, differences between medians are tested by a Wilcoxon/Mann-Whitney tests. ***, ***, and * indicate statistical significance of a 1%, 5%, and 10% level, respectively. All variables are winsorized at a 2.5% level on both sides.

		DIP is	suers							
	Number	Mean	Median	St. dev.	Number	Mean	Median	St. dev.	Dif. mean	Dif. median
Total assets (EURm)	27	386.2	136.6	546.9	19	294.6	76.5	433.2	91.6	60.1
Return on assets	27	-9.5%	-8.4%	14.3%	19	-9.2%	-2.4%	19.5%	-0.3%	-5.9%
Leverage	27	59.0%	59.9%	19.0%	19	51.4%	54.3%	21.3%	7.6%	5.7%
Equity ratio	27	0.4%	5.4%	25.8%	19	14.1%	17.7%	17.9%	-13.7% *	-12.4%
Intangible assets	27	8.1%	2.3%	11.8%	19	5.3%	2.9%	7.8%	2.8%	-0.6%
Tangible assets	27	32.3%	29.3%	25.2%	19	31.5%	30.3%	23.8%	0.8%	-1.0%
Net working capital	27	30.0%	30.9%	24.7%	19	35.1%	36.5%	27.2%	-5.1%	-5.6%
Altman Z-Score	27	4.0	5.0	3.1	19	4.7	4.9	3.7	-0.7	0.1

4.6.1.2 Results from multivariate analysis

We expand the univariate analysis by using a Probit regression model to determine issuer characteristics that influence the decision to choose preliminary DIP management procedures. In this set of regression models, the dependent variable equals one if the issuer successfully filed for a preliminary DIP management procedure and the procedure was not removed by the insolvency court within 30 days after the filing, and zero otherwise. For each of the following regression models, we work with standard error estimates that are robust to heteroscedasticity by using Huber–White robust standard errors. We check for multicollinearity by calculating the VIFs, which we denote in the table descriptions. We ensure that the maximum VIF for each table stays below the critical value of 10, as recommended by Wooldridge (2016, p.86). The final Probit regressions take the general form:

$$Pr(DIP_{i}=1|x_{i}) = \Phi\{\beta_{0} + \beta_{i}x_{i}\} + e_{i}$$
[4.3]

 $\beta_i x_i$ is a vector with a combination of the variables introduced in Section 4.5.3. Table 4.8 shows the results. Models (1) to (3) provide the base case regressions, with only issuer-specific financial variables, while Models (4) to (6) include variables that expand the analysis to include the impact of bond collateralization and employment of a CRO.

We first comment on how issuer quality impacts the choice of a preliminary DIP management procedure. The coefficients of the equity ratio are significantly negative in each model where the variable is included. Higher equity ratios seem to negatively impact the decision to conduct a DIP procedure. This contradicts the claim that higher quality issuers (quality expressed as strength of the balance sheet measured using the equity ratio) select the DIP procedure. The coefficients of return on assets (quality expressed as profitability measured using return on assets) are positive, but only statistically significant at the 10% level in Model (5). The Altman Z-Score in Model (3) yields positive but statistically insignificant coefficients. Overall, we find only mixed evidence that quality differences among issuers impact selection of the DIP procedure, which means that our analysis yields no support for Hypothesis 1.

Next, we discuss our proxies for complexity. In each of the models, the coefficients of the share of intangible assets are significantly positive. In contrast, the coefficients of total assets are not statistically significant. In Model (2), we use an interaction variable between the share of intangible assets and total assets, which is weakly significant at the 10% significance level. Overall, we find some indication that issuer complexity positively impacts the decision to pursue a DIP procedure. In Models (5) and (6), we test for the impact of collateralization on DIP management. In both models, the coefficients of the dummy variables are significantly negative at the 1% significance level. Bond collateralization negatively impacts the decision to conduct a DIP procedure. This is consistent with prior research, such as Bergström, Eisenberg, and Sundgren (2002), who find that secured creditors tend to oppose a distressed creditor's reorganization. In Models (4) and (6), the coefficients of the CRO dummy variable are statistically significant and positive, which indicates that employing a CRO positively impacts the decision to the decision for a DIP procedure. This is in line with Herbst (2014, p.611), who states that the appointment of a CRO can boost confidence vis-á-vis creditors to benevolently support the restructuring process of an issuer in a DIP procedure.

In summary, the decision to conduct a DIP procedure is not driven by quality differences between issuers, which somewhat contradicts our hypothesis. In contrast, our analysis shows that complexity is an important driver of the decision to conduct the DIP procedure. Combined with the findings on CRO employment and bond collateralization, this means that the DIP procedure is the method of choice when an issuer is complex, the procedure is well-prepared by employing a process specialist, and creditors are not protected by collateral.

Table 4.8: Ordinary least squares model for determinants of DIP management procedures

This table reports the results from the Probit regression model for issuer characteristics. The dependent variable is a dummy that equals one if the debtor has filed for preliminary debtor-in-possession management and the proceedings have not been removed by the insolvency court within 30 days after filing for bankruptcy and zero otherwise. Huber–White heteroscedasticity-consistent standard errors are shown in parentheses below the coefficients, followed by the marginal coefficients in italics. All independent variables, except dummy variables, are winsorized at the 2.5% level on both sides. Investigating the variance inflation factors (VIFs) reveals no multicollinearity, as the mean VIF is 1.68 and the maximum VIF is 3.76. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent variables: Dummy variable for selection of DIP proceeding										
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)					
Intercept	-1.3021	-0.1046	-2.1126	-1.2667	0.0242	0.0172					
	(1.5913)	(0.8150)	(1.7990)	(1.5331)	(1.7110)	(1.6726)					
	-0.4994	-0.0402	-0.8177	-0.4837	0.0092	0.0066					
Equity ratio (%)	-2.6256 **	-2.4467 **		-1.5986	-4.7903 *	-3.1326 *					
	(1.2661)	(1.1702)		(1.0953)	(2.7243)	(1.8071)					
	-1.0070	-0.9393		-0.6105	-1.8202	-1.2018					
Return on assets (%)	1.6647	1.5520		0.8424	3.3160 *	2.3873					
	(1.3140)	(1.2669)		(1.3397)	(1.7183)	(1.6229)					
	0.6385	0.5958		0.3217	1.2600	0.9159					
Intangible asset ratio (%)	3.7565 **		3.5464 *	4.0932 **	4.0957 **	4.2759 **					
	(1.8379)		(1.9346)	(1.8794)	(1.9575)	(1.9151)					
	1.4408		1.3726	1.5631	1.5563	1.6405					
Leverage ratio (%)	0.5973	0.7401	1.8971 *	0.7969	1.9383	2.1012					
	(1.3470)	(1.2480)	(1.1321)	(1.1544)	(1.6327)	(1.3282)					
	0.2291	0.2841	0.7342	0.3043	0.7365	0.8061					
Total assets (log)	0.1104		0.0819	0.0470	-0.0024	-0.0673					
	(0.1453)		(0.1440)	(0.1474)	(0.1701)	(0.1713)					
	0.0423		0.0317		-0.0009	-0.0258					
Int. asset ratio (%) × total assets (log)		0.3209 *									
		(0.1645)									
		0.1232									
Altman Z-Score			0.0211								
			(0.0626)								
			0.0082								
CRO (dummy)				1.1012 **		1.0105 *					
				(0.4576)		(0.5196)					
				0.4205		0.3877					
Collateralization (dummy)					-2.9411 ***	-2.7193 ***					
					(0.9902)	(0.9609)					
					-1.1176	-1.0433					
McFadden R ²	0.1372	0.1264	0.0705	0.2328	0.3378	0.4005					
Observations with $Dep = 0$	19	19	19	19	19	19					
Observations with $Dep = 1$	27	27	27	27	27	27					

4.6.2 Determinants of recovery rates

4.6.2.1 Univariate analysis of determinants of recovery rates

Next, we examine the drivers of bond recovery rates 30 trading days after bankruptcy filing. To get a first impression of how the different company-specific financial variables impact recovery rates, we run a linear regression analysis with the different financial variables as independent variables and recovery rates as the dependent variable. Figure 4.5 illustrates the linear regression models and includes the different regression equations. Based on the linear regression models, the different issuer-specific financial variables are individually poor predictors of bond recovery rates. The R²-values are below 0.1 for most of the variables used; only the ratio of tangible assets to total assets yields an R²-value that is slightly above 0.1. It is surprising, however, that the coefficient of the tangible asset ratio is negative, which indicates that the higher the share of tangible assets, the lower the recovery rate. In contrast, the coefficients of the ratio of net working capital to total assets is positive, yet the R²-value is rather low. Nevertheless, this indicates that a higher share of net working capital positively impacts bond recovery rates slightly. We interpret that the bond market perceives the value of tangible assets as difficult to recover within a bankruptcy setting, while working capital appears to be more liquid and, therefore, more easily recovered.

Figure 4.5. Univariate regression analysis of recovery rate drivers

The diagrams show univariate analyses of potential influencing factors on bond recovery rates. The equations of regression lines and R^2 -values are depicted in the graphs.



4.6.2.2 Multivariate analysis of recovery rate determinants

Reverse causality issues may impact our analysis results; the decision to conduct a preliminary DIP management procedure may be driven by the fundamental aspects of the issuers. This could mean that bond recovery rates may not be driven only by the choice of insolvency procedure but also by quality differences between issuers. To account for this possibility, we treat the choice of preliminary DIP management as endogenous and employ a two-stage least squares (2SLS) regression, in addition to an OLS regression, to control for potential endogeneity. We use the DIP characteristic dummy variables from the Probit regression of Model (6) in Table 4.8 as instruments in our regression, as this model displays the highest adjusted R²-values of this analysis. We formulate the following regression equations and show the results of the OLS and 2SLS regressions in Table 4.9.

Recovery rate (%) =
$$\beta_0 + \sum_{i=1}^{k} \beta_i X_{ji} + \beta_i DIP_i + e_i$$
 [4.4]

 β_j is a vector of coefficients of bond- and issuer-specific variables. For the OLS models, DIP_i is a dummy variable that equals one if the issuer conducted a preliminary DIP procedure. For the 2SLS models, we use the fitted coefficients for the DIP dummy from Model (6) of Table 4.8. We show the results in Table 4.9.

Overall, we find that the coefficients of the Collateralization dummy variable are significantly positive, while the coefficients of the Mezzanine dummies are significantly negative. This is consistent with the expectation that collateralized bonds tend to have higher recovery rates, while mezzanine bonds, which are subordinated to senior unsecured bonds, have lower recovery rates, in line with absolute priority rule of collateralized and mezzanine debt. The issuer quality control variables, the equity ratio, return on assets, and Altman Z-Score are not statistically significant, with the exception of a weakly significant coefficient for equity ratio in the 2SLS in Model (2). This yields no indication that issuer quality in terms of balance sheet strength (equity ratio) and profitability (return on assets) has a significant impact on recovery rates. Interestingly, the models display statistically significant and negative coefficients for the tangible and intangible asset ratios, but significantly positive coefficients for the tangible and intangible and intangible assets are less liquid or rather difficult to liquidate during a bankruptcy procedure compared to working capital, these findings can be interpreted as the mistrust of bondholders or the market in terms of the quality and value of the issuers' fixed assets.

Table 4.9: Ordinary least squares model for determinants of bond recovery rates

This table reports the regression results of the determinants of bond recovery rates. The dependent variable is the bond trading price 30 days after filing for bankruptcy. Huber–White heteroscedasticity-consistent standard errors are shown in parentheses below the coefficients, followed by the marginal coefficients in italics. All independent variables except dummy variables are winsorized at the 2.5% level on both sides. Investigating the variance inflation factors (VIFs) reveals a mean VIF of 2.62 and maximum VIF of 6.49. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent variables: Bond recovery rates 30 days after insolvency filing												
Independent variables	Moo	lel (1)	Mod	lel (2)	Mod	lel (3)							
	OLS	2SLS	OLS	2SLS	OLS	2SLS							
Intercept	16.1589 ***	14.8257 ***	10.4255 ***	9.6432 **	15.6791 ***	15.2691 ***							
	(3.0414)	(3.6187)	(2.8425)	(4.5185)	(2.9571)	(3.3346)							
Collateralization (dummy)	11.2245 ***	13.0030 ***	11.2289 ***	11.4848 ***	11.2842 ***	12.2710 ***							
	(1.7799)	(2.8055)	(1.7679)	(3.0029)	(1.8353)	(2.2594)							
Mezzanine (dummy)	-6.9515 ***	-6.7293 ***	-8.1414 ***	-8.0299 ***	-7.0184 ***	-7.0626 ***							
	(2.0040)	(1.6558)	(1.8241)	(1.8678)	(2.0379)	(1.7895)							
Leverage ratio (%)	-5.0876	-4.8549	-10.6413 **	-10.2549 **	-6.8430	-6.4153							
	(4.3986)	(4.5371)	(4.6248)	(4.8327)	(4.1026)	(4.2254)							
Equity ratio (%)	2.5103	4.4122	-5.9125	-7.2157 *									
	(3.2250)	(4.5186)	(4.1530)	(4.0715)									
Return on assets (%)	3.2391	0.4862	0.1953	-1.0678									
	(4.1083)	(4.7750)	(5.1174)	(6.7918)									
Tangible asset ratio (%)	-14.3273 ***	-16.5294 ***			-12.9553 ***	-14.7460 ***							
	(3.9786)	(4.3347)			(3.5305)	(3.5934)							
Intangible asset ratio (%)	-22.3253 **	-29.0153 **			-20.7228 ***	-25.0289 ***							
	(8.5584)	(11.9746)			(7.7647)	(9.3606)							
Net Working Capital ratio (%)			9.9753 *	11.9897 **									
			(5.2146)	(5.6620)									
Altman Z-Score					0.1900	0.1862							
					(0.2318)	(0.2285)							
Preliminary DIP (dummy)	5.6223 ***	8.5701 *	5.2561 ***	5.0274	5.4591 ***	6.9705 *							
	(1.6325)	(5.1029)	(1.6676)	(4.7385)	(1.5509)	(3.6912)							
Adj. R ²	0.4501	0.4074	0.3763	0.3213	0.4543	0.4107							
Number of observations	67	67	67	67	67	67							

The variable of main interest is the "Preliminary DIP dummy," which is positive in each model, and statistically significant at the 1% significance level in each of the OLS models. This indicates that the choice of the DIP insolvency procedure is positively correlated with bond recovery rates, after controlling for the above-mentioned variables. However, the 2SLS models show that controlling for the endogeneity of the DIP dummy variable reduces the statistical significance level considerably. Only in Models (1) and (3) are the coefficients weakly significant at the 10% significance level. Based on this analysis, we find only weak evidence of higher recovery rates for bonds of issuers who select preliminary DIP management. Therefore, we find weak support for Hypothesis 2, which is encouraging for attainment of the

ESUG's goal to improve investor recovery rates. In the next section, we report the results of several robustness tests to further investigate this issue.

4.7 Robustness tests

To test our initial findings, we run a series of robustness tests. For the first part of the analysis regarding differences in issuer quality, we exclude the observation point with the highest recovery rate, which is "Strenesse AG" (46% recovery rate, see Figure 4.3), and estimate the regressions in Table 4.8 with a reduced sample of only 45 issuers. The results are shown in Appendix 4.3 and yield no significant findings beyond the initial calculations. Therefore, the robustness test is consistent with the original finding of no support for Hypothesis 1.

We also run three robustness tests for the results in Table 4.9 to further examine Hypothesis 2 regarding the differences in recovery rates of DIP and Non-DIP bonds. First, we refer to Figure 4.4, which shows that the bond recovery rates are stable for about five trading days after insolvency filing, while trading volumes drop to pre-insolvency levels. We therefore recalculate the OLS and 2SLS regressions of Models (1), (2), and (3) from Table 4.9 and use the bond recovery rates observed in time intervals of five days beginning at Day 5 until Day 50 after the bankruptcy filing. The results are presented in Appendix 4.4. In addition, we also calculate the volume-weighted recovery rates during different time intervals beginning between Day 5 and Day 10 after the bankruptcy filing and until Day 50 to reflect potential price distortions due to thin bond trading volumes. The results are shown in Appendix 4.5. Please note that some observation points were dropped due to incomplete bond price data for some bonds. Our variable of main interest, the Preliminary DIP dummy, remains positive across all observation points and models. However, the coefficients are significantly positive only in the OLS models. For the 2SLS specification of our models, we only find significantly positive coefficients in four of the models: the observations of 30 and 35 trading days after bankruptcy filing in Models (1) and (3) of Panels A and C in Appendix 4.4. The coefficients of the volume-weighted recovery rates in Appendix 4.5 are not significant. In addition, we also re-estimate the Table 4.9 models after excluding the observation point of Strenesse AG and show our results in Appendix 4.6. The coefficients for the Preliminary DIP dummy remain positive; however, they are only significant for the OLS models. Again, evidence for positive effects of a preliminary DIP filing remains weak, and we find only limited support for Hypothesis 2 based on the robustness test.

4.8 Summary and conclusion

Research on cross-country design differences in legal environments shows that welldesigned insolvency regulations contribute to the effectiveness of corporate debt markets (La Porta et al., 1997, 1998). The German insolvency law reform of 2012 is intended to make the German Insolvency Code restructuring more friendly by providing troubled debtors with better access to a DIP management insolvency procedure in an attempt to facilitate earlier bankruptcy filings and higher creditor recovery rates. While existing research uses rather indirect methods to assess the success of the 2012 insolvency law reform, we employed an explicitly marketfocused approach by focusing on a sample of insolvent bond issuers and their bond prices after bankruptcy filing. Our analysis found no indication of quality differences between issuers who choose a DIP management procedure and issuers who pursue standard insolvency procedures. We rather found evidence that issuer complexity (size, share of intangible assets) is a better predictor of a DIP procedure, as is employing a CRO. A CRO was employed in most of these cases and was established as an essential component of a DIP management procedure. We also confirmed the previous research finding that collateralized debt is a strong predictor of a standard insolvency procedure.

The analysis of recovery rates showed that a higher share of both tangible and intangible assets reduces recovery rates, while a higher share of net working capital increases recovery rates. This indicates that bondholders mistrust issuers' asset quality and prefer issuers with balance sheet positions that can be liquidated in the short-term. We found weak evidence for higher recovery rates of DIP bonds compared to Non-DIP bonds after controlling for reverse causality effects.

Overall, our results were inconclusive in terms of evaluating the insolvency reform of 2012, as our analysis found mixed evidence for the success of the redesigned law. As the data sample was limited to a time span of seven years and focuses only on bond issuers, we recommend further market-based research in this field. It would be optimal if further research could be conducted with a dataset provided by a German commercial lender, comparable to the data of Grunert and Weber (2009). This could yield valuable insights into quality differences in insolvent debtors and recovery rates from a private debt market perspective. In addition, a more comprehensive analysis of recovery rates and security price effects that also includes equity holders, as in Betker (1998), is desirable.

5 Concluding remarks

This dissertation examines recent regulatory and market-driven developments in the German bond market and focuses on how banks and retail investors impact the viability of the bond restructuring process. These elements are connected across three separate empirical studies, based on a detailed analysis of a sample of bond default and restructuring events.

The first study in Chapter 2 examines the determinants and benefits of the bond restructuring process in Germany. It provides evidence that direct interactions between banks and bond issuers prior to bankruptcy events are drivers for launching a bond restructuring process. The bond restructuring process can serve as a tool to mitigate surprise risks for uninformed bondholders because abnormal bond returns around insolvency filing dates were less negative for issuers who launched a bond restructuring process before bankruptcy filing than for issuers who filed for insolvency without attempting to restructure their bonds. Given these outcomes, the role of banks cannot be underestimated as a valuable monitoring element in the German debt market; moreover, the bond restructuring process can benefit bondholders.

The second study in Chapter 3 examines the viability of amending bond terms under the German Bond Act and focuses primarily on how retail investors impact the bond restructuring process. It demonstrates that the German Bond Act solves many of the inherent problems of bond restructuring. However, retail investors can impede the bond restructuring process due to their rational apathy. This issue materializes in three ways: First, retail investor holdings negatively impact the bondholder meeting participation rate. Second, retail investor holdings also negatively impact the probability of achieving quorums in bondholder meetings. Finally, retail investor holdings negatively impact the ability to successfully restructure bonds. Therefore, the German Bond Act does not completely resolve bondholders' rational apathy problem, although it was explicitly designed to deal with this issue.

The third study in Chapter 4 provides a market-oriented examination of the ability of the newly introduced DIP regulation in the German insolvency law to attain its goals. The new regulation was introduced to facilitate earlier insolvency filings and reach higher recovery rates for borrowers. The study finds no evidence that issuers with better balance sheet quality or profitability select the DIP procedure. It rather shows that highly complex issuers and employing a CRO drive the decision to select this procedure. The analysis of bond recovery rates reveals weak evidence for higher recovery rates of bonds whose issuers selected the DIP procedure after controlling for reverse causality effects, a result that is encouraging for the reformed law's goal attainment. These mixed results of our evaluation of the reformed law are in line with mixed assessments in previous studies.

Taken together, this dissertation provides a comprehensive analysis of defaults and restructuring events in the German bond market. It takes an innovative research approach by assessing legal regulations from a strictly market-based perspective and extends our understanding of how retail investors' inherent flaws can affect capital markets. The study also adds to the ongoing discussions of flaws in the market for mini-bonds and the goal attainment of the reformed German Insolvency Code of 2012. These insights were gained by gathering and analyzing a comprehensive sample of bond restructuring events from the German bond market, which cannot be found in any comparable existing study.

Declaration of honor

I declare upon my word of honor that this doctoral thesis submitted is entirely my own research. Coauthors, sources, references, or quotations in any form and their use have been clearly identified. The dissertation has not been submitted for examination purposes to any institution before.

Ich erkläre hiermit ehrenwörtlich, dass ich die vorliegende Arbeit selbständig angefertigt habe. Mitarbeit durch weitere Autoren und sämtliche aus fremden Quellen direkt oder indirekt übernommenen Gedanken sind als solche kenntlich gemacht. Die Arbeit wurde bisher keiner anderen Prüfungsbehörde vorgelegt und noch nicht veröffentlicht

Valentin Peter

Darmstadt, March 26, 2021
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Appendix

Appendix 2.1: Variable descriptions and data sources

This table provides an overview of the variables and databases used. "Variable name" is the name used in all tables and figures, "Database / Data source" shows which database or data source was used to obtain the information, "Variable or Calculation method" is the name of the data item in the respective database or describes how the variable was derived or calculated.

Variable Name	Database / Data source	Variable or Calculation method
Total assets	WVD or Amadeus	WVD: Total Assets
		Amadeus: Total Assets
Return on assets	WVD or Amadeus	WVD: EBIT / Total Assets
		Amadeus: Operating results / Total Assets
Leverage	WVD or Amadeus	WVD: Total Financial Debt / Total Assets
		Amadeus: (Loans + Long term debt + Liabilities to banks) / Total Assets
Equity ratio	WVD or Amadeus	WVD: Book Value - Shareholders' Equity / Total Assets
		Amadeus: Equity / Total Assets
Intangible assets	WVD or Amadeus	WVD: Goodwill & Intangibles / Total Assets
		Amadeus: Intangible assets / Total Assets
Tangible assets	WVD or Amadeus	WVD: (Net Property Plant & Equipment + Leasing & Investment Properties + Long
		Term Investments + Other Long Term Assets) / Total Assets
		Amadeus: (Tangible assets + Financial assets) / Total Assets
Total bank debt	WVD or Amadeus, bond issue prospectuses,	WVD: Total Financial Debt - Face Value of Bond Debt
	Bloomberg	Amadeus: (Loans + Long term debt + Liabilities to banks) - Face Value of Bond Debt
Share of bank debt	WVD or Amadeus, bond issue prospectuses,	WVD: Total bank debt / Total Financial Debt
	Bloomberg	Amadeus: Total bank debt / (Loans + Long term debt + Liabilities to banks)
Listed issuer	Bloomberg	Dummy variable: 1 if the issuer's equity was listed on a stock exchange, 0 otherwise
Bank debt dummy	WVD or Amadeus	WVD: Dummy variable: 1 if Total bank debt > 0
		Amadeus: Dummy variable: 1 if Total bank debt > 0
Bank negotiations	FAZ, Handelsblatt, Börsen-Zeitung, Capital,	Dummy variable: 1 if issuer engaged in bank negotiations before bankruptcy, 0
	WirtschaftsWoche, FINANCE Magazin	otherwise
Restructuring concept	FAZ, Handelsblatt, Börsen-Zeitung, Capital,	Dummy variable: 1 if issuer prepared restructuring concept before bankruptcy, 0
	WirtschaftsWoche, FINANCE Magazin	otherwise
Collateral	Bond issue prospectuses or Bloomberg	Dummy variable: 1 if the bond is collateralized
Mezzanine	Bond issue prospectuses or Bloomberg	Dummy variable: 1 if the bond is a mezzanine bond

Appendix 2.2: Summary information on bankruptcy cases (1/4)

This table provides summary information on the sample of bankruptcy cases of the dataset. "Issuer" is the company name. "Number of bonds in the dataset" is the number of bond issues outstanding at bankruptcy filing date with enough information to be included in our analysis. "Bond Issue volume (EURm)" is the issued volume, not the nominal amount of the bond. "Bankruptcy filing date" is the date of the public announcement of the bankruptcy filing. The information in "Description of the case" is based on a news comprehensive news research.

	1	Distressed bond	s			Restructur	ing process		
lssuer	Number of bonds in data set	Bond issue volume (EURm)	SME-bond issuer	Bankruptcy filing date	Bond restructuring prior to bankruptcy	Start of bond restructuring prior to bankruptcy	Bank negotiations prior to bankruptcy	Restructuring concept prior to bankruptcy	Description of the case
Air Berlin plc	3	477	Yes	15/08/2017	No	n.a.	No	Yes	The withdrawal of the financial commitments of the major shareholder Ethad Airways led to bankruptcy. Air Berlin faced severe operating problems and suffered financial losses for several years. McKinsey worked on restructuring concept but did not finish before bankruptcy filing.
Alno AG	2	59	Yes	11/07/2017	No	n.a.	No	No	Alno suffered financial losses for several years and was unable service its debt payments any longer. Latest restructuring concept supported by PwC in 2010/12, long before the bond issue and bankruptcy filing, therefore it was disregarded as a bank involvement.
Alpine Holding GmbH	1	100	Yes	19/06/2013	No	n.a.	Yes	Yes	The bankruptcy was caused by weak overall economic situation, delays in construction projects and fail asset sales. Restructuring concept was successfully negotiated with banks, which took a haircut of EURm 150 prior to bankruptcy.
Beate Uhse AG	1	30	Yes	15/12/2017	Yes	24/05/2016	No	Yes	The issuer faced long-lasting problems with offline sales and failure to expand stronger into online sales. Inability to convince investors to provide fresh capital led to bankruptcy. Banks were not involved as Beate Uhse was not financed with bank debt. The restructuring concept was drafted by EY.
BKN biostrom AG	1	25	Yes	13/06/2012	No	n.a.	Yes	No	Banks refused further funding of non-consolidated subsidiaries and withdrew financing commitments, which led to bankruptcy of BKN biostrom AG.
Centrosolar AG	1	50	Yes	18/10/2013	Yes	12/04/2013	Yes	Yes	A failed financial restructuring concept and a sharp decrease in sales and profits in Q3 2012 led to liquidity problems and finally triggered bankruptcy filing.
DF Deutsche Forfait AG	1	30	Yes	29/09/2015	Yes	07/01/2015	Yes	Yes	Issuer was black-listed by US government agency OFAC due to supposed business ties to Iran. Later, it failed to complete its financial restructuring concept and was not able to close an equity gap, which resulted in the bankruptcy filing.
FFK Environment GmbH	1	16	Yes	24/10/2013	No	n.a.	Yes	No	Failed expansion plan due to technical issues and a resulting decrease in sales and profit led to liquidity problems. After the issuer failed to attract additional debt and equity financing, it filed for bankruptcy.
friedola Gebr. Holzapfel GmbH	1	13	Yes	23/12/2015	Yes	07/09/2015	Yes	Yes	The issuer faced a poor liquidity situation and was highly indebted. The bankruptcy filing was triggered because the refinancing in April 2017 was not secured. Roland Berger drafted a restructuring concept prior to bankruptcy.
Gebr. Sanders GmbH & Co. KG	1	22	Yes	29/09/2016	Yes	19/11/2015	Yes	No	The issuer faced operating and profitability issues. The bankruptcy was triggered because Commerzbank refused to extend the existing lines of credit.
German Pellets GmbH	4	266	Yes	10/02/2016	Yes	26/01/2016	Yes	Yes	The bankruptcy was triggered by the inability to repay SME-bonds, maturing in April 2016. Houlihan Lokey and CMS drafted a comprehensive restructuring concept, which was not implemented.
getgoods.de AG	1	30	Yes	14/11/2013	No	n.a.	Yes	No	A subsidiary lost more than half of its equity and filed for bankruptcy, which triggered liquidity problems of the issuer. Getgoods finally failed to attract additional funding from investors and had to file for bankruptcy.
GEWA 5 to 1 GmbH & Co. KG	1	35	Yes	18/11/2016	No	n.a.	No	No	The issuer faced operating issues with the completion of its multistory building near Stuttgart. The general contractor refused to resume its work. Banks were not involved, as the building was financed entirely with bond debt.
Golden Gate AG	1	30	Yes	02/10/2014	No	n.a.	No	No	The issuer was unable to sell two of its already finished buildings, which led to a deteriorating liquidity situation. Finally, the issuer was unable to pay back its mini-bond, which triggered bankruptcy.
Günther Zamek GmbH & Co. KG	1	45	Yes	24/02/2014	No	n.a.	No	No	The issuer faced profitability issues for several years. The bond debt was used to expand the business which failed and triggered an adverse liquidity situation and resulted in the bankruptcy filing.
hkw Personalkonzepte GmbH	1	10	Yes	10/12/2013	No	n.a.	No	No	Business customers of the issuer refused to settle outstanding invoices, which resulted in liquidity issues and finally triggered the bankruptcy filing.
KARLIE Group GmbH	1	10	Yes	06/12/2016	Yes	21/04/2016	Yes	Yes	IT-issues triggered delivery delays, which led to a profit decline. A subsidiary filed for bankruptcy as banks terminated loan agreements, which finally lead to the bankruptcy filing of the issuer. A restructuring concept was completed in January 2016 by Hahn Consultants.
KTG Agrar SE	2	342	Yes	05/07/2016	No	n.a.	Yes	No	The issuer used the bond debt to expand rapidly, however was unable to pay interest of EURm 17.8 in July/August 2016, which triggered the bankruptcy filing.

Summary information on bankruptcy cases (2/4)

	1	Distressed bond	s			Restructur	ing process		
Issuer	Number of bonds in data set	Bond issue volume (EURm)	SME-bond issuer	Bankruptcy filing date	Bond restructuring prior to bankruptcy	Start of bond restructuring prior to bankruptcy	Bank negotiations prior to bankruptcy	Restructuring concept prior to bankruptcy	Description of the case
KTG Energie AG	1	50	Yes	27/09/2016	No	n.a.	No	No	The bankruptcy filing of KTG Agrar, which was the major shareholder and business partner of the issuer, triggered supply bottlenecks and impairments on receivables and credits. This finally led to the bankruptcy filing of KTG Energie.
Laurèl GmbH	1	20	Yes	14/11/2016	Yes	12/08/2015	No	Yes	The issuer failed to attract funding from the strategic investor Shenzhen Oriental Fashion Asset Management Co. Ltd. Banks were not involved as the issuer had no bank debt. A restructuring concept was drafted by Hanse Management Consulting.
MIFA Mitteldeutsche Fahrradwerke AG	1	25	Yes	29/09/2014	Yes	23/05/2014	Yes	Yes	The issuer faced profitability and financing problems and tried to solve these issues through a holistic financial restructuring, but finally failed to attract funding by potential investor Hero Cycles Ltd. The restructuring concept was drafted by EY.
Mox Telecom AG	1	35	Yes	17/06/2014	No	n.a.	Yes	No	The issuer failed to negotiate a renewal of financing contracts with its bank, which triggered the inability to repay its debt finally led to the bankruptcy filing.
MS "Deutschland" Beteiligungsgesellschaft mbH	1	50	Yes	29/10/2014	Yes	05/09/2014	No	Yes	The issuer faced operating and financial difficulties (negative margins and low equity ratio) for years. A deteriorating liquidity led to bankruptcy filing. Bank were not involved, as the issuer was entirely finance by bond debt. The restructuring concept was discussed in the first bondholder meeting.
MT-Energie GmbH	1	14	Yes	08/10/2014	Yes	07/03/2014	Yes	Yes	In March 2014, banks initially agreed to extend financing facilities until end of 2015. After a covenant breach in summer 2014, the issuer had to file for bankruptcy. An independent business review and a restructuring concept by an external business consultant were drafted in late 2013.
Penell GmbH	1	5	Yes	02/02/2015	Yes	14/01/2015	Yes	Yes	The issuer faced liquidity problems, while banks and shareholders were unwilling to provide further financing. A restructuring concept was drafted by MSW beginning in December 2014.
RENA Technologies GmbH	2	78	Yes	26/03/2014	No	n.a.	Yes	No	During a period of strong growth, RENA diversified into several new businesses, which led to organizational distress. Negotiations with banks and credit insurer failed due to joint liability issues for liabilities of an insolvent subsidiary company of the issuer.
RENA LANGE Holding GmbH	1	5	Yes	09/09/2014	No	n.a.	No	No	The issuer finished H1 2014 poorly with deteriorating sales and a net loss. This resulted in a very low equity ratio and overindebtedness which triggered the bankruptcy filing. Banks were not involved, as the issuer was primarily financed with bond debt.
RENÉ LEZARD Mode GmbH	1	15	Yes	07/03/2017	Yes	30/09/2016	Yes	Yes	The issuer faced problems with the design of its latest fashion collection, resulting in a shrinking demand. Negotiations with investors to attract new financing failed, which triggered bankruptcy filing. A restructuring concept was presented during bondholder meeting in October 2016.
Rickmers Holding AG	1	275	Yes	31/05/2017	Yes	21/04/2017	Yes	Yes	The issuer failed to secure the support of its main bank HSH Nordbank for the restructuring concept. The restructuring concept was drafted by EY and was presented in the bondholder meeting in May 2017.
"Royalbeach" Spielwaren und Sportartikel Vertriebs GmbH	1	3	Yes	24/01/2018	No	n.a.	No	No	n.a.
Rudolf Wöhrl AG	1	30	Yes	05/09/2016	No	n.a.	No	No	After facing weak operating results the issuer's shareholder meeting decided to file for bankruptcy in order to better support a restructuring and the search for new investors.
S.A.G. Solarstrom AG	2	42	Yes	13/12/2013	No	n.a.	Yes	No	The issuer faced a liquidity gap after delays in its project business. Negotiations with banks and other creditors to attract additional financing failed, which led to the bankruptcy filing.
Schneekoppe GmbH & Co. KG/Schneekoppe Lifestyle GmbH	1	10	Yes	08/08/2014	No	n.a.	No	No	The issuer faced poor financial results in 2013 and operated in a loss. The bankruptcy was triggered due to the inability to service interest payments of the SME-bond in September 2014. Banks were not involved, as the issuer was financed entirely with bond debt.
SIAG Schaaf Industrie AG	1	12	Yes	15/03/2012	No	n.a.	No	No	SIAG Schaaf expanded rapidly, however lost revenues and operated in loss since 2010. In 2012 the issuer announced the loss of more than half of its equity, due to delays in completing several projects. This finally triggered the bankruptcy filing.
SiC Processing GmbH	1	80	Yes	18/12/2012	No	n.a.	Yes	Yes	Problems in the solar industry and the bankruptcy of a large client resulted in an adverse financial situation. Negotiations with banks resulted in deferred payments, but could not avoid bankruptcy. A restructuring concept was drafted but not finalized before bankruptcy filing.
SolarWatt AG	1	25	Yes	13/06/2012	No	n.a.	Yes	No	Worsening condition in the solar industry lead to severe losses in 2011, overindebtedness and covenant breaches. Shareholders of the issuer could not agree on restructuring contributions, which triggered the bankruptcy filing.
Solen AG	1	28	Yes	16/04/2013	Yes	21/02/2013	No	Yes	Regulatory changes in the solar industry lead to an adverse financial situation of the issuer. The issuer could not service the interest payments on the bond debt, while bondholders refused to provide restructuring contributions, which triggered the bankruptcy filing.
Steilmann SE Gruppe/ Steimann-Boecker Fashion Point GmbH & Co. KG	3	89	Yes	23/03/2016	No	n.a.	Yes	No	A poor operating performance coupled with an unsuccessful IPO, which failed to attract sufficient funds, resulted in a poor financial situation of the issuer. Private restructuring negotiations failed, which triggered the bankruptcy filing.
Strenesse AG	1	12	Yes	16/04/2014	Yes	31/01/2014	Yes	Yes	Issuer faced poor operating performance issues due to problems with a clothing collection and conflicts within the founder family. The bankruptcy filing was triggered to facilitate the restructuring process, which was initiated prior to the bankruptcy filing.
Windreich GmbH	2	125	Yes	06/09/2013	No	n.a.	Yes	No	The issuer suffered from poor operating results due to delays in the completion of wind farm projects. The founder provided private capital and attracted bank financing, but finally had to file for bankruptcy.
DEIKON GmbH (ehm. Boetzelen RheinMainHypo)	3	70	No	03/09/2012	Yes	24/08/2010	Yes	Yes	The issuer faced financial difficulties since 2010 and tried to solve these issues through a restructuring concept. However in 2012, the issuer failed to successfully complete the restructuring negotiations with its investors.
EDOB Abwicklungs AG (ehm. Escada AG)	1	200	No	11/08/2009	Yes	26/06/2009	Yes	Yes	The issuer faced severe profitability issues. The bankruptcy filing was triggered by the inability to convince bondholders to provide restructuring contributions.

Summary information on bankruptcy cases (3/4)

		Distressed bond	s			Restructur	ring process		
Issuer	Number of bonds in data set	Bond issue volume (EURm)	SME-bond issuer	Bankruptcy filing date	Bond restructuring prior to bankruptcy	Start of bond restructuring prior to bankruptcy	Bank negotiations prior to bankruptcy	Restructuring concept prior to bankruptcy	Description of the case
ACAZIS AG	1	12	No	01/07/2015	n.a.	n.a.	n.a.	n.a.	n.a.
Alemannia Aachen GmbH	1	24	No	23/11/2012	No	n.a.	Yes	Yes	The new stadium and the relegation from the second national league posed a heavy financial burden on the issuer. A restructuring concept was prepared for the city council of Aachen.
Arcandor AG	1	26	No	09/06/2009	No	n.a.	Yes	Yes	The issuer faced financial difficulties for some time. The trigger for bankruptcy filing was the inability to secure a government assisted bridge loan. The restructuring concept was drafted by KPMG.
AZEGO AG	1	0	No	10/01/2008	No	n.a.	No	No	The issuer faced financial difficulties, which could not be resolved by internal cost-cutting measures. The bankruptcy filing was finally triggered by the inability to attract funding by issuing a convertible bond.
Cargofresh AG	2	66	No	12/11/2009	Yes	17/06/2009	No	No	The issuer failed to attract a bridge loan from its main shareholder Ponaxis AG, which also faced financial difficulties. No bank involvement was recognized.
Conergy AG	1	580	No	05/07/2013	No	n.a.	Yes	Yes	The issuer faced difficult PV-market conditions and was unable to convince all of its banks to participate in the restructuring. A "strategic plan for the future" was prepared prior to bankruptcy.
Cybits Holding AG	1	200	No	01/12/2016	Yes	10/04/2015	n.a.	n.a.	п.а.
Deutsche Nickel AG	1	550	No	31/05/2005	Yes	26/03/2004	Yes	Yes	Stand-still agreement and renegotiation syndicated loan in 2004. Restructuring concept drafted by Roland Berger. Bankruptcy filing due to non- payment of a intra group liability by DNICK Ltd.
Gebhard Real Estate AG	2	275	No	13/11/2013	Yes	06/01/2010	n.a.	n.a.	n.a.
Global PVQ Netherlands BV (ehem. Q- Cells International Finance B.V.)	3	871	No	02/04/2012	Yes	10/10/2011	Yes	Yes	The issuer faced challenging PV-market conditions and tried a bond restructuring through a debt-to-equity swap. However, it turned out that this intended solution was not supported by German commercial law. The legal restructuring concept was designed by Hengeler Müller.
IVG Immobilien AG	2	800	No	21/08/2013	No	n.a.	Yes	Yes	The issuer overstretched its operations, suffered losses from some large projects, and finally could not agree with all of its debtholders on a financial restructuring. A restructuring concept was drafted before the bankruptcy filing.
Jopp AG	1	20	No	17/06/2016	No	n.a.	No	No	The issuer faced strategic (e.g. pricing) and quality issues. Banks were not involved.
Konservenfabrik Zachow GmbH & Co. KG	1	12	No	21/02/2011	Yes	13/08/2010	No	No	The issuer was faced with overcapacities after years of expansion, but was short in liquid assets to rework its facilities. Finally, one important customer reduced its order by half, which led to the bankruptcy filing.
loginet3 AG (ehm. Ponaxis AG)	2	0	No	21/03/2012	Yes	16/11/2009	No	No	The issuer lost more than 50% of its equity in 2008 and finally had to file for bankruptcy.
Novatec Solar GmbH (ehm. NOVATEC BioSol AG)	1	250	No	31/03/2015	Yes	01/12/2014	n.a.	n.a.	n.a.
Pfleiderer AG	1	275	No	27/03/2012	Yes	30/05/2011	Yes	Yes	The issuer faced profitability issues. It was able to successfully negotiate a restructuring concept with its debtholders. However, the implementation was stopped by Frankfurt Higher Regional Court due to legal issues.
Praktiker AG	1	250	No	11/07/2013	Yes	01/03/2012	Yes	Yes	The issuer faced difficult DIY market conditions. Negotiations for restructuring financing were stopped after failed asset sale of a subsidiary, which finally triggered the bankruptcy filing. The restructuring concept was presented in first bondholder meeting.
RINOL Aktiengesellschaft	1	66	No	23/01/2006	Yes	25/09/2003	Yes	Yes	The main bank refused to provide further financing in order to support the restructuring, which finally triggered the bankruptcy filing. The restructuring concept was drafted by Roland Berger and was presented during the bondholder meeting in August 2005.
Solar Millennium AG	5	270	No	21/12/2011	No	n.a.	No	No	The issuer failed to complete the sale of its US-assets. Investors refused to inject funds into another German project, which finally triggered the bankruptcy filing. Banks were not involved, as the issuer was primarily bond financed.
Solarworld AG	2	550	No	10/05/2017	Yes	06/05/2013	Yes	Yes	Prior to bankruptcy filing, the issuer completed a financial restructuring, but the price drop in the PV-market finally forced the management to file for bankruptcy. The initial restructuring concept was presented in July 2012.
Solon SE	1	200	No	13/12/2011	No	n.a.	Yes	Yes	The issuer faced difficult conditions of the PV-market. After intense negotiations with banks and other investors failed, the issuer had to file for bankruptcy. The restructuring concept was drafted by Alvarez & Marsal beginning in June 2010.
systaic AG	2	26	No	14/12/2010	No	n.a.	Yes	Yes	The issuer delivered a strong growth in 2007/08 but faced operational issues and project delays thereafter. A refocusing on core activities came too late, while banks refused to provide a bridge financing. The restructuring concept was drafted by Hawkpoint.
TRIA IT-solutions AG	1	270	No	01/03/2010	Yes	03/09/2008	n.a.	n.a.	n.a.
TV-Loonland AG	1	3	No	08/12/2009	Yes	18/11/2008	No	No	Shareholders refused capital reductions twice during shareholder meetings, which made it impossible to attract additional external financing. The issuer was unable to service its liabilities, which triggered bankruptcy. No banks involved, as issues was mainly bond financed.

Summary information on bankruptcy cases (3/4)

	Distressed bonds				Restructuring process				
Issuer	Number of bonds in data set	Bond issue volume (EURm)	SME-bond issuer	Bankruptcy filing date	Bond restructuring prior to bankruptcy	Start of bond restructuring prior to bankruptcy	Bank negotiations prior to bankruptcy	Restructuring concept prior to bankruptcy	Description of the case
UNYLON AG	2	15	No	30/01/2012	Yes	05/06/2009	n.a.	n.a.	n.a.
VERION AG (ehm Pongs & Zahn Aktiengesellschaft)	1	20	No	23/12/2010	Yes	10/08/2009	No	No	The issuer lost more than 50% of its equity in 2009 and had to file for bankruptcy in the year thereafter. The successful bond restructuring in September 2009 did not provide sufficient relief to avoid bankruptcy.
Vivacon AG	1	2	No	01/10/2013	Yes	24/04/2009	Yes	Yes	The loss of ground rents due to bankruptcy of Conergy AG posed a burden for the issuer. The issuer was unable to convince its debtholders to participate in the restructuring finance, which triggered bankruptcy. A restructuring concept was prepared in 2010.
WGF Westfälische Grundbesitz und Finanzverwaltung AG	8	198	No	11/12/2012	No	n.a.	No	No	The issuer suffered heavy losses in 2011 and finally had to declare bankruptcy. Banks were not involved, as the issuer was bond financed only. A restructuring concept was drafted only after the bankruptcy filing.

Appendix 2.3: Univariate comparison of Process and Non-process issuers – Robustness test Table 2.4

This table reports the mean and median differences of fundamental and other data variables between Process and Non-process issuers and is a robustness test of Table 2.4. Process issuers initiate the bond restructuring process for at least one bond prior to insolvency filing. Differences between means are tested using t-tests, differences between medians are tested using Wilcoxon–Mann–Whitney tests. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. All variables, except the dummy variables "Lister issuer," "Bank negotiations," and "Restructuring concept" are winsorized at the 2.5% level on both sides.

		Process	issuers		١	Non-proce	ss issuers			
	Number	Mean	Median	St. dev.	Number	Mean	Median	St. dev.	Dif. mean	Dif. median
Panel A: Financial data										
Total assets (EURm)	35	289.4	74.4	477.8	35	491.9	136.6	897.5	-202.5	-62.2 *
Return on assets	34	-13.9%	-9.5%	19.0%	35	-5.7%	-0.2%	13.1%	-8.3% **	-9.3% **
Leverage	35	59.2%	57.8%	19.9%	35	46.3%	40.8%	22.4%	13.0% **	17.0% ***
Equity ratio	35	3.2%	2.8%	17.8%	35	10.7%	17.0%	25.5%	-7.5%	-14.2% ***
Intangible asset ratio	35	10.1%	3.1%	18.0%	35	7.9%	2.3%	12.9%	2.2%	0.8%
Tangibility ratio	35	31.4%	29.3%	25.3%	35	30.7%	29.2%	22.0%	0.7%	0.0%
Total bank debt (EURm)	35	116.6	6.0	264.1	35	184.3	14.4	454.7	-67.7	-8.4
Share of bank debt	35	35.9%	32.9%	29.6%	35	39.4%	36.7%	30.5%	-3.4%	-3.8%
Panel B: Other data										
Listed issuer (dummy)	35	0.6	1.0	0.5	35	0.5	0.0	0.5	0.1	1.0
Bank negotiations (dummy)	29	0.7	1.0	0.5	34	0.5	1.0	0.5	0.2	0.0 *
Restructuring concept (dummy)	29	0.8	1.0	0.4	34	0.3	0.0	0.4	0.6 ***	1.0 ***

Appendix 2.4: Probit model for start of restructuring process - Robustness test Table 2.5

This table reports the results from the Probit regression model for issuer characteristics and bank involvement variables. For this test, we exclude the two largest issuers by asset size (IVG and Arcandor). The dependent variable is a dummy, which is equal to one if the restructuring process has started 30 trading days prior to bankruptcy filing at the latest, and zero if the process has not started. Huber–White-heteroscedasticity consistent standard errors are shown in brackets below the coefficients and marginal effects are shown below standard errors in italics. All independent variables except the listed issuer and bank debt dummy variables are winsorized at the 2.5% level on both sides. The number of observations varies due to data availability. Investigating the variance inflation factors (VIFs) reveals no multicollinearity, as the mean VIF is 1.73 and the maximum VIF is 3.28. ***, **, and * indicate statistical significance of a 1%, 5%, and 10% level, respectively.

	Dependent variables: Dummy variable for bond restructuring process start							
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
Constant	0.4942	0.6525	0.5019	1.1191	1.4109	0.9922	1.3640	
	(1.5363)	(1.5240)	(1.5771)	(1.8812)	(2.2081)	(1.8402)	(1.8580)	
	0.1953	0.2578	0.1983	0.4292	0.5143	0.3842	0.5268	
Equity Ratio (%)	1.3933	1.4086	1.3959	1.1812	2.2977	1.4507	1.7596	
	(0.9903)	(0.9834)	(1.0064)	(1.0465)	(1.4911)	(1.0874)	(1.1740)	
	0.5506	0.5565	0.5516	0.4530	0.8376	0.5618	0.6796	
Return on assets (%)	-2.2920 *	-2.2395 *	-2.2940 *	-2.0260	0.2061	-1.5487	-0.9469	
	(1.2146)	(1.2082)	(1.2340)	(1.2510)	(1.1729)	(1.1955)	(1.2109)	
	-0.9057	-0.8849	-0.9065	-0.7771	0.0751	-0.5997	-0.3657	
Tangible asset ratio (%)	0.0685	-0.0134	0.0666	0.0614	-0.7165	-0.3361	-0.4106	
	(0.9472)	(0.9798)	(0.9513)	(0.9449)	(1.1958)	(0.9277)	(0.9621)	
	0.0270	-0.0053	0.0263	0.0236	-0.2612	-0.1302	-0.1586	
Intangible asset ratio (%)	0.4500	0.5221	0.4459	-0.5170	0.7855	-0.5566	-0.4321	
	(1.3027)	(1.3190)	(1.3187)	(1.8653)	(1.7840)	(1.6537)	(1.6549)	
T (0()	0.1778	0.2063	0.1762	-0.1983	0.2863	-0.2156	-0.1669	
Leverage ratio (%)	3.2034 ***	3.153/ ***	3.2017 ***	4.03/8 ***	5.0846 ***	3.495/ ***	3.4442 ***	
	(1.0527)	(1.0341)	(1.0525)	(1.1629)	(1.6370)	(1.1010)	(1.1515)	
Total assats (log)	0.2682 *	0.2401	1.2032	1.348/	1.6333 0.5201 **	1.3337	0.2602 **	
Total assets (log)	-0.2082	-0.2478	-0.2092	-0.4170	(0.2179)	-0.3370	-0.3093	
	-0 1060	-0.0979	-0 1064	-0.1602	-0 1929	-0 1305	-0.1426	
Listed issuer (dummy)	0.8284 *	0.8522 **	0.8273 *	0.9999 **	1 1229 **	0.8968 **	0.9323 **	
Listed issuer (duffility)	(0.4319)	(0.4305)	(0.4331)	(0.4586)	(0.5051)	(0.4413)	(0.4447)	
	0.3273	0.3367	0.3269	0.3835	0.4093	0.3473	0.3601	
Bank debt (dummy)		-0.3892						
		(0.6678)						
		-0.1538						
Share bank debt (%)			0.0154					
			(0.6345)					
			0.0061					
Bank negotiations (dummy)				1.0798 ***				
				(0.4175)				
				0.4142				
Restructuring concept (dummy)					2.2133 ***			
					(0.5228)			
					0.8068			
Share bank debt × bank neg. dum	uny					1.1745 *		
						(0.7091)		
Change have been been stated as a second stated as	4					0.4548	1 5712 **	
Share bank debt × restr. concept of	uummy						1.3/13 **	
							(0.7058) 0.6069	
McFadden R2	0.2076	0.2111	0.2076	0.2448	0.4298	0.2095	0.2317	
Observations with $Dep = 0$	36	36	36	35	35	35	35	
Observations with $Dep = 1$	31	31	31	26	26	26	26	

Appendix 2.5: Probit model for start of restructuring process - Robustness test Table 2.5

This table reports the results from the Probit regression model for issuer characteristics and bank involvement variables. The dependent variable is a dummy, which is equal to one, when the restructuring process starts 0 days prior to bankruptcy filing at the latest, and zero when the process has not started. The Huber–White heteroscedasticity consistent standard errors are shown in parentheses below the coefficients, and the marginal effects are shown below the standard errors in italics. All the independent variables, except the dummy variables, are winsorized at 2.5% level on both sides. The number of observations varies due to data availability. Investigating the variance factors (VIFs) reveals no multicollinearity, as the mean VIF is 1.69 and the maximum VIF is 2.92. ***, **, and * indicate statistical significance of 1%, 5%, and 10% level, respectively.

		Dependent v	ariables: Dummy	variable for bor	d restructuring p	process start	
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	0.0711	0.1170	0.1340	0.8188	1.5179	0.7107	1.1904
	(1.3867)	(1.4006)	(1.4596)	(1.7426)	(2.1821)	(1.7392)	(1.7727)
	0.0284	0.0467	0.0535	0.3239	0.5872	0.2818	0.4712
Equity ratio (%)	1.3877	1.3909	1.4080	1.1471	2.4170 *	1.4003	1.6991
	(0.9094)	(0.9079)	(0.9291)	(0.9895)	(1.3876)	(1.0030)	(1.0916)
	0.5535	0.5547	0.5616	0.4537	0.9350	0.5553	0.6726
Return on assets (%)	-2.1425 *	-2.1307 *	-2.1642 *	-2.0555 *	0.3619	-1.5109	-0.9449
	(1.1332)	(1.1359)	(1.1592)	(1.2354)	(1.2045)	(1.1541)	(1.1801)
	-0.8545	-0.8498	-0.8632	-0.8130	0.1400	-0.5991	-0.3740
Tangible asset ratio (%)	0.1114	0.0930	0.0968	0.2267	-0.8238	-0.2448	-0.3/2/
	(0.8670)	(0.8952)	(0.8/13)	(0.9055)	(1.1843)	(0.8658)	(0.8938)
Intensible exact ratio $(0/)$	0.0444	0.0371	0.0380	0.0897	-0.318/	-0.0971	-0.1475
intaligible asset fatio (%)	(1.2891)	(1.2926)	(1.3084)	-0.1708	(1.6323)	(1.5247)	-0.4279
	(1.28)1)	(1.2)20)	0.2556	-0.0675	(1.0525) 0 4143	-0 1849	-0 1694
Leverage ratio (%)	3.0780 ***	3.0666 ***	3.0675 ***	3.9482 ***	5.0631 ***	3.2750 ***	3.2138 ***
())	(0.9546)	(0.9532)	(0.9565)	(1.0743)	(1.4964)	(1.0193)	(1.0530)
	1.2276	1.2231	1.2235	1.5617	1.9587	1.2986	1.2721
Total assets (log)	-0.1980	-0.1938	-0.2063	-0.3712 **	-0.5086 **	-0.2743 *	-0.3132 *
	(0.1288)	(0.1333)	(0.1413)	(0.1688)	(0.2050)	(0.1645)	(0.1616)
	-0.0790	-0.0773	-0.0823	-0.1468	-0.1968	-0.1088	-0.1240
Listed issuer (dummy)	0.3803	0.3864	0.3707	0.4897	0.4354	0.3898	0.4073
	(0.4123)	(0.4147)	(0.4111)	(0.4384)	(0.4825)	(0.4357)	(0.4392)
	0.1517	0.1541	0.1479	0.1937	0.1684	0.1546	0.1612
Bank debt (dummy)		-0.0939					
		(0.6524)					
		-0.0374					
Share bank debt (%)			0.1252				
			(0.6334)				
Dealers - the time (downward)			0.0499	1 2007 ***			
Bank negotiations (duminy)				(0.4164)			
				(0.4104)			
Restructuring concept (dummy)				0.5077	2.5965 ***		
rastractaning concept (daming)					(0.5412)		
					1.0044		
Share bank debt × bank neg. dum	my					1.2260 *	
-						(0.7000)	
						0.4861	
Share bank debt \times restr. concept of	dummy						1.6411 **
							(0.6859)
							0.6496
McFadden R2	0.1620	0.1622	0.1625	0.2375	0.4616	0.1775	0.2059
Observations with $Dep = 0$	35	35	35	34	34	34	34
Observations with Dep = 1	34	34	34	29	29	29	29

Appendix 2.6: Probit outcome model for determinants of bond restructuring after bank negotiations - Robustness test Table 2.7

This table reports the results of the Probit regression model of the determinants of bond restructuring process after bank negotiations. The dependent variable is a dummy, which is equal to one if the issuer launched a bond restructuring process 30 days prior to insolvency filing and zero otherwise. These 39 issuers are a subsample of the overall sample, and only consist of issuers which negotiated with banks. The Inverse Mills Ratio is calculated based on Model (2) of Table 2.6. Huber–White-heteroscedasticity consistent standard errors are shown in brackets below the coefficients and marginal effects are shown below standard errors in italics. All independent variables are winsorized at the 2.5% level on both sides. Investigating the variance inflation factors (VIFs) reveals no multicollinearity, as the mean VIF is 1.52 and the maximum VIF is 2.08. ***, **, and * indicate statistical significance of a 1%, 5%, and 10% level, respectively.

	Dependent variables: Dummy variable for bond restructuring process start							
Independent variables	(1)	(2)	(3)	(4)	(5)			
Constant	-2.1631 *	-2.4401 **	-2.2734 **	-1.8672 **	-2.4494 ***			
	(1.1153)	(1.0216)	(1.0077)	(0.9070)	(0.9070)			
	-0.8626	-0.9718	-0.9069	-0.7444	-0.9716			
Leverage ratio (%)	5.6731 ***	5.4785 ***	5.5812 ***	4.7546 ***	3.6440 ***			
	(1.8200)	(1.6473)	(1.6597)	(1.3445)	(1.3445)			
	2.2622	2.1818	2.2265	1.8955	1.4455			
Tangible asset ratio (%)	-3.7344 **	-3.0755 **	-2.9081 **	-2.4744 *				
	(1.5336)	(1.3641)	(1.3313)	(1.2779)				
	-1.4891	-1.2248	-1.1601	-0.9865				
Equity ratio (%)	3.1522 **	2.5580 **	1.2603					
	(1.4321)	(1.2789)	(1.2752)					
	1.2570	1.0187	0.5028					
Return on sales (%)	-4.4662 **	-4.0249 **						
	(1.8561)	(1.7874)						
	-1.7809	-1.6029						
Intangible asset ratio (%)	-2.8139							
	(2.0160)							
	-1.1221							
Inverse Mills Ratio	-0.2483	-0.0791	0.0814	0.1473	0.8812			
	(0.8755)	(0.8010)	(0.7465)	(0.7318)	(0.7318)			
	-0.0990	-0.0315	0.0325	0.0587	0.3496			
McFadden R ²	0.3402	0.3205	0.2592	0.2412	0.1821			
Observations with $Dep = 0$	21	21	21	21	21			
Observations with $Dep = 1$	18	18	18	18	18			

Appendix 2.7: Bond price effects around start of bond restructuring processes - Robustness test Table 2.8

This table presents the cumulated abnormal returns (CARs) of the bond price reactions around the start of the restructuring processes. Issuers started the restructuring process before the bankruptcy filing, issuer. t-test statistics are provided in brackets below the CARs. ***, **, and * indicate statistical significance of a 1%, 5%, and 10% level, respectively.

	Process start before insolvency filing N = 27								
_									
Event windows	Mean	Median	St. Dev	Fraction < 0					
[-1;1]	-0.150286 *** (-2.9499)	-0.040004 ** (2.3905)	0.264727	0.63					
[-3;3]	-0.259930 *** (-3.0881)	-0.133272 *** (3.0632)	0.437362	0.78					
[-5;5]	-0.382141 ** (-2.3762)	-0.106890 ** (2.2463)	0.835647	0.70					
[-10;10]	-0.585846 ** (-2.2210)	-0.109835 ** (2.0061)	1.370643	0.74					
[-30;30]	-0.936881 *** (-2.7797)	-0.441670 *** (3.4236)	1.751333	0.81					

Appendix 2.8: Ordinary least square model for CARs around bankruptcy filing on issuer level - Robustness test Table 2.10

This table presents the cross-sectional analysis of CARs of bonds of bankrupt issuers from 30 trading days prior to until 30 trading days after the bankruptcy filing on an issuer level. The values for the independent financial variables are winsorized on a 2.5% level on both sides. Investigating the variance inflation factors (VIFs) reveals no multicollinearity, as the mean VIF is 2.31 and the maximum VIF is 4.52. Huber–White heteroscedasticity consistent standard errors are shown in brackets below the coefficients. ***, **, and * indicate statistical significance of a 1%, 5%, and 10% level, respectively.

	Dependent variables: CARs of bonds around bankruptcy filing						
Independent variables	(1)	(2)	(3)	(3)			
Intercept	0.5941	-0.2551	0.4610	1.8033			
-	(1.4737)	(1.4569)	(1.4637)	(1.2089)			
Collateralization (dummy)	-0.2975	-0.1538	-0.2821	-0.0347			
	(0.2371)	(0.2388)	(0.2438)	(0.2977)			
Mezzanine (dummy)	0.4450	0.5019	0.4721	-0.0847			
	(0.4834)	(0.4705)	(0.4667)	(0.5068)			
Stock-listing (dummy)	0.0758	-0.0937	-0.0481	0.0123			
	(0.3264)	(0.3216)	(0.3266)	(0.2695)			
Equity ratio (%)	1.0692 *	0.9621	1.1568 *	0.1195			
	(0.5551)	(0.6253)	(0.6270)	(0.4624)			
Intangible assets ratio (%)	-0.0144	0.3289	0.0589	0.4933			
	(0.8333)	(0.8841)	(0.8235)	(0.9722)			
Tangible asset ratio (%)	0.4522	0.3762	0.2468	-0.1780			
	(0.6249)	(0.6203)	(0.6649)	(0.6727)			
Return on assets (%)	-1.1269	-0.5095	-1.1309	0.3898			
	(0.7469)	(0.6998)	(0.7276)	(0.7820)			
Total assets	-0.1757	-0.0986	-0.1608	-0.1387			
	(0.1230)	(0.1221)	(0.1210)	(0.0953)			
Leverage ratio (%)	0.5053	0.0994	0.4406				
	(0.7277)	(0.7769)	(0.7716)				
Process start (dummy)		0.6228 ***					
		(0.2300)					
Process duration (days)			0.0007 **				
			(0.0003)				
Bond price t-30 days				-0.0171 **			
				(0.0066)			
Adj. R ²	-0.0605	0.0150	-0.0381	0.1568			
Number of observations	55	55	55	55			

Appendix 2.9: Variation of recovery rates after bankruptcy filing on issuer level – Robustness test Table 2.11

This table presents the cross-sectional analysis of recovery rates of bonds of bankrupt issuers after 30 days after bankruptcy filing on an issuer level. The values for the independent financial variables are winsorized on a 2.5% level on both sides. Investigating the variance inflation factors (VIFs) reveals no multicollinearity, as the mean VIF is 2.02 and the maximum VIF is 2.84. Huber–White heteroscedasticity consistent standard errors are shown in brackets below the coefficients. ***, **, and * indicate statistical significance of a 1%, 5%, and 10% level, respectively. Please note, that we excluded the dummy variable for "Mezzanine" due to multicollinearity issues.

	Dependent variable: Bond recovery rates after bankruptcy filing							
Independent variables	(1)	(2)	(3)	(4)				
Intercept	32.7206 ***	28.5557 ***	32.0915 ***	28.9921 ***				
	(9.5498)	(9.2433)	(9.5953)	(10.0504)				
Collateralization (dummy)	5.8537 *	6.5552 **	5.9240	4.9599 *				
	(2.9737)	(3.0631)	(3.1263)	(2.8065)				
Stock-listing (dummy)	3.2421	2.4479	2.6645	3.7041				
	(2.3961)	(2.7104)	(2.6195)	(2.2860)				
Equity ratio (%)	-9.0261 *	-9.5436 *	-8.5985 *	-5.9010				
	(5.0692)	(4.7528)	(4.7419)	(5.1217)				
Intangible assets ratio (%)	-7.6245	-5.9898	-7.2990	-9.6253				
	(7.3084)	(7.5076)	(7.3854)	(6.9307)				
Tangible asset ratio (%)	-5.2483	-5.6103	-6.2327	-3.1385				
	(4.8436)	(5.2021)	(5.0408)	(4.8081)				
Return on assets (%)	13.7363 ***	16.8648 ***	13.7544 ***	9.3450 *				
	(4.7688)	(6.0134)	(4.7496)	(5.4359)				
Total assets (log)	-1.5767 **	-1.1975	-1.5055 *	-1.7049				
	(0.7631)	(0.7930)	(0.7796)	(0.7848)				
Leverage ratio (%)	-0.3422	-2.3596	-0.6606					
	(5.5019)	(5.3714)	(5.3914)					
Process dummy t-30		3.0743						
		(3.0187)						
Process duration (days)			0.0036					
			(0.0039)					
Bond price t-30 days				0.0552				
				(0.0365)				
Adj. R ²	0.0907	0.0970	0.0823	0.0999				
Number of observations	55	55	55	55				

		First bondhold	er meeting			Second bond	lholder meeting			
		Approval rate	e requirements	Quorum requir	ements	Approval r	ate requirements	Quorum requirements		
SchVG 2009	Restructuring voting items (Sec. 5 (4) No. 2, Sec. 5 (3) No. 1-9)	"Qualified majority"	Sec. 5 (4) No. 2	"At least fifty per cent of the outstanding notes by value"	Sec. 15 (3) No. 1	"Qualified majority"	Sec. 5 (4) No. 2	"At least 25% of the outstanding notes for resolutions which require a qualified majority"	Sec. 15 (3) No. 4	
	Other voting items	"Simple majority"	Sec. 5 (4) No. 1	"At least fifty per cent of the outstanding notes by value"	Sec. 15 (3) No. 1	"Simple majority"	Sec. 5 (4) No. 1	"Such second meeting requires no quorum"	Sec. 15 (3) No. 3	
	Voting items in insolvency proceedings	"Majority resolution"	Sec. 19. (2) No. 1; Sec. 76 (2) No. 1 InsO	No quorum requirements in insolvency. Provisions of insolvency law apply.	Sec. 19 (1), Sec. 76 (2) No. 1 InsO	n/a	n/a	n/a	n/a	
Opt-in SchVG 2009	Transitional provisions (Sec. 24)	"Qualified majority"	Sec. 24 (2) No. 2	"At least fifty per cent of the outstanding notes by value"	Sec. 15 (3) No. 1	"Qualified majority"	Sec. 5 (4) No. 2	"For resolutions which require a qualified majority the persons present must represent at least 25 per cent of the outstanding notes."	Sec. 15 (3) No. 4	

Appendix 3.1: Approval rates and quorum requirements in bondholder meetings according to the German Bond Act of 2009

Appendix 3.2: Variable descriptions and data sources

This table provides an overview of the variables and databases used. "Variable name" is the name used in all tables and figures, "Database / data source" shows which sources were used to obtain the information, "Variable or calculation method" is the name of the data item in the respective database or describes how the variable was derived or calculated

Variable name	Database / data source	Variable or calculation method
Total assets	WVD, Amadeus or annual reports	WVD: Total Assets Amadeus: Total Assets
ROA	WVD, Amadeus or annual reports	WVD: EBIT / Total Assets Amadeus: Operating results / Total Assets
Equity ratio (%)	WVD, Amadeus or annual reports	WVD: Book Value - Shareholders' Equity / Total Assets Amadeus: Equity / Total Assets
Issue size (EURm)	Bond prospectus or Bloomberg	Actual bond issue volume
Time-to-maturity	Bond prospectus or Bloomberg	Fixed maturity of bond at issue date
Coupon	Bond prospectus or Bloomberg	Initial coupon at issue date
Second bondholder meeting (dummy)	Official bondholder meeting documents on bundesanzeiger.de	Dummy variable which is equal to one if the bondholder meeting was scheduled as a second bondholder meeting and zero otherwise
Restructuring of bond terms (dummy)	Official bondholder meeting documents on bundesanzeiger.de	Dummy variable which is equal to one if the bondholder meeting included voting items which materially amend bond terms with regards to loan duration, coupon size, principal amount etc. and zero otherwise
Participation rate (%)	Press releases, official bondholder meeting documents on bundesanzeiger.de, newsletters of SdK e.V. or DIU e.V.	Bond voting capital in attendance of a bondholder meeting
Bond holdings of retail investors	"Microdatabase: Securities Holdings Statistics" (SHS) database of Deutsche Bundesbank	Relative share of nominal bond capital held by households or retail investors at the time of a bondholder meeting
Quorum constitution (dummy)	Press releases, official bondholder meeting documents on bundesanzeiger.de	Dummy variable which is equal to one if the bondholder meeting constituted a quorum (50% participation rate in first meeting, 25% participation rate in second meeting)
Meeting success (dummy)	Press releases, official bondholder meeting documents on bundesanzeiger.de	Dummy variable which is equal to one if the bondholder meeting approved the (major) voting items on the agenda and zero otherwise
Sequence success (dummy)	Press releases, official bondholder meeting documents on bundesanzeiger.de	Dummy variable which is equal to one if the voting items were approved either in the first or in the in second meeting)

Appendix 3.3: Summary information on bondholder meeting sequences (1/6)

This table provides summary information on 91 bondholder meeting sequences and the corresponding 139 bondholder meetings of the dataset. Some bond issuers and bonds were restructured multiple times. In case the first bondholder meeting of a sequences was successful, a second bondholder meeting was not conducted and is marked with "n/a". Bondholder meeting participation rates are only fragmentarily available and are marked with "n/a", when no information could be found.

Seq.		First bondholder meeting Second bondholder meeting									
ID	Issuer	Bond ISIN	Restrc.	Event date	Quorum	Part. rate	Event date	Quorum	Part. rate	Success	Comments
1	3W Power Holdings S.A.	DE000A1A29T7	YES	25/11/2013	NO	31.20%	18/12/2013	NO	n.a.	NO	Appointment and authorization of a joint representative to negotiate restructuring measures concerning the due coupon payment of December 2012, the second bondholder meeting was canceled
2	3W Power Holdings S.A.	DE000A1A29T7	YES	09/04/2014	NO	27.41%	05/05/2014	YES	40.90%	YES	Comprehensive bond restructuring, measures include a debt-to-equity swap and a distressed bond exchange
3	3W Power Holdings S.A.	DE000A1ZJZB9	YES	09/09/2015	NO	n/a	05/10/2015	YES	29.92%	YES	Amendment of bond terms to enable the bond issuer to issue a convertible bond
4	3W Power Holdings S.A.	DE000A1ZJZB9	YES	14/12/2016	NO	n/a	05/01/2017	YES	78.00%	YES	Amendment of coupon interest rate to a step-up schedule, deferment agreement of interest payments of 2017, abandonment of cancellation right
5	3W Power Holdings S.A.	DE000A1ZJZB9	YES	04/01/2018	NO	n/a	25/01/2018	YES	48.98%	YES	Approval of a comprehensive bond restructuring, measures include a debt-to- equity swap and a hair cut of 99%
6	3W Power Holdings S.A.	DE000A1Z9U50	YES	20/12/2016	YES	71.43%	n/a	n/a	n/a	YES	One-time increase of coupon interest rate from 5.5% to 9.5% , abandonment of cancellation right
7	3W Power Holdings S.A.	DE000A1Z9U50	YES	25/01/2018	YES	n/a	n/a	n/a	n/a	YES	Approval of comprehensive bond restructuring, e.g debt-to-equity swap and hair cut of 99%
8	Beate Uhse AG	DE000A12T1W6	YES	08/06/2016	NO	12.52%	06/07/2016	NO	20.93%	NO	Loan life extension from 2019 to 2024, reduction of coupon interest rate from 7.75% to 2.00%, deferment agreement of interest payments, abandonment of cancellation rights
9	Centrosolar AG	DE000A1E85T1	YES	02/05/2013	NO	28.00%	21/05/2013	YES	34.84%	YES	Debt-to-equity swap which includes 110 shares for EUR 1,000 bond principal
10	Centrosolar AG	DE000A1E85T1	YES	18/03/2014	NO	37.00%	14/04/2014	YES	44.20%	YES	Authorization of joint representative to approve insolvency plan which includes a debt-to-equity swap
11	DF Deutsche Forfait AG	DE000A1R1CC4	YES	22/01/2015	NO	39.20%	19/02/2015	YES	42.70%	YES	Reduction of coupon interest rate from 7.875% to 2.00%
12	Ekosem-Agrar GmbH	DE000A1MLSJ1	YES	19/02/2016	NO	n/a	17/03/2016	YES	28.49%	YES	Loan life extension from 2017 to 2021
13	Ekosem-Agrar GmbH	DE000A1R0RZ5	YES	19/02/2016	NO	n/a	17/03/2016	YES	26.68%	YES	Loan life extension from 2018 to 2022
14	eno energy GmbH	DE000A1H3V53	YES	10/09/2015	NO	16.86%	25/02/2016	YES	31.30%	YES	Loan life extension from 2016 to 2018, posting of additional bond collateral
15	friedola Gebr. Holzapfel GmbH	DE000A1MLYJ9	YES	01/10/2015	NO	n/a	28/10/2015	YES	28.40%	YES	Loan life extension from 2017 to 2020, reduction of coupon interest rate from7.25% to 1.0% until 2017, 2.0% until 2018, and 7.25% from 2018 to 2020
16	Gebr. Sanders GmbH & Co. KG	DE000A1X3MD9	YES	09/12/2015	NO	20.87%	08/01/2016	YES	34.86%	YES	Cancellation of negative pledge clause

Summary information on bondholder meeting sequences (2/6)

Seq.				First bondholde	r meeting		Second bondho	older meetir	ıg		
ID	Issuer	Bond ISIN	Restrc.	Event date	Quorum	Part. rate	Event date	Quorum	Part. rate	Success	Comments
17	Gebr. Sanders GmbH & Co. KG	DE000A1X3MD9	YES	21/11/2016	NO	n/a	12/12/2016	YES	41.39%	YES	Authorization of joint representative to transfer a part of the principal in the course of a transferring restructuring
18	Gebr. Sanders GmbH & Co. KG	DE000A1X3MD9	NO	02/01/2017	NO	18.90%	24/01/2017	YES	41.23%	YES	Authorization of joint representative to approve a purchase offer with a minimum amount of EURm 18.5 in the course of a transferring restructuring
19	German Pellets GmbH	DE000A1H3J67	YES	10/02/2016	NO	n/a	n/a	n/a	n/a	NO	Loan-life extension from 2016 to 2018, reduction of coupon interest rate from 7.25% to 5.25%, meeting was cancelled
20	GEWA 5 to 1 GmbH & Co. KG	DE000A1YC7Y7	YES	25/04/2017	NO	44.94%	n/a	n/a	n/a	NO	Authorization of collateral trustee to liquidate bond collateral
21	GEWA 5 to 1 GmbH & Co. KG	DE000A1YC7Y7	YES	28/07/2017	YES	58.87%	n/a	n/a	n/a	YES	Agreement regarding the liquidation agreement between collateral trustee and insolvency administrator
22	Golden Gate AG	DE000A1KQXX5	YES	28/11/2014	NO	49.60%	12/01/2015	YES	58.00%	YES	Amendments of bond provisions concerning the bond collateral
23	Golden Gate AG	DE000A1KQXX5	YES	13/12/2017	NO	21.00%	31/01/2018	YES	45.00%	YES	Postponement of priority of bondholders concerning due interest payments
24	Herbawi GmbH	DE000A12T6J2	YES	13/05/2015	YES	56.78%	n/a	n/a	n/a	YES	Abandonment of cancellation rights, amendment of trustee agreement
25	Herbawi GmbH	DE000A12T6J2	YES	20/01/2017	YES	52.76%	n/a	n/a	n/a	YES	Cancellation of bond terms concerning the bond collateral
26	HPI AG	DE000A1MA904	YES	30/10/2014	YES	71.60%	n/a	n/a	n/a	YES	Deferment agreement of interest payments, abandonment of cancellation right was not approved by bondholders
27	HPI AG	DE000A1MA904	YES	25/02/2015	YES	n/a	n/a	n/a	n/a	YES	Loan life extension to indefinite term, deferment of interest payment, reduction of coupon interest rate from 9.0% to 3.5%, hair cut of 25%, downgrade of bond seniority
28	HPI AG	DE000A1MA904	YES	17/12/2015	YES	n/a	n/a	n/a	n/a	YES	Confirmation of resolutions of the previous bondholder meeting, partial waiver of due interest payments, downgrade of bond seniority
29	HPI AG	DE000A1MA6Z2	YES	27/04/2015	YES	n/a	n/a	n/a	n/a	NO	Loan life extension to indefinite term, reduction of coupon interest rate from 4.5% to 3.5%, deferment of interest payments, hair cut of 25%, downgrade of bond seniority
30	KARLIE Group GmbH	DE000A1TNG90	YES	09/05/2016	NO	37.00%	30/05/2016	YES	40.53%	YES	Reduction of coupon interest rate from 6.75% to 5.00%, loan life extension from 2018 to 2021, one year option for further loan life extension
31	Laurèl GmbH	DE000A1RE5T8	YES	31/08/2015	NO	19.50%	26/10/2015	YES	30.63%	YES	Authorization of joint representative to negotiate deferment of interest payment
32	Laurèl GmbH	DE000A1RE5T8	YES	17/10/2016	NO	12.00%	14/11/2016	NO	n.a.	NO	Deferment of accrued interests, elimination of coming coupon interest payments, haircut of 78% and early repayment of reduced principal, the second bondholder meeting was cancelled
33	Laurèl GmbH	DE000A1RE5T8	NO	25/04/2017	NO	37.00%	15/05/2017	NO	17.00%	NO	Authorization of joint representative to approve insolvency plan, the second bondholder meeting was not carried out as registered capital for this meeting rate was too low
34	MIFA Mitteldeutsche Fahrradwerke AG	DE000A1X25B5	YES	13/06/2014	NO	24.74%	23/07/2014	YES	27.50%	YES	Authorization of joint representative to approve deferment of claim of interest payment of August 2014

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Summary information on bondholder meeting sequences (3/6)

Seq.	First bondholder meeting Second bondholder meeting										
ID	Issuer	Bond ISIN	Restrc.	Event date	Quorum	Part. rate	Event date	Quorum	Part. rate	Success	Comments
35	MS "Deutschland" Beteiligungsgesellschaft mbH	DE000A1RE7V0	YES	08/10/2014	NO	44.06%	12/11/2014	YES	46.00%	NO	Deferment of interest payment, abandonment of cancellation rights. As issuer filed for bankruptcy before the second bondholder meeting, restructuring voting items were not voted
36	MT-Energie GmbH	DE000A1MLRM7	YES	01/04/2014	NO	26.60%	29/04/2014	YES	30.00%	YES	Authorization of joint representative to negotiate abandonment of cancellation rights of bondholders for a reward fee of 1% of bond principal
37	Penell GmbH	DE000A11QQ82	NO	04/02/2015	NO	n/a	n/a	n/a	n/a	NO	Extension of deadline to post additional collateral from November 2014 to February 2015, meeting was cancelled
38	Penell GmbH	DE000A11QQ82	NO	27/04/2016	NO	39.44%	n/a	n/a	n/a	NO	Removal of collateral trustee, authorization of joint representative to implement the resolution of the bondholder meeting
39	Procar Automobile Finanz- Holding GmbH & Co. KG	DE000A1K0U44	YES	05/04/2012	YES	58.13%	n/a	n/a	n/a	YES	Amendment of bond terms regarding lowering of dividend threshold from EURm 30.0 equity to EURm 15.0
40	RENÉ LEZARD Mode GmbH	DE000A1PGQR1	YES	20/10/2016	NO	n/a	09/11/2016	YES	40.51%	YES	Loan life extension from 2017 to 2050, early repayment of 35% and haircut of 40% of bond principal, waiver of due interest payments
41	RENÉ LEZARD Mode GmbH	DE000A1PGQR1	YES	27/01/2017	NO	n/a	16/02/2017	YES	40.71%	YES	Extension of deferment of interest payments, extension of waiver of cancellation rights, authorization of joint representative to approve extension of interest deferrals
42	RENÉ LEZARD Mode GmbH	DE000A1PGQR1	YES	24/10/2017	YES	n/a	n/a	n/a	n/a	YES	Authorization of joint representative to approve insolvency plan, which includes a debt-to-equity swap
43	Rickmers Holding AG	DE000A1TNA39	YES	10/05/2017	NO	17.37%	n/a	n/a	n/a	NO	Loan life extension from 2018 to 2021 and reduction of coupon interest rate from 8.5% to 2.0%
44	Rudolf Wöhrl AG	DE000A1R0YA4	NO	03/04/2017	NO	n/a	24/04/2017	n/a	6.36%	NO	Resolution regarding funding framework agreement, the second meeting was cancelled due to too low registered capital
45	SANHA GmbH & Co. KG	DE000A1TNA70	YES	31/07/2017	NO	11.00%	15/09/2017	YES	29.60%	YES	Loan life extension from 2018 to 2023, reduction of coupon interest rate from 8.5% to 6.25%, posting of addition bond collateral, inclusion of financial covenants
46	Singulus AG	DE000A1MASJ4	YES	08/10/2015	NO	8.41%	29/10/2015	NO	13.80%	NO	Abandonment of cancellation right, authorization of joint representative to negotiate deferment agreement of interest payments
47	Singulus AG	DE000A1MASJ4	YES	18/01/2016	NO	16.60%	15/02/2016	YES	33.00%	YES	Debt-to-equity swap, deferment of interest payments, abandonment of cancellation right
48	Smart Solutions Holding GmbH vorm. Sympatex	DE000A1X3MS7	YES	09/10/2015	NO	n/a	09/11/2015	NO	21.65%	NO	Release of bond collateral
49	Smart Solutions Holding GmbH vorm. Sympatex	DE000A1X3MS7	YES	04/10/2017	NO	8.00%	01/12/2017	YES	47.00%	YES	Haircut of 10%, waiver of interest payments, amendment of bond guarantee
50	Solar8 Energy Aktiengesellschaft	DE000A1H3F87	YES	12/11/2014	YES	n/a	n/a	n/a	n/a	YES	Loan life extension until 2021, reduction of coupon interest rate from 9.25% to 3.00%
51	Solen AG	DE000A1H3M96	YES	08/03/2013	NO	n/a	03/04/2013	NO	n.a.	NO	Waiver of 75% of interest payments between April 2012 and April 2013, abandonment of cancellation rights
52	Steilmann SE Gruppe/ Steimann- Boecker Fashion Point GmbH & Co. KG	DE000A12UAE0	YES	19/06/2015	NO	44.48%	07/07/2015	YES	31.81%	YES	Authorization of issuer to replace existing collateral

Summary information on bondholder meeting sequences (4/6)

Seq.				First bondholde	er meeting		Second bondho	older meetin	g		
ID	Issuer	Bond ISIN	Restrc.	Event date	Quorum	Part. rate	Event date	Quorum I	Part. rate	Success	Comments
53	Steilmann SE Gruppe/ Steimann Boecker Fashion Point GmbH	DE000A14J4G3	YES	19/06/2015	YES	51.38%	n/a	n/a	n/a	YES	Authorization of issuer to replace existing collateral
54	Strenesse AG	DE000A1TM7E4	YES	20/02/2014	YES	53.00%	n/a	n/a	n/a	YES	Loan life extension from 2014 to 2017, posting of additional collateral, addition of a call option of the issuer
55	DEIKON GmbH (ehm. Boetzelen RheinMainHypo)	DE000A0EPM07	NO	28/02/2011	NO	13.68%	11/10/2011	YES	n.a.	YES	Opt-in German Bond Act 2009, permission to schedule vote without meeting
56	DEIKON GmbH (ehm. Boetzelen RheinMainHypo)	DE000A0JQAG2	NO	01/03/2011	NO	11.80%	12/10/2011	YES	n.a.	YES	Opt-in German Bond Act 2009, permission to schedule vote without meeting
57	DEIKON GmbH (ehm. Boetzelen RheinMainHypo)	DE000A0KAHL9	NO	02/03/2011	NO	44.55%	13/10/2011	YES	n.a.	YES	Opt-in German Bond Act 2009, permission to schedule vote without meeting
58	Global PVQ Netherlands BV (ehem. Q-Cells International Finance B.V.)	DE000A0LMY64	NO	25/10/2011	YES	82.25%	n/a	n/a	n/a	YES	Opt-in German Bond Act 2009, minor amendments of guarantee provisions
59	Global PVQ Netherlands BV (ehem. Q-Cells International Finance B.V.)	DE000A0LMY64	YES	27/02/2012	YES	n/a	n/a	n/a	n/a	YES	Deferment of repayment of principal amount until max. December 2012
60	Konservenfabrik Zachow GmbH & Co. KG	DE000A0H5JK6	YES	13/12/2010	YES	n/a	13/12/2010	YES	n.a.	YES	Opt-in German Bond Act 2009, loan life extension from 2013 to 2016, reduction of coupon interest rate from 8.0% to 3.5%
61	Pfleiderer AG	XS0297230368	YES	20/06/2011	YES	50.58%	n/a	n/a	n/a	YES	Opt-in German Bond Act 2009, debt-to-equity swap
62	Pfleiderer GmbH	DE000A12T176	YES	14/09/2015	YES	n/a	n/a	n/a	n/a	YES	Amendment of financial and other covenants
63	Praktiker AG	DE000A1H3JZ8	YES	25/03/2012	NO	19.12%	n/a	n/a	n/a	NO	Reduction of coupon interest rate from 5.875% to 1.0%
64	Solar Millennium AG	DE000A0NKTG7	NO	15/05/2012	NO	n/a	n/a	n/a	n/a	NO	Opt-in German Bond Act 2009
65	Solar Millennium AG	DE000A0NKTG7	NO	07/06/2013	YES	n/a	n/a	n/a	n/a	YES	Opt-in German Bond Act 2009
66	Solar Millennium AG	DE000A0V8YQ8	NO	15/05/2012	NO	n/a	n/a	n/a	n/a	NO	Opt-in German Bond Act 2009
67	Solar Millennium AG	DE000A0V8YQ8	NO	07/06/2013	YES	n/a	n/a	n/a	n/a	YES	Opt-in German Bond Act 2009
68	Solar Millennium AG	DE000A0XFKC4	NO	15/05/2012	NO	n/a	n/a	n/a	n/a	NO	Opt-in German Bond Act 2009
69	Solar Millennium AG	DE000A0XFKC4	NO	07/06/2013	YES	n/a	n/a	n/a	n/a	YES	Opt-in German Bond Act 2009
70	Solarworld AG	XS0641270045	YES	08/07/2013	NO	21.93%	05/08/2013	YES	35.78%	YES	Debt-to-equity and distressed exchange of bonds, abandonment of cancellation rights
71	Solarworld AG	XS0478864225	YES	09/07/2013	NO	18.18%	06/08/2013	YES	37.80%	YES	Debt-to-equity and distressed exchange of bonds, abandonment of cancellation rights

Summary information on bondholder meeting sequences (5/6)

Seq.		First bondholder meeting Second bondholder meeting									
ID	Issuer	Bond ISIN	Restrc.	Event date	Quorum	Part. rate	Event date	Quorum	Part. rate	Success	Comments
72	Koch Gruppe Automobile AG	DE000A0STJ93	YES	28/03/2011	NO	n/a	28/03/2011	YES	n.a.	YES	Distressed exchange of a 9%-straight bond to a convertible bond with 4% coupon
73	Carpevigo Holding AG	DE000A1MA458	YES	18/07/2013	YES	n/a	n/a	n/a	n/a	YES	Deferment of repayment of principal amount until 2016, reduction of coupon interest rate with step-up schedule of 2.0%, 2.5%, and 3.0% between 2014 and 2016, abandonment of cancellation rights
74	Carpevigo Holding AG	DE000A1MA458	YES	11/05/2016	YES	n/a	n/a	n/a	n/a	YES	Loan life extension until 2021, reduction of coupon interest rate to 1.5%, repayment of 105% of principal amount at due date
75	Carpevigo Holding AG	DE000A1PGWY5	YES	18/07/2013	NO	n/a	18/09/2013	YES	n.a.	YES	Loan life extension from 2013 until 2017, reduction of coupon interest rate with step-up schedule of 2.0%, 2.5%, and 3.0% between 2014 and 2016, abandonment of cancellation rights
76	Carpevigo Holding AG	DE000A1PGWY5	YES	11/05/2016	YES	n/a	n/a	n/a	n/a	YES	Loan life extension until from 2016 to 2021, reduction of coupon interest rate from 3.0% in 2016 to 1.5%, increase of principal repayment to 105%
77	Carpevigo Holding AG	DE000A0N3X28	YES	18/07/2013	YES	n/a	n/a	n/a	n/a	YES	Loan life extension from 2013 to 2016, reduction of coupon interest rate from 8.25 to step-up schedule of 2.0%, 2.5%, and 3.0% between 2014 and 2016, abandonment of cancellation right
78	Carpevigo Holding AG	DE000A0N3X28	YES	11/05/2016	NO	n/a	22/06/2016	YES	n.a.	YES	Loan life extension until from 2016 to 2021, reduction of coupon interest rate from 3.0% in 2016 to 1.5%, repayment of 105% of principal amount at due date
79	Carpevigo Holding AG	DE000A0N3X28	YES	20/11/2017	YES	71.15%	n/a	n/a	n/a	YES	Confirmation of resolutions made during previous bondholder meeting, partial waiver of interest payments of 2013
80	Novatec Solar GmbH (ehem. NOVATEC BioSol AG)	DE000A1CRZ50	YES	19/12/2014	YES	51.76%	n/a	n/a	n/a	YES	Haircut of 67.5%, waiver of due interest payments
81	LensWista Aktiengesellschaft	DE000A0LRKZ5	NO	09/12/2011	YES	n/a	n/a	n/a	n/a	YES	Opt-in German Bond Act 2009
82	LensWista Aktiengesellschaft	DE000A0LRKZ5	YES	15/06/2012	YES	n/a	n/a	n/a	n/a	YES	Debt-to-equity swap which includes the swap of EUR 1,000 bond principal for 960 shares of the issuer
83	Activa Resources AG	DE000A1YCS50	YES	27/10/2016	YES	51.00%	n/a	n/a	n/a	YES	Loan life extension from 2017 to 2021, reduction of coupon interest rate from 8.0% to 0.5%, repayment of bond principal for 108%
84	Regenbogen AG	DE000A0N4KG7	YES	29/04/2016	YES	59.00%	n/a	n/a	n/a	YES	Opt-in German Bond Act 2009, loan life extension from 2017 to 2022, amendment of coupon interest rate to 6.0% until 2019 and 6-month Euribor + 4% until 2022
85	PELLEX Bioenergie AG	DE000A1EMCX1	YES	26/05/2014	YES	n/a	n/a	n/a	n/a	YES	Loan life extension from June 2014 to December 2014, increase of coupon interest rate from 7.4% to 7.8%
86	PELLEX Bioenergie AG	DE000A1EMCX1	YES	18/12/2014	YES	n/a	n/a	n/a	n/a	YES	Loan life extension December 2014 to December 2016, increase of coupon interest rate from 7.4% to 7.8%
87	PELLEX Bioenergie AG	DE000A1EMCX1	YES	19/10/2016	NO	n/a	25/10/2016	YES	n.a.	NO	The first bondholder meeting was canceled, in the second meeting loan life extension 2012 to 2018 and coupon interest rate from 7.4% to 5.8% was
88	PELLEX Bioenergie AG	DE000A1EMCX1	YES	29/06/2017	NO	n/a	29/06/2017	YES	n.a.	YES	Loan life extension from June 2017 to December 2018, reduction of coupon interest rate from 7.4% to 5.2%

XXXVI

Summary information on bondholder meeting sequences (6/6)

Seq.			First bondholder meeting				Second bondho	older meeti	ing		
ID	Issuer	Bond ISIN	Restrc.	Event date	Quorum	Part. rate	Event date	Quorum	Part. rate	Success	Comments
89	DEMIRE Deutsche Mittelstand	DE000A1YDDY4	YES	30/09/2014	YES	n/a	n/a	n/a	n/a	YES	Cancellation of cash settlement option
	Real Estate AG										
90	CCG Cool Chain Group Holding	DE000A0KAH37	YES	05/04/2012	NO	n/a	26/04/2012	YES	n.a.	YES	Opt-in German Bond Act 2009, loan life extension from 2012 to 2018
	AU										
91	CCG Cool Chain Group Holding	DE000A0KAH37	YES	08/06/2016	NO	n/a	07/07/2016	YES	n.a.	YES	Repayment of bond principal for 113% in October 2016
	AG	~									

Appendix 3.4: Descriptive overview of approval rates in bondholder meetings

This table provides a descriptive statistics of approval rates of 37 voting items respectively. The coverage of approval rates in bondholder meetings is very limited, therefore this table only includes supplementary information outside of the main analyses.

Number	37	Mean	94.9%
Min	50.3%	Median	98.6%
Max	100.0%	25% -quintile	92.1%
Std. dev.	8.9%	75% -quintile	100.0%

Appendix 3.5: Ordinary least square analysis of bondholder meeting participation rates - Robustness test Table 3.8

This table reports the results from the OLS regression model for bondholder meeting participation rates. The dependent variable is the participation rate (in %) of the different bondholder meetings. The independent variables which are no dummy variables are winsorized on a 2.5% level on both sides. Huber–White-heteroscedasticity consistent standard errors are given in parentheses below the coefficients. Investigating the variance inflation factors (VIFs) reveals no multicollinearity, as the mean VIF is 1.72 and the maximum VIF is 4.67. ***, **, and * indicate statistical significance of a 1%, 5%, and 10% level, respectively.

	Dependent variables: Bondholder meeting participation rate (%)											
		Panel A: Bond	dholder meeting	gs 2010-2015		Panel B: Bondholder meetings 2016-2018						
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)		
Intercept	0.8621 ***	0.7760 ***	0.6493 ***	0.6492 ***	0.5702 ***	0.9168 ***	0.9879 ***	0.8897 ***	0.8792 ***	0.6954 ***		
	(0.1406)	(0.0882)	(0.0732)	(0.0723)	(0.0734)	(0.1036)	(0.0959)	(0.0883)	(0.0851)	(0.0887)		
Bond holdings by retail investors (%)	-0.5337 ***	-0.5170 ***	-0.4166 ***	-0.4167 ***	-0.4077 ***	-0.9080 ***	-0.9228 ***	-0.7396 ***	-0.6913 ***	-0.6957 ***		
	(0.1230)	(0.1101)	(0.1367)	(0.1343)	(0.1349)	(0.1545)	(0.1582)	(0.1474)	(0.1493)	(0.1690)		
Bond issue volume (log)	-0.0421 *	-0.0340	-0.0208	-0.0208		-0.0733 **	-0.0697 **	-0.0699 ***	-0.0610 **			
	(0.0221)	(0.0290)	(0.0181)	(0.0178)		(0.0271)	(0.0263)	(0.0230)	(0.0251)			
Second bondholder meeting (dummy)	0.0082	-0.0017	-0.0005			0.0873 *	0.0825 *	0.0803 *				
	(0.0439)	(0.0434)	(0.0435)			(0.0458)	(0.0457)	(0.0467)				
Equity ratio (%)	-0.2062 *	-0.2476 ***				0.2097 *	0.2000 *					
	(0.1022)	(0.0856)				(0.1081)	(0.1072)					
Return on assets (%)	-0.1594	-0.0815				0.3255	0.3093					
	(0.1604)	(0.1664)				(0.2174)	(0.2129)					
Restructuring of bond terms (dummy)	-0.0747					0.0846						
	(0.1106)					(0.0580)						
Year control dummies	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		
Adj. R ²	0.2878	0.2926	0.2491	0.2674	0.2603	0.5350	0.5215	0.4692	0.4377	0.3475		
# obs.	44	44	44	44	44	36	36	36	36	36		

Appendix 3.6: Probit model of quorum constitution in bondholder meetings – Robustness test Table 3.9

This table reports the results from the Probit regression model of quorum maintaining in bondholder meetings. The dependent variable is a dummy variable which is equal to one if the bondholder meeting constitutes a quorum and zero otherwise. The independent variables which are no dummy variables are winsorized on a 2.5% level on both sides. The independent variables, which are not dummy variables are winsorized at 2.5% level on both sides. Huber–White heteroscedasticity consistent standard errors are shown in parentheses below the coefficients, and marginal effects are shown below the standard errors in italics. Investigating the variance inflation factors (VIFs) reveals no multicollinearity, as the mean VIF is 1.21 and the maximum VIF is 1.64. ***, **, and * indicate statistical significance of a 1%, 5%, and 10% level, respectively.

	Dependent variables: Dummy variable for constituting a quorum											
		Panel A.: Boi	ndholder meetin	gs 2010-2015		Panel B.: Bondholder meetings 2016-2018						
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)		
Intercept	2.7049 ***	1.6356 ***	1.7038 ***	1.6656 ***	0.8764 ***	-0.9388	0.8414	0.4807	0.7027	0.4179		
	(0.7937)	(0.5479)	(0.4708)	(0.4670)	(0.3102)	(1.0607)	(0.6967)	(0.6688)	(0.5696)	(0.4311)		
	1.0594	0.6416	0.6687	0.6546	0.3454	-0.3741	0.3354	0.1917	0.2803	0.1667		
Bond holdings by retail investors (%)	-2.4048 ***	-1.8710 ***	-1.8736 ***	-1.4157 ***	-1.3146 **	-1.0775	-1.3385	-1.1671	-0.6177	-0.8835		
	(0.6567)	(0.6498)	(0.6479)	(0.5322)	(0.5196)	(1.2892)	(1.2442)	(1.0989)	(0.8844)	(0.8543)		
	-0.7723	-0.7339	-0.7353	-0.5564	-0.5181	-0.4294	-0.5336	-0.4654	-0.2464	-0.3525		
Bond issue volume (log)	-0.3116 **	-0.2379 **	-0.2867 ***	-0.2222 **		-0.2419	-0.2301	-0.1929	-0.1439			
	(0.1341)	(0.1210)	(0.1086)	(0.1061)		(0.1677)	(0.1569)	(0.1566)	(0.1516)			
	-0.1220	-0.0933	-0.1125	-0.0873		-0.0964	-0.0917	-0.0769	-0.0574			
Second bondholder meeting (dummy)	1.5571 ***	1.3771 ***	1.3353 ***			2.0675 **	* 1.7610 *	** 1.6436 **	**			
	(0.4034)	(0.3903)	(0.3845)			(0.4532)	(0.4046)	(0.4025)				
	0.6099	0.5402	0.5240			0.8238	0.7019	0.6554				
Equity ratio (%)	0.0823	-0.1509				-1.3293	-1.4104					
	(1.1969)	(1.1171)				(1.0872)	(1.0182)					
	0.0322	-0.0592				-0.5297	-0.5622					
Return on assets (%)	0.2142	0.8925				3.2135 *	2.8547					
	(1.2814)	(1.1290)				(1.8922)	(1.8133)					
	0.0839	0.3501				1.2805	1.1379					
Restructuring of bond terms (dummy)	-0.8403 *					1.7745 **						
	(0.5013)					(0.7197)						
	-0.3291					0.7071						
Year control dummies	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		
McFadden R ²	0.2619	0.2359	0.2286	0.0845	0.0527	0.3620	0.2911	0.2624	0.0255	0.0135		
Observations with $Dep = 0$	36	36	36	36	36	29	29	29	29	29		
Observations with $Dep = 1$	45	45	45	45	45	29	29	29	29	29		

Appendix 3.7: Probit model for successful restructuring sequence – Robustness test Table 3.10

This table reports the results from the Probit regression model for successful restructuring sequences. The dependent variable is a dummy variable which is equal to one if the restructuring sequence is completed successfully and zero otherwise. Huber–White-heteroscedasticity consistent standard errors are shown in parentheses below the coefficients and marginal effects are shown below the standard errors in italics. Investigating the variance inflation factors (VIFs) reveals no multicollinearity, as the mean VIF is 1.60 and the maximum VIF is 2.67. ***, **, and * indicate statistical significance of a 1%, 5%, and 10% level, respectively.

	Dependent variables: Dummy variable for successful restructuring sequence												
		Panel A	.: Sequences 20	010-2015		Panel B.: Sequences 2016-2018							
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)			
Intercept	1.6678 **	1.8957 ***	1.9152 ***	1.9468 ***	1.5867 ***	-0.4785	1.2164	0.9523	1.0597	0.7984			
	(0.8369)	(0.6436)	(0.5382)	(0.5711)	(0.3826)	(0.6540)	(0.1361)	(0.2454)	(0.2003)	(0.1388)			
	0.4402	0.4997	0.5077	0.5137	0.4235	-0.1403	0.3706	0.2965	0.3303	0.2499			
Bond holdings by retail investors (%)	-1.2721 **	-1.4226 **	-1.4047 **	-1.3624 **	-1.3351 **	0.5150	0.0524	-0.1351	-0.0310	-0.2216			
	(0.6477)	(0.5956)	(0.5737)	(0.5590)	(0.5887)	(0.7035)	(0.9669)	(0.8992)	(0.9762)	(0.8342)			
	-0.3357	-0.3750	-0.3724	-0.3595	-0.3564	0.1510	0.0160	-0.0421	-0.0097	-0.0694			
Bond issue volume (log)	-0.0758	-0.0922	-0.1239	-0.1069		-0.2106	-0.1971	-0.1125	-0.1210				
	(0.1813)	(0.1623)	(0.1448)	(0.1510)		(0.3129)	(0.2994)	(0.6017)	(0.5834)				
	-0.0200	-0.0243	-0.0328	-0.0282		-0.0618	-0.0601	-0.0350	-0.0377				
Second bondholder meeting (dummy)	0.2045	0.2698	0.2194			0.4433	0.3331	0.2135					
	(0.4683)	(0.4041)	(0.4214)			(0.3285)	(0.4752)	(0.6467)					
	0.0540	0.0711	0.0582			0.1300	0.1015	0.0665					
Equity ratio (%)	-0.2251	-0.1760				-1.5729	-1.9588						
	(1.9660)	(1.9158)				(0.2915)	(0.1867)						
	-0.0594	-0.0464				-0.4613	-0.5968						
Return on assets (%)	0.9261	0.7728				1.5619	1.2301						
	(1.7120)	(1.5561)				(0.5529)	(0.6127)						
	0.2444	0.2037				0.4581	0.3748						
Restructuring of bond terms (dummy)	0.1897					1.6804 **							
	(0.5818)					(0.0220)							
	0.0501					0.4928							
Year control dummies	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO			
McFadden R ²	0.0886	0.0870	0.0807	0.0755	0.0658	0.1782	0.0466	0.0807	0.0112	0.0010			
Observations with $Dep = 0$	11	11	11	11	11	9	9	9	9	9			
Observations with $Dep = 1$	43	43	43	43	43	28	28	28	28	28			

Appendix 4.1: Variable descriptions and data sources

This table provides an overview of the variables and databases used. "Variable" name means the name used in all tables and figures, "Database / Data source" shows which database or data source was used to obtain the information, "Variable or Calculation method" is the name of the data item in the respective database or describes how the variable was derived or calculated.

Variable Name	Database / Data source	Variable or Calculation method								
Total assets	WVD or Amadeus	WVD: Total Assets								
		Amadeus: Total Assets								
Return on assets	WVD or Amadeus	WVD: EBIT / Total Assets								
		Amadeus: Operating results / Total Assets								
Leverage	WVD or Amadeus	WVD: Total Financial Debt / Total Assets								
		Amadeus: (Loans + Long term debt + Liabilities to banks) / Total Assets								
Equity ratio (%)	WVD or Amadeus	WVD: Book Value - Shareholders' Equity / Total Assets								
		Amadeus: Equity / Total Assets								
Intangible asset ratio (%)	WVD or Amadeus	WVD: Goodwill & Intangibles / Total Assets								
		Amadeus: Intangible assets / Total Assets								
Tangible asset ratio (%)	WVD or Amadeus	WVD: (Net Property Plant & Equipment + Leasing & Investment Properties + Long								
		Investments + Other Long Term Assets) / Total Assets								
		Amadeus: (Tangible assets + Financial assets) / Total Assets								
Net Working capital ratio (%)	WVD or Amadeus	WVD: (Accounts Receivable + Stocks Inventories + Prepayment & Advances + Other								
		Current Assets - Accounts Payable - Taxes Payable - Other Current Liabilities) / Total								
		Assets								
		Amadeus: (Inventories + Receivables and other assets - Payments received on account of								
Collateral	Bond issue prospectuses or Bloomberg	Dummy variable: 1 if the bond is collateralized								
Mezzanine	Bond issue prospectuses or Bloomberg	Dummy variable: 1 if the bond is a mezzanine/subordinated bond								
Debtor-in-Possession	Press releases, insolvenz-portal.de	Dummy variable: 1 if issuer conducted bankruptcy procedure under §270a/b InsO, 0								
Management (DIP)	_	otherwise								
CRO employment	Press releases	Dummy variable: 1 if the issuer employed a CRO or CIO around the initial insolvency filing								
Altman Z-Score	Calculations based on WVD or Amadeus	$\overline{\text{Z-Score} = 6.56 \times X_1 + 3.26 \times X_2 + 6.72 \times X_3 + 1.05 \times X_4 + 3.25}$								
		$X_1 = $ working capital/total assets								
		$X_2 =$ etained earnings/total assets								
		$X_3 = EBIT/total assets$								
		$X_4 = book value of equity/total liabilities$								

Appendix 4.2: Summary information on bankruptcy cases (1/2)

This table provides summary information on the sample of insolvency cases of German bond issuers after the introduction of ESUG in March 2012. The information regarding the restructuring processes is based on a news comprehensive news research. "Sec. 270a Inso" means the application of the issuer for a "Opening Proceedings" after Sec. 270a InsO, while "Sec. 270b InsO" is the application of the issuer for "Preparations for Reorganisation" after Sec. 270b InsO. "DIP" is the opening of insolvency procedure in "Debtor-in-Possession Management" after Sec. 270 InsO. "Asset Deal" is the sale of the issuer in total or in parts to a new investor ("transferring restructuring"), "Insolvency plan" is the stand-alone restructuring of the issuer, and "Liquidation" is the shut-down of the issuer. "CRO" means Chief Restructuring Officer and "CIO" means Chief Insolvency Officer.

	Initial filing		Court ruling reg. Sec. 270a/b Sec. 270a/b decision removed Start insolvency proceedings DIP removed						Final outcome If insolvency	plan	CRO / CIO appointed			
Issuer	Туре	Date	Decision	Date	Decision	Date	Decision	Date	Decision	Date	Typ Outcome	Date	Decision	Name
Air Berlin plc	Sec. 270a InsO	8/15/2017	Confirmed	15/08/2017	No	n.a.	DIP	01/11/2017	NO	n.a.	Asset Deal n.a.	n.a.	No	n.a.
Alno AG	Sec. 270a InsO	7/11/2017	Confirmed	13/07/2017	Yes	29/08/2017	Non-DIP	10/10/2017	n.a.	n.a.	Asset Deal n.a.	n.a.	No	n.a.
Beate Uhse AG	Sec. 270a InsO	12/15/2017	Confirmed	15/12/2017	No	n.a.	DIP	02/03/2018	NO	n.a.	Insolvency pla Confirmed	15/06/2018	Yes	Thomas Kresse
BKN biostrom AG	Ord. insolvency	6/13/2012	n.a.	n.a.	n.a.	n.a.	Non-DIP	31/08/2012	n.a.	n.a.	Asset Deal n.a.	n.a.	No	n.a.
Centrosolar AG	Sec. 270b InsO	10/18/2013	Confirmed	18/10/2013	No	n.a.	DIP	01/01/2014	NO	n.a.	Insolvency pla Removed	12/09/2014	No	n.a.
DEIKON GmbH	Ord. insolvency	9/3/2012	n.a.	n.a.	n.a.	n.a.	Non-DIP	28/09/2012	n.a.	n.a.	Asset Deal n.a.	n.a.	No	n.a.
DF Deutsche Forfait AG	Sec. 270b InsO	9/29/2015	Confirmed	30/09/2015	No	n.a.	DIP	01/01/2016	NO	n.a.	Insolvency pla Completed	01/07/2016	No	n.a.
FFK Environment GmbH	Ord. insolvency	10/24/2013	n.a.	n.a.	n.a.	n.a.	Non-DIP	24/01/2014	n.a.	n.a.	Asset Deal n.a.	n.a.	No	n.a.
friedola Gebr. Holzapfel GmbH	Ord. insolvency	12/23/2015	n.a.	n.a.	n.a.	n.a.	Non-DIP	01/02/2016	n.a.	n.a.	Asset Deal n.a.	n.a.	No	n.a.
Gebr. Sanders GmbH & Co. KG	Sec. 270b InsO	9/29/2016	Confirmed	29/09/2016	No	n.a.	DIP	01/01/2017	n.a.	n.a.	Asset Deal n.a.	n.a.	No	n.a.
German Pellets GmbH	Sec. 270a InsO	2/10/2016	Rejected	10/02/2016	n.a.	n.a.	Non-DIP	01/05/2016	n.a.	n.a.	Asset Deal n.a.	n.a.	Yes	Frank Günther
getgoods.de AG	Ord. insolvency	11/14/2013	n.a.	n.a.	n.a.	n.a.	Non-DIP	01/02/2014	n.a.	n.a.	Asset Deal n.a.	n.a.	No	n.a.
GEWA 5 to 1 GmbH & Co. KG	Ord. insolvency	11/18/2016	n.a.	n.a.	n.a.	n.a.	Non-DIP	27/09/2018	n.a.	n.a.	Asset Deal n.a.	n.a.	No	n.a.
Global PVQ Netherlands BV (ehem. Q-Cells)	Ord. insolvency	4/2/2012	n.a.	n.a.	n.a.	n.a.	Non-DIP	01/07/2012	n.a.	n.a.	Asset Deal n.a.	n.a.	No	n.a.
Golden Gate AG	Sec. 270a InsO	10/2/2014	Rejected	09/10/2014	n.a.	n.a.	Non-DIP	24/02/2015	n.a.	n.a.	Asset Deal n.a.	n.a.	Yes	Dr. Hans Volkert Volckens
Günther Zamek GmbH & Co. KG	Sec. 270a InsO	2/24/2014	Confirmed	25/02/2014	No	n.a.	DIP	07/05/2014	YES	05/06/2014	Asset Deal n.a.	n.a.	No	n.a.
hkw Personalkonzepte GmbH	Ord. insolvency	12/10/2013	n.a.	n.a.	n.a.	n.a.	Non-DIP	01/02/2014	n.a.	n.a.	Asset Deal n.a.	n.a.	No	n.a.
IVG Immobilien AG	Sec. 270b InsO	8/20/2013	Confirmed	21/08/2013	No	n.a.	DIP	01/11/2013	NO	n.a.	Insolvency pla Completed	16/09/2014	Yes	Hans-Joachim Ziems
KARLIE Group GmbH	Sec. 270a InsO	12/6/2016	Confirmed	06/12/2016	No	n.a.	DIP	10/04/2017	NO	n.a.	Asset Deal n.a.	n.a.	No	n.a.
KTG Agrar SE	Sec. 270a InsO	7/5/2016	Confirmed	05/07/2016	No	n.a.	DIP	01/09/2016	YES	28/09/2016	Asset Deal n.a.	n.a.	Yes	Jan Ockelmann
KTG Energie AG	Sec. 270a InsO	9/27/2016	Confirmed	27/09/2016	No	n.a.	DIP	01/12/2016	NO	n.a.	Insolvency pla Completed	20/03/2017	Yes	Dr. Thorsten Bieg, Dr. Gerrit Hölze
Laurèl GmbH	Sec. 270b InsO	11/14/2016	Confirmed	18/11/2016	No	n.a.	DIP	01/02/2017	NO	n.a.	Insolvency pla Completed	29/09/2017	No	n.a.
MIFA Mitteldeutsche Fahrradwerke AG	Sec. 270a InsO	9/29/2014	Rejected	07/10/2014	n.a.	n.a.	Non-DIP	01/12/2014	n.a.	n.a.	Asset Deal n.a.	n.a.	Yes	Dr. Stefan Weniger
Mox Telecom AG	Sec. 270a InsO	6/17/2014	Confirmed	20/06/2014	Yes	01/10/2014	Non-DIP	01/10/2014	n.a.	n.a.	Asset Deal n.a.	n.a.	No	n.a.
MS "Deutschland" Beteiligungsgesellschaft mbH	Sec. 270a InsO	10/29/2014	Rejected	30/10/2014	n.a.	n.a.	Non-DIP	01/01/2015	n.a.	n.a.	Asset Deal n.a.	n.a.	Yes	Frank Günther
MT-Energie GmbH	Ord. insolvency	10/8/2014	n.a.	n.a.	n.a.	n.a.	Non-DIP	01/01/2015	n.a.	n.a.	Asset Deal n.a.	n.a.	No	n.a.
Penell GmbH	Ord. insolvency	2/2/2015	n.a.	n.a.	n.a.	n.a.	Non-DIP	27/03/2015	n.a.	n.a.	Liquidation n.a.	n.a.	No	n.a.
Pfleiderer AG	Sec. 270a InsO	3/27/2012	Confirmed	28/03/2012	No	n.a.	DIP	17/04/2012	n.a.	n.a.	Insolvency pla Completed	31/12/2012	Yes	Hans-Joachim Ziems, Elmar Geissinger
Praktiker AG	Ord. insolvency	7/11/2013	n.a.	n.a.	n.a.	n.a.	Non-DIP	01/10/2013	n.a.	n.a.	Asset Deal n.a.	n.a.	No	n.a.
RENA LANGE Holding GmbH	Sec. 270a InsO	9/9/2014	Confirmed	11/09/2014	Yes	19/11/2014	Non-DIP	19/11/2014	NO	n.a.	Liquidation n.a.	n.a.	Yes	Frank Günther
RENA Technologies GmbH	Sec. 270a InsO	3/26/2014	Confirmed	26/03/2014	No	n.a.	DIP	01/06/2014	NO	n.a.	Asset Deal n.a.	n.a.	Yes	Thomas Oberle, Jan von Schuckmann
RENÉ LEZARD Mode GmbH	Sec. 270b InsO	3/7/2017	Confirmed	09/03/2017	No	n.a.	DIP	01/06/2017	NO	n.a.	Insolvency pla Completed	29/09/2017	Yes	Jens Weber
Rickmers Holding AG	Sec. 270a InsO	5/31/2017	Confirmed	31/05/2017	No	n.a.	DIP	05/09/2017	NO	n.a.	Asset Deal n.a.	n.a.	Yes	Dr. Christoph Morgen
"Royalbeach" Spielwaren und Sportartikel Vertriebs GmbH	Ord. insolvency	1/24/2018	n.a.	n.a.	n.a.	n.a.	Non-DIP	01/04/2018	NO	n.a.	Liquidation n.a.	n.a.	No	n.a.
Rudolf Wöhrl AG	Sec. 270b InsO	9/5/2016	Confirmed	05/09/2016	No	n.a.	DIP	01/12/2016	NO	n.a.	Asset Deal n.a.	n.a.	Yes	Dr. Christian Gerloff
S.A.G. Solarstrom AG	Sec. 270a InsO	12/13/2013	Confirmed	17/12/2013	Yes	13/02/2014	Non-DIP	01/03/2014	NO	n.a.	Asset Deal n.a.	n.a.	No	n.a.
Schneekoppe GmbH & Co. KG	Sec. 270b InsO	8/8/2014	Confirmed	08/08/2014	No	n.a.	DIP	05/11/2014	NO	n.a.	Insolvency pla Completed	29/07/2015	Yes	Andreas Liebaug
SIAG Schaaf Industrie AG	Sec. 270a InsO	3/15/2012	Confirmed	15/03/2012	No	n.a.	DIP	01/06/2012	NO	n.a.	Insolvency pla Completed	06/03/2013	Yes	Andrew Seidl
SiC Processing GmbH	Sec. 270b InsO	12/18/2012	Confirmed	20/12/2012	No	n.a.	DIP	01/03/2013	YES	02/04/2013	Liquidation n.a.	n.a.	Yes	Peter Thysell

Summary information on bankruptcy cases (2/2)

	Initial filing		Court ruling r	eg. Sec. 270a/b	Sec. 270a/b	decision remove	ed Start insolve	Start insolvency proceedings DIP removed			Final outcome	If insolvency plan		CRO / CIO appointed	
Issuer	Туре	Date	Decision	Date	Decision	Date	Decision	Date	Decision	Date	Тур	Outcome	Date	Decision	Name
SolarWatt AG	Sec. 270b InsO	6/13/2012	Confirmed	13/06/2012	No	n.a.	DIP	01/08/2012	NO	n.a.	Insolvency pla	Completed	17/10/2012	Yes	Andreas Ziegenhagen
Solarworld AG Exchange Bonds	Ord. insolvency	5/10/2017	n.a.	n.a.	n.a.	n.a.	Non-DIP	01/08/2017	n.a.	n.a.	Asset Deal	n.a.	n.a.	No	n.a.
Solen AG	Ord. insolvency	4/16/2013	n.a.	n.a.	n.a.	n.a.	Non-DIP	01/07/2013	NO	n.a.	Liquidation	n.a.	n.a.	No	n.a.
Steilmann SE Gruppe	Ord. insolvency	3/23/2016	n.a.	n.a.	n.a.	n.a.	Non-DIP	01/06/2016	NO	n.a.	Asset Deal	n.a.	n.a.	No	n.a.
Strenesse AG	Sec. 270a InsO	4/16/2014	Confirmed	16/04/2014	No	n.a.	DIP	01/07/2014	YES	05/09/2016	Asset Deal	n.a.	n.a.	Yes	Michael Pluta
WGF Westfälische Grundbesitz und Finanzverwaltung AG	Sec. 270a InsO	12/11/2012	Confirmed	11/12/2012	No	n.a.	DIP	01/03/2013	NO	n.a.	Insolvency pla	Completed	24/06/2013	Yes	Bernd Depping
Windreich GmbH	Sec. 270a InsO	9/6/2013	Confirmed	06/09/2013	Yes	22/11/2013	Non-DIP	01/12/2013	n.a.	n.a.	Asset Deal	n.a.	n.a.	No	n.a.
Appendix 4.3: Multivariate analysis of determinants of preliminary DIP management procedure – Robustness test Table 4.8

This table reports the results from the Probit regression model for issuer characteristics of conducting a DIP management procedure. In this test, we excluded the observation point "Strenesse AG", as this is the DIP-issuer with the highest bond recovery rate. The dependent variable is a dummy, which is equal to one if the issuer has chosen to file for preliminary debtor-in-possession management and the proceeding has not been removed by the insolvency court within 30 days after filing, and zero otherwise. Huber–White-heteroscedasticity consistent standard errors are shown in brackets below the coefficients. All independent variables except the CRO- and collateral-dummy variables are winsorized at the 2.5% level on both sides. The number of observations varies due to data availability. Investigating the variance inflation factors (VIFs) reveals no multicollinearity, as the mean VIF is 1.66 and the maximum VIF is 3.53. ***, **, and * indicate statistical significance of a 1%, 5%, and 10% level, respectively.

	Dependent variables: Dummy variable for selection of DIP-proceeding												
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)							
Intercept	-1.6722	-0.1804	-2.3565	-1.5019	-0.2972	-0.1679							
	(1.6096)	(0.8134)	(1.8147)	(1.5655)	(1.7600)	(1.7255)							
Equity ratio	-2.5796 **	-2.3721 **		-1.6229	-4.6031 *	-3.1053 *							
	(1.2288)	(1.1194)		(1.0623)	(2.6176)	(1.7800)							
Return on assets	1.6199	1.4895		0.8573	3.1995 *	2.3541							
	(1.3035)	(1.2534)		(1.3263)	(1.6790)	(1.6028)							
Intangible assets	3.9186 **		3.6449 *	4.1446 **	4.1579 **	4.2890 **							
	(1.8504)		(1.9307)	(1.8608)	(1.9595)	(1.9029)							
Leverage ratio	0.6155	0.7876	1.8571	0.7973	1.9190	2.0895							
	(1.3456)	(1.2448)	(1.1327)	(1.1556)	(1.6169)	(1.3275)							
Total assets (log)	0.1366		0.1038	0.0671	0.0200	-0.0520							
	(0.1463)		(0.1459)	(0.1493)	(0.1706)	(0.1738)							
Int. assets \times Total assets (log)		0.3348 **											
		(0.1657)											
Altman Z-Score			0.0141										
			(0.0626)										
CRO Dummy				1.0404 **		0.9785 *							
				(0.4658)		(0.5320)							
Collateral Dummy					-2.8392 ***	-2.6778 ***							
					(0.9724)	(0.9629)							
McFadden R ²	0.1451	0.1300	0.0773	0.2290	0.3345	0.3934							
Observations with $Dep = 0$	19	19	19	19	19	19							
Observations with $Dep = 1$	26	26	26	26	26	26							

Appendix 4.4: Multivariate analysis of determinants of bond recovery rates– Robustness test Table 4.9 (1/2)

This table shows regression results of the determinants of recovery rates. The dependent variable is the bond trading price at different observation points after insolvency filing. For example, "t5" means that the recovery rates are extracted five trading days after insolvency filing. All independent variables except the dummy variables are winsorized at the 2.5% level on both sides. Investigating the variance inflation factors (VIFs) reveals mean VIF of 2.55 and the maximum VIF of 7.89. ***, **, and * indicate statistical significance of a 1%, 5%, and 10% level, respectively.

	Panel A: Bond recovery rates after insolvency filing dependent on independent variables of Model (1) of Table 4.9																	
	t	10	t	15	t2	0	t2	25	t	30	t	35		t40	t	45	t50	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
Intercept	12.5527 ***	14.3219 ***	15.2256 ***	17.2241 ***	14.7287 ***	15.0121 ***	14.5871 ***	14.3595 ***	16.1589 ***	14.8257 ***	14.6504 ***	12.7088 ***	13.6955 **	* 13.1167 ***	12.5746 ***	12.9024 ***	13.8735 ***	14.3545 ***
	(2.8689)	(3.5265)	(3.0083)	(3.4756)	(3.1085)	(3.6943)	(2.6946)	(3.5132)	(3.0414)	(3.6187)	(3.2380)	(3.7303)	(3.5408)	(4.0296)	(4.1544)	(4.5255)	(3.7859)	(4.2785)
Collateralization (dummy)	9.2063 ***	7.4805 **	8.7242 ***	6.6151 **	10.2864 ***	10.1608 ***	10.6056 ***	11.1226 ***	11.2245 ***	13.0030 ***	9.9153 ***	12.6480 ***	8.2358 **	* 9.1895 ***	9.6598 ***	9.5928 ***	11.4265 ***	11.2187 ***
	(1.9373)	(2.8555)	(1.9088)	(2.8392)	(2.0115)	(2.8091)	(1.5380)	(2.3923)	(1.7799)	(2.8055)	(1.7609)	(2.7645)	(1.7129)	(2.4917)	(2.2083)	(2.8452)	(1.9744)	(2.7626)
Mezzanine (dummy)	-5.6624 ***	-5.6994 ***	-6.4186 ***	-6.4579 ***	-7.2989 ***	-7.2137 ***	-7.1883 ***	-7.0592 ***	-6.9515 ***	-6.7293 ***	-6.4648 ***	-6.4085 ***	-6.6261 **	* -6.6823 ***	-6.5040 ***	-6.5908 ***	-5.5832 **	-5.6596 ***
	(1.3134)	(1.6095)	(1.0575)	(1.2843)	(1.9294)	(1.6980)	(1.7117)	(1.4839)	(2.0040)	(1.6558)	(2.0922)	(1.6280)	(2.3926)	(1.8995)	(2.4070)	(2.1406)	(2.4837)	(2.0729)
Leverage ratio (%)	0.9275	3.4893	-1.0227	1.9970	-1.4107	0.0561	-2.1378	-1.2893	-5.0876	-4.8549	-1.9853	-2.5169	1.1920	2.0288	2.8554	4.3237	-1.4821	0.2613
	(4.4787)	(4.8736)	(4.4824)	(4.7874)	(4.7091)	(4.8366)	(4.1380)	(4.0016)	(4.3986)	(4.5371)	(4.3214)	(4.3498)	(4.8117)	(5.0172)	(5.7498)	(5.8424)	(5.2088)	(5.4734)
Equity ratio (%)	0.0836	-2.1798	1.7761	-0.9629	2.7511	2.4050	4.5597	4.9369	2.5103	4.4122	3.8659	7.1746	4.5647	5.7860	4.3277	4.2900	3.0221	2.7794
	(2.5001)	(3.2455)	(3.0162)	(3.5308)	(2.9476)	(3.7528)	(2.8774)	(3.9716)	(3.2250)	(4.5186)	(3.5346)	(4.9296)	(4.0900)	(5.0304)	(5.1023)	(5.7464)	(4.6001)	(5.4326)
Return on assets (%)	3.5169	5.8642	3.7682	6.6859	5.6007	5.6462	3.7228	2.9141	3.2391	0.4862	2.4483	-1.2492	2.5939	1.6871	3.5472	4.1375	1.1706	2.1187
	(3.7562)	(4.4666)	(4.4872)	(4.6699)	(4.4036)	(4.9421)	(3.9945)	(4.7167)	(4.1083)	(4.7750)	(4.1303)	(4.8530)	(4.3906)	(4.7206)	(4.6028)	(4.8876)	(4.4217)	(4.9491)
Tangible assets (%)	-11.7630 ***	-12.9034 ***	-14.4942 ***	-15.5979 ***	-13.8797 ***	-15.3820 ***	-12.9609 ***	-14.5731 ***	-14.3273 ***	-16.5294 ***	-15.5146 ***	-17.8390 ***	-16.4711 **	* -18.6580 ***	-16.3573 ***	-18.2163 ***	-14.9874 ***	-17.0081 ***
	(3.3170)	(3.7530)	(3.2951)	(3.5790)	(3.6743)	(3.8216)	(3.5151)	(3.6357)	(3.9786)	(4.3347)	(4.0796)	(4.1683)	(4.2207)	(4.4146)	(4.3262)	(4.4953)	(4.0884)	(4.3346)
Intangible assets (%)	-17.1565 **	-14.6072 *	-21.5672 **	-17.7854 *	-18.8582 **	-20.2270 **	-15.9378 **	-19.0934 *	-22.3253 **	-29.0153 **	-24.2524 ***	-34.1276 ***	-30.0510 **	* -35.9295 ***	-25.5940 **	-28.6375 **	-35.5501 ***	-38.7207 ***
	(7.6466)	(8.6080)	(8.2558)	(9.3066)	(8.0318)	(9.8459)	(7.0597)	(9.5701)	(8.5584)	(11.9746)	(8.2249)	(12.1507)	(9.0752)	(12.7637)	(10.4064)	(13.4475)	(9.4575)	(12.8641)
Preliminary DIP (dummy)	4.6390 ***	0.6165	4.5307 ***	-0.2779	4.5920 ***	3.7828	4.5173 ***	5.0357	5.6223 ***	8.5701 *	5.3669 ***	10.3566 **	5.4876 **	* 7.3431	4.9513 ***	4.7349	5.3633 ***	4.8170
	(1.3473)	(3.6233)	(1.2845)	(3.4799)	(1.4440)	(3.8645)	(1.5530)	(4.4214)	(1.6325)	(5.1029)	(1.5828)	(5.1542)	(1.5453)	(4.9388)	(1.5628)	(4.8474)	(1.5201)	(5.0756)
Adj. R ²	0.4799	0.3973	0.5039	0.4295	0.5090	0.4517	0.5019	0.4527	0.4501	0.4074	0.4352	0.4191	0.4258	0.3794	0.3886	0.3451	0.4576	0.4059
Observations	65	65	66	66	66	66	66	66	67	67	63	63	64	64	64	64	63	63
						Panel B: Bo	nd recovery rat	es after insolve	ency filing depe	endent on inder	endent variable	es of Model (2)	of Table 4.9					
	t	10	t	15	t2	t20 t2		25	t30		t35		t40		t45		t50	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS

	11	0	L.	15	12	.0	12	2		0	ι.	5	1-	10	L.	ŧJ	L.	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
Intercept	8.5502 ***	11.9982 ***	9.8674 ***	13.5625 ***	9.8673 ***	11.0894 ***	8.5502 ***	9.6432 **	10.4255 ***	9.6432 **	8.1239 ***	6.2344	5.8753 **	5.9890	5.4598	6.1808	5.0378	6.9539
	(2.8346)	(3.7684)	(2.8855)	(3.7787)	(2.8331)	(4.1186)	(2.8346)	(4.5185)	(2.8425)	(4.5185)	(2.7838)	(4.7242)	(2.9130)	(4.8764)	(3.3965)	(5.0421)	(3.1825)	(4.9261)
Collateralization (dummy)	9.0825 ***	6.4871 **	8.6681 ***	5.7947 *	10.2832 ***	9.1690 ***	9.0825 ***	11.4848 ***	11.2289 ***	11.4848 ***	9.9685 ***	10.9699 ***	8.2880 ***	7.7678 ***	9.8204 ***	8.9172 ***	11.3645 ***	9.5768 ***
	(1.9112)	(2.9237)	(1.8815)	(2.9938)	(1.9858)	(2.8971)	(1.9112)	(3.0029)	(1.7679)	(3.0029)	(1.7545)	(2.9327)	(1.6471)	(2.7776)	(2.0966)	(2.8558)	(1.8354)	(2.9074)
Mezzanine (dummy)	-7.0313 ***	-7.1333 ***	-7.9264 ***	-8.0291 ***	-8.7008 ***	-8.6852 ***	-7.0313 ***	-8.0299 ***	-8.1414 ***	-8.0299 ***	-7.6654 ***	-7.7083 ***	-7.7633 ***	-7.9013 ***	-7.4928 ***	-7.6402 ***	-6.3493 **	-6.4907 **
	(1.7653)	(1.8371)	(1.4225)	(1.5339)	(1.6555)	(1.7259)	(1.7653)	(1.8678)	(1.8241)	(1.8678)	(1.8892)	(1.8011)	(2.1757)	(2.0973)	(2.2458)	(2.2736)	(2.4143)	(2.4851)
Leverage ratio (%)	-3.5406	-2.2757	-6.4309	-4.8053	-7.0422	-6.1275	-3.5406	-10.2549 **	-10.6413 **	-10.2549 **	-8.0721 *	-7.7945 *	-4.4619	-3.6773	-3.9262	-3.0622	-5.1334	-3.8447
	(4.5587)	(4.8652)	(4.5626)	(4.8369)	(4.7132)	(4.9250)	(4.5587)	(4.8327)	(4.6248)	(4.8327)	(4.5639)	(4.6269)	(4.6520)	(4.8683)	(5.3623)	(5.4918)	(5.0250)	(5.3215)
Equity ratio (%)	-5.9890 *	-9.9558 ***	-6.0519	-10.3562 ***	-4.7672	-7.2639 *	-5.9890 *	-7.2157 *	-5.9125	-7.2157 *	-5.1356	-5.3973	-5.3152	-7.2532	-5.7205	-7.9767	-6.7375	-10.1072 *
	(3.1422)	(3.2220)	(3.8276)	(3.6173)	(3.6833)	(3.6696)	(3.1422)	(4.0715)	(4.1530)	(4.0715)	(4.3681)	(4.3595)	(5.0705)	(4.7030)	(5.5827)	(5.3086)	(5.4744)	(5.1043)
Return on assets (%)	1.9602	4.6530	1.3947	4.4600	3.0214	3.7325	1.9602	-1.0678	0.1953	-1.0678	-2.0780	-3.8967	-2.2995	-1.8184	-1.9710	-0.8953	-3.3831	-0.8292
	(4.7615)	(5.9350)	(5.5265)	(6.1734)	(5.2291)	(6.3950)	(4.7615)	(6.7918)	(5.1174)	(6.7918)	(4.8613)	(6.9615)	(5.1861)	(7.0842)	(5.3893)	(6.9672)	(5.5122)	(7.2917)
Net Working Cap. Ratio (%)	6.0476 *	6.8826 *	8.3156 **	8.9589 **	8.1028 **	9.3846 **	6.0476 *	11.9897 **	9.9753 *	11.9897 **	11.2853 **	13.6492 **	12.9821 **	14.8956 ***	13.4748 ***	15.0888 ***	13.9231 ***	15.3669 ***
	(3.5882)	(3.8671)	(3.5470)	(3.8188)	(4.0136)	(4.2713)	(3.5882)	(5.6620)	(5.2146)	(5.6620)	(5.2960)	(5.5606)	(5.0734)	(5.4265)	(5.0023)	(5.2650)	(4.8662)	(5.2366)
Preliminary DIP (dummy)	4.4579 ***	-1.4274	4.3047 ***	-2.1645	4.4316 **	1.4861	4.4579 ***	5.0274	5.2561 ***	5.0274	5.1659 ***	6.6814	5.0564 ***	3.7691	4.6064 **	2.5601	4.5688 ***	0.6505
	(1.5504)	(3.9353)	(1.6116)	(3.8450)	(1.6640)	(4.0054)	(1.5504)	(4.7385)	(1.6676)	(4.7385)	(1.6746)	(4.8111)	(1.6947)	(4.7085)	(1.7713)	(4.6118)	(1.6888)	(4.8419)
Adj. R ²	0.3762	0.3011	0.3629	0.2991	0.4068	0.3458	0.3762	0.3213	0.3763	0.3213	0.3591	0.3203	0.3395	0.2838	0.3438	0.3004	0.3948	0.3495
Observations	65	65	66	66	66	66	65	67	67	67	63	63	64	64	64	64	63	63

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						Panel C: Bo	nd recovery rat	es after insolve	ncy filing dep	endent on inde	pendent variable	s of Model (3)	of Table 4.9					
	tl	10	t	15	t	20	ť	25		t30	ť	35	t	40	t	45	t.	50
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
Intercept	12.8799 ***	13.2336 ***	15.3996 ***	15.9134 ***	14.1651 ***	14.1832 ***	13.7316 ***	13.8053 ***	15.6791 **	* 15.2691 ***	* 14.2485 ***	13.8328 ***	13.0133 ***	12.8879 ***	11.5329 ***	11.6447 ***	13.4690 ***	13.5172 ***
	(3.2006)	(3.5979)	(3.3198)	(3.6471)	(3.3829)	(3.7863)	(2.5794)	(3.0127)	(2.9571)	(3.3346)	(2.9030)	(3.3023)	(3.2010)	(3.6484)	(3.8336)	(4.1188)	(3.5790)	(3.9326)
Collateralization (dummy)	9.5363 ***	8.7285 ***	8.9509 ***	7.6627 ***	10.5039 ***	10.4390 ***	10.5355 ***	10.4953 ***	11.2842 **	* 12.2710 ***	* 9.8478 ***	11.1282 ***	8.0939 ***	8.2903 ***	9.5642 ***	9.1989 ***	11.2875 ***	10.8587 ***
	(1.9480)	(2.4471)	(1.9301)	(2.4603)	(2.0401)	(2.4319)	(1.6019)	(1.9148)	(1.8353)	(2.2594)	(1.8232)	(2.1183)	(1.7353)	(2.0247)	(2.1378)	(2.3271)	(1.9188)	(2.1915)
Mezzanine (dummy)	-5.5006 ***	-5.2595 ***	-6.4083 ***	-6.0796 ***	-7.2670 ***	-7.1502 ***	-7.4346 ***	-7.3093 ***	-7.0184 **	* -7.0626 ***	* -6.7344 ***	-7.0128 ***	-6.9514 ***	-7.0501 ***	-6.7519 ***	-6.7369 ***	-5.8080 **	-5.7500 **
	(1.4230)	(1.6326)	(1.1280)	(1.1758)	(1.9742)	(1.7078)	(1.7410)	(1.6366)	(2.0379)	(1.7895)	(2.0726)	(1.8248)	(2.3166)	(2.0935)	(2.2936)	(2.2381)	(2.3811)	(2.1761)
Leverage ratio (%)	-0.5704	2.2428	-3.2058	0.3018	-4.0008	-2.3228	-4.6008	-3.1787	-6.8430	-6.4153	-4.1685	-4.4971	-1.0845	0.1400	0.6525	2.5734	-2.7985	-0.5479
	(4.3675)	(4.8427)	(4.2997)	(4.7372)	(4.5547)	(4.7016)	(3.8591)	(3.7672)	(4.1026)	(4.2254)	(3.8592)	(3.9553)	(3.9819)	(4.2650)	(4.6773)	(5.1013)	(4.2320)	(4.7464)
Equity ratio (%)	-11.4055 ***	-13.1086 ***	-13.4411 ***	-15.1248 ***	-12.1441 ***	-13.7084 ***	-10.6914 ***	-12.1631 ***	-12.9553 **	* -14.7460 ***	* -13.6234 ***	-15.1883 ***	-14.2558 ***	-16.0061 ***	-14.0557 ***	-15.7382 ***	-13.6263 ***	-15.4870 ***
	(2.9913)	(3.2355)	(2.9769)	(3.0889)	(3.3685)	(3.3399)	(3.2063)	(3.1698)	(3.5305)	(3.5934)	(3.5820)	(3.5014)	(3.6844)	(3.6982)	(3.8379)	(3.8549)	(3.5941)	(3.6666)
Return on assets (%)	-18.4483 **	-18.2102 *	-21.5632 **	-19.9783 *	-17.5290 **	-18.9292 **	-12.4470 *	-14.0206 *	-20.7228 **	* -25.0289 ***	* -21.6076 ***	-27.4172 ***	-26.5553 ***	-29.9139 ***	-21.8785 **	-23.6275 *	-33.3354 ***	-35.3180 ***
	(8.4486)	(9.2809)	(9.1571)	(10.0357)	(8.4099)	(9.3632)	(6.6425)	(7.9971)	(7.7647)	(9.3606)	(7.1703)	(9.2603)	(8.4615)	(10.6486)	(9.9559)	(11.9380)	(9.1049)	(11.3177)
Altman Z-Score	-0.0035	0.0168	0.0917	0.1170	0.2285	0.2374	0.3228 *	0.3287 *	0.1900	0.1862	0.2312	0.2517	0.2953	0.3310	0.3269	0.3656	0.1884	0.2393
	(0.1755)	(0.1839)	(0.1856)	(0.1933)	(0.1891)	(0.1944)	(0.1926)	(0.1938)	(0.2318)	(0.2285)	(0.2460)	(0.2407)	(0.2587)	(0.2577)	(0.2778)	(0.2783)	(0.2658)	(0.2620)
Preliminary DIP (dummy)	4.7931 ***	2.5796	4.5001 ***	1.2891	4.5042 ***	3.8806	4.1345 ***	3.6141	5.4591 **	* 6.9705 *	5.0360 ***	7.3663 **	5.0586 ***	5.4145	4.5942 ***	3.7810	5.0223 ***	4.0432
	(1.2405)	(2.6204)	(1.2545)	(2.7488)	(1.4402)	(3.0315)	(1.5110)	(3.1919)	(1.5509)	(3.6912)	(1.5301)	(3.6440)	(1.4912)	(3.6789)	(1.5932)	(3.8829)	(1.5177)	(3.8392)
Adj. R ²	0.4827	0.3958	0.5017	0.4252	0.5014	0.4476	0.4993	0.4529	0.4543	0.4107	0.4380	0.4125	0.4285	0.3817	0.3937	0.3527	0.4650	0.4162
Observations	65	65	66	66	66	66	66	66	67	67	63	63	64	64	64	64	63	63

Appendix 4.5: Multivariate analysis of determinants of volume-weighted bond recovery rates– Robustness test Table 4.9 (1/2)

This table shows regression results of the determinants of recovery rates. The dependent variable is the volume-weighted bond trading price at different observation periods after insolvency filing. For example, "t5 - t10" means that the volume-weighted recovery rates are extracted between the 5th and 10th trading days after insolvency filing. All independent variables except the dummy variables are winsorized at the 2.5% level on both sides. Investigating the variance inflation factors (VIFs) reveals mean VIF of 2.52 and the maximum VIF of 6.41. ***, **, and * indicate statistical significance of a 1%, 5%, and 10% level, respectively.

	Panel A: Volume-weighted bond recovery rates after insolvency filing dependent on independent variables of Model (1) of Table 4.9																	
	t5 -	t10	t5 -	t15	t5 -	t20	t5 -	t25	t5 -	t30	t5 -	- t35	t5-	- t40	t5 -	t45	t5 -	- t50
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
Intercept	12.4216 ***	14.1685 ***	13.2101 ***	15.0788 ***	13.5771 ***	15.3171 ***	14.2935 ***	15.9072 ***	14.7572 ***	16.1727 ***	14.4555 ***	15.7057 ***	14.4740 ***	15.6806 ***	14.4007 ***	15.6469 ***	14.5251 ***	15.8933 ***
	(2.9002)	(3.6863)	(2.7961)	(3.4134)	(2.8729)	(3.4575)	(2.8575)	(3.4310)	(2.8629)	(3.4365)	(2.8187)	(3.3858)	(2.8332)	(3.4043)	(3.0449)	(3.5719)	(3.1072)	(3.6147)
Collateral Dummy	10.7526 ***	8.7453 ***	10.0422 ***	8.0708 ***	10.0413 ***	8.2134 ***	9.8662 ***	8.1657 ***	9.8540 ***	8.3867 ***	9.6526 ***	8.3796 ***	9.5844 ***	8.3697 ***	10.1344 ***	8.8741 ***	10.3423 ***	8.9446 ***
	(2.1777)	(3.1101)	(2.0551)	(2.8031)	(2.0167)	(2.7889)	(1.8995)	(2.7056)	(1.8681)	(2.6980)	(1.6878)	(2.4563)	(1.6300)	(2.3299)	(1.7933)	(2.4432)	(1.8292)	(2.4750)
Mezzanine Dummy	-4.7741 ***	-5.4296 **	-5.9339 ***	-5.9703 ***	-5.7708 ***	-5.8006 ***	-5.8438 ***	-5.8710 ***	-5.7790 ***	-5.7899 ***	-5.6690 ***	-5.6662 ***	-5.5280 ***	-5.5180 ***	-5.3355 ***	-5.3282 ***	-5.2123 ***	-5.2118 ***
	(1.3377)	(2.0739)	(1.1924)	(1.3742)	(1.1584)	(1.3514)	(1.1634)	(1.3861)	(1.1553)	(1.4143)	(1.1044)	(1.3733)	(1.1003)	(1.3711)	(1.1137)	(1.3906)	(1.1485)	(1.4169)
Leverage ratio (%)	0.5069	3.6191	0.0778	2.9053	-0.0321	2.6470	-0.9969	1.5259	-1.4420	0.9216	-0.6255	1.6056	-0.6068	1.6323	-0.3014	1.9753	-0.9801	1.4326
	(5.3664)	(5.6388)	(4.5150)	(4.6619)	(4.4727)	(4.6174)	(4.4096)	(4.5204)	(4.3747)	(4.4744)	(4.1959)	(4.3056)	(4.1937)	(4.3318)	(4.4195)	(4.5939)	(4.4392)	(4.6523)
Equity ratio (%)	1.2841	-1.0599	1.3723	-1.1886	2.0012	-0.3813	1.6066	-0.6382	1.6999	-0.2661	1.8819	0.1483	2.1697	0.4984	2.6682	0.9414	2.6104	0.7127
	(2.9933)	(3.8564)	(2.7393)	(3.4054)	(2.8404)	(3.4941)	(2.8558)	(3.5169)	(2.9119)	(3.6282)	(2.9406)	(3.6286)	(3.0402)	(3.6816)	(3.4340)	(4.0568)	(3.5126)	(4.1373)
Return on assets (%)	1.6436	4.4611	2.5675	5.2941	1.7798	4.3022	2.3650	4.6721	2.6381	4.6069	2.6053	4.2919	2.3935	3.9898	2.6121	4.2738	2.1789	4.0351
	(4.1152)	(4.8544)	(4.0721)	(4.4756)	(4.4122)	(4.7004)	(4.4810)	(4.7126)	(4.5654)	(4.7834)	(4.4304)	(4.6731)	(4.3661)	(4.6319)	(4.2268)	(4.6108)	(4.2200)	(4.6197)
Tangible assets (%)	-12.1989 ***	-13.2740 ***	-12.8835 ***	-13.9207 ***	-13.3573 ***	-14.3832 ***	-13.3451 ***	-14.3913 ***	-13.8112 ***	-14.9283 ***	-14.2960 ***	-15.4725 ***	-14.7061 ***	-15.9551 ***	-15.1290 ***	-16.3716 ***	-14.8658 ***	-16.1150 ***
	(4.0002)	(4.3258)	(3.4224)	(3.7459)	(3.3813)	(3.6762)	(3.3438)	(3.6096)	(3.3830)	(3.6644)	(3.3100)	(3.6083)	(3.3062)	(3.6184)	(3.3706)	(3.7302)	(3.3436)	(3.7254)
Intangible assets (%)	-11.1137	-7.6602	-13.2572 *	-9.7285	-15.2660 *	-12.0656	-16.5081 **	-13.6774	-17.3223 **	-15.1222 *	-19.2680 **	-17.5939 *	-20.8532 ***	-19.3988 **	-21.6373 ***	-20.0679 **	-22.6474 ***	-20.7612 **
	(7.6474)	(8.5194)	(7.4909)	(8.3094)	(7.6580)	(8.5839)	(7.5799)	(8.7282)	(7.5786)	(9.0323)	(7.3049)	(9.1012)	(7.2362)	(9.3242)	(7.6015)	(9.9286)	(7.7321)	(10.2061)
Preliminary DIP dummy	4.2526 ***	-0.2622	4.2516 ***	-0.2451	4.1353 ***	-0.0573	4.1622 ***	0.2937	4.2402 ***	0.8307	4.3060 ***	1.2791	4.4915 ***	1.5610	4.4988 ***	1.4760	4.5992 ***	1.2899
	(1.4395)	(4.0863)	(1.3049)	(3.4953)	(1.3149)	(3.5351)	(1.3429)	(3.6554)	(1.3682)	(3.8223)	(1.3450)	(3.7332)	(1.3216)	(3.6885)	(1.3364)	(3.8347)	(1.3211)	(3.9077)
Adj. R ²	0.4377	0.3748	0.4853	0.4204	0.4850	0.4239	0.4842	0.4232	0.4803	0.4191	0.5042	0.4402	0.5149	0.4458	0.4992	0.4358	0.4936	0.4280
Observations	64	64	66	66	66	66	67	67	67	67	67	67	67	67	67	67	67	67
Panel B: Volume-weighted hond recovery rates after insolvency filing dependent on independent variables of Model (2) of Table 4.9																		
	t5 -	t10	t5 -	t15	t5 -	t20	5-t5	t25	t5 -	t 30	t5 -	- 135	t5 -	- t40	t5 -	t45	t5 -	- t50
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
Intercept	9.8064 ***	12.2224 ***	9.7437 ***	12.6918 ***	9.6488 ***	12.6058 ***	10.0908 ***	13.0033 ***	10.2912 ***	12.9452 ***	9.4932 ***	12.0259 ***	9.1207 ***	11.6645 ***	8.7405 ***	11.2754 ***	8.6728 ***	11.4260 ***
	(3.3129)	(4.2167)	(2.9557)	(3.8244)	(2.9401)	(3.8811)	(2.9220)	(3.8885)	(2.9253)	(3.9352)	(2.7600)	(3.9179)	(2,7055)	(3.9432)	(2.8042)	(4.0704)	(2.8028)	(4.0789)
Collateral Dummy	10.7370 ***	8.5989 ***	10.0086 ***	7.6638 **	10.0026 ***	7.6622 **	9.8295 ***	7.5001 **	9.8348 ***	7.6886 **	9.6406 ***	7.5832 ***	9.5741 ***	7.5022 ***	10.1576 ***	8.0953 ***	10.3545 ***	8.1338 ***
-	(2.2030)	(3.2047)	(2.0943)	(2.9907)	(2.0394)	(2.9790)	(1.9311)	(2.9123)	(1.9076)	(2.9103)	(1.7154)	(2.6792)	(1.6472)	(2.5697)	(1.7780)	(2.6181)	(1.7908)	(2.6293)
Mezzanine Dummy	-6.7469 ***	-7.4371 ***	-7.5803 ***	-7.6464 ***	-7.3981 ***	-7.4679 ***	-7.4049 ***	-7.4899 ***	-7.3088 ***	-7.3806 ***	-7.1289 ***	-7.1951 ***	-6.9494 ***	-7.0147 ***	-6.6603 ***	-6.7259 ***	-6.4554 ***	-6.5312 ***
	(1.5873)	(2.1596)	(1.5835)	(1.6625)	(1.5332)	(1.6320)	(1.5410)	(1.6807)	(1.5178)	(1.7119)	(1.4131)	(1.6491)	(1.3819)	(1.6429)	(1.3589)	(1.6479)	(1.3876)	(1.6709)
Leverage ratio (%)	-5.4364	-3.7845	-5.6335	-4.2162	-5.7221	-4.3272	-6.4804	-5.1641	-7.1864	-5.9396	-6.4495	-5.2412	-6.4821	-5.2576	-6.5006	-5.2848	-6.8459	-5.5641
	(5.4347)	(5.7923)	(4.8773)	(5.1669)	(4.8135)	(5.1012)	(4.6832)	(4.9424)	(4.6702)	(4.9309)	(4.4369)	(4.6805)	(4.4017)	(4.6439)	(4.5773)	(4.8252)	(4.6004)	(4.8761)
Equity ratio (%)	-4.2683	-7.6094 **	-4.7545	-8.5314 **	-4.5666	-8.2789 **	-5.1213	-8.8032 **	-5.4555	-8.9568 **	-5.8354	-9.2342 **	-5.9764	-9.4239 **	-6.0142	-9.4356 **	-6.0936	-9.6900 **
	(3.2271)	(3.5887)	(3.3494)	(3.3328)	(3.5388)	(3.4637)	(3.6545)	(3.5301)	(3.7328)	(3.5947)	(3.7979)	(3.6141)	(3.9295)	(3.6897)	(4.1739)	(3.9309)	(4.2640)	(3.9820)
Return on assets (%)	0.1366	2.2139	0.6420	2.9908	-0.2665	2.1109	0.2822	2.6316	0.2782	2.3787	-0.0249	1.9638	-0.4165	1.5715	-0.6277	1.3573	-1.0125	1.1765
	(4.9841)	(6.2341)	(4.9362)	(5.9490)	(5.2536)	(6.1440)	(5.2860)	(6.0892)	(5.3666)	(6.1831)	(5.3131)	(6.1869)	(5.2910)	(6.2089)	(5.2554)	(6.2772)	(5.2752)	(6.2915)
Net Working Cap. Ratio (%)	3.9612	5.0047	5.3552	6.2099	6.0813	6.8628 *	6.5027 *	7.2199 *	7.2277 *	8.0221 *	8.2518 **	9.0652 **	8.9980 **	9.8475 **	10.0444 **	10.8776 **	10.2753 **	11.0648 **
	(4.0882)	(4.2085)	(3.6825)	(3.9115)	(3.7063)	(3.9652)	(3.7439)	(4.0437)	(3.8925)	(4.2269)	(3.8004)	(4.1813)	(3.7666)	(4.1768)	(3.9008)	(4.3309)	(3.9339)	(4.3865)
Preliminary DIP dummy	4.5181 ***	-0.4441	4.3952 ***	-1.0235	4.1952 ***	-1.1828	4.1477 **	-1.0780	4.1863 **	-0.6798	4.1543 **	-0.5303	4.2666 ***	-0.4626	4.2129 ***	-0.4897	4.2429 ***	-0.7797
	(1.6290)	(4.2192)	(1.5387)	(3.7554)	(1.5680)	(3.8187)	(1.5763)	(3.8397)	(1.5883)	(3.9273)	(1.5673)	(3.8682)	(1.5497)	(3.8186)	(1.5580)	(3.8896)	(1.5354)	(3.9027)
A d: \mathbf{p}^2	0.3376	0.2657	0.3708	0.3013	0.3639	0.3014	0.3664	0.3058	0.3632	0.3024	0.3814	0.3199	0.3888	0.3239	0.3911	0.3335	0.3928	0.3355
Auj. K Observations	64	64	66	66	66	66	67	67	67	67	67	67	67	67	67	67	67	67

						Panel C: Bo	nd recovery rat	es after insolve	ncy filing dep	pendent on indep	pendent variable	es of Model (3)	of Table 4.9					
	t1	.0	t	15	ť.	20	ť.	25		t30	ť	35	t	40	t	45	t5	i0
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
Intercept	12.8799 ***	13.2336 ***	15.3996 ***	15.9134 ***	14.1651 ***	14.1832 ***	13.7316 ***	13.8053 ***	15.6791 **	* 15.2691 ***	14.2485 ***	13.8328 ***	13.0133 ***	12.8879 ***	11.5329 ***	11.6447 ***	13.4690 ***	13.5172 ***
	(3.2006)	(3.5979)	(3.3198)	(3.6471)	(3.3829)	(3.7863)	(2.5794)	(3.0127)	(2.9571)	(3.3346)	(2.9030)	(3.3023)	(3.2010)	(3.6484)	(3.8336)	(4.1188)	(3.5790)	(3.9326)
Collateralization (dummy)	9.5363 ***	8.7285 ***	8.9509 ***	7.6627 ***	10.5039 ***	10.4390 ***	10.5355 ***	10.4953 ***	11.2842 **	* 12.2710 ***	9.8478 ***	11.1282 ***	8.0939 ***	8.2903 ***	9.5642 ***	9.1989 ***	11.2875 ***	10.8587 ***
	(1.9480)	(2.4471)	(1.9301)	(2.4603)	(2.0401)	(2.4319)	(1.6019)	(1.9148)	(1.8353)	(2.2594)	(1.8232)	(2.1183)	(1.7353)	(2.0247)	(2.1378)	(2.3271)	(1.9188)	(2.1915)
Mezzanine (dummy)	-5.5006 ***	-5.2595 ***	-6.4083 ***	-6.0796 ***	-7.2670 ***	-7.1502 ***	-7.4346 ***	-7.3093 ***	-7.0184 **	* -7.0626 ***	-6.7344 ***	-7.0128 ***	-6.9514 ***	-7.0501 ***	-6.7519 ***	-6.7369 ***	-5.8080 **	-5.7500 **
	(1.4230)	(1.6326)	(1.1280)	(1.1758)	(1.9742)	(1.7078)	(1.7410)	(1.6366)	(2.0379)	(1.7895)	(2.0726)	(1.8248)	(2.3166)	(2.0935)	(2.2936)	(2.2381)	(2.3811)	(2.1761)
Leverage ratio (%)	-0.5704	2.2428	-3.2058	0.3018	-4.0008	-2.3228	-4.6008	-3.1787	-6.8430	-6.4153	-4.1685	-4.4971	-1.0845	0.1400	0.6525	2.5734	-2.7985	-0.5479
	(4.3675)	(4.8427)	(4.2997)	(4.7372)	(4.5547)	(4.7016)	(3.8591)	(3.7672)	(4.1026)	(4.2254)	(3.8592)	(3.9553)	(3.9819)	(4.2650)	(4.6773)	(5.1013)	(4.2320)	(4.7464)
Tangible asset ratio (%)	-11.4055 ***	-13.1086 ***	-13.4411 ***	-15.1248 ***	-12.1441 ***	-13.7084 ***	-10.6914 ***	-12.1631 ***	-12.9553 **	* -14.7460 ***	-13.6234 ***	-15.1883 ***	-14.2558 ***	-16.0061 ***	-14.0557 ***	-15.7382 ***	-13.6263 ***	-15.4870 ***
	(2.9913)	(3.2355)	(2.9769)	(3.0889)	(3.3685)	(3.3399)	(3.2063)	(3.1698)	(3.5305)	(3.5934)	(3.5820)	(3.5014)	(3.6844)	(3.6982)	(3.8379)	(3.8549)	(3.5941)	(3.6666)
Intangible asset ratio (%)	-18.4483 **	-18.2102 *	-21.5632 **	-19.9783 *	-17.5290 **	-18.9292 **	-12.4470 *	-14.0206 *	-20.7228 **	* -25.0289 ***	-21.6076 ***	-27.4172 ***	-26.5553 ***	-29.9139 ***	-21.8785 **	-23.6275 *	-33.3354 ***	-35.3180 ***
	(8.4486)	(9.2809)	(9.1571)	(10.0357)	(8.4099)	(9.3632)	(6.6425)	(7.9971)	(7.7647)	(9.3606)	(7.1703)	(9.2603)	(8.4615)	(10.6486)	(9.9559)	(11.9380)	(9.1049)	(11.3177)
Altman Z-Score	-0.0035	0.0168	0.0917	0.1170	0.2285	0.2374	0.3228 *	0.3287 *	0.1900	0.1862	0.2312	0.2517	0.2953	0.3310	0.3269	0.3656	0.1884	0.2393
	(0.1755)	(0.1839)	(0.1856)	(0.1933)	(0.1891)	(0.1944)	(0.1926)	(0.1938)	(0.2318)	(0.2285)	(0.2460)	(0.2407)	(0.2587)	(0.2577)	(0.2778)	(0.2783)	(0.2658)	(0.2620)
Preliminary DIP (dummy)	4.7931 ***	2.5796	4.5001 ***	1.2891	4.5042 ***	3.8806	4.1345 ***	3.6141	5.4591 **	* 6.9705 *	5.0360 ***	7.3663 **	5.0586 ***	5.4145	4.5942 ***	3.7810	5.0223 ***	4.0432
	(1.2405)	(2.6204)	(1.2545)	(2.7488)	(1.4402)	(3.0315)	(1.5110)	(3.1919)	(1.5509)	(3.6912)	(1.5301)	(3.6440)	(1.4912)	(3.6789)	(1.5932)	(3.8829)	(1.5177)	(3.8392)
Adj. R ²	0.4827	0.3958	0.5017	0.4252	0.5014	0.4476	0.4993	0.4529	0.4543	0.4107	0.4380	0.4125	0.4285	0.3817	0.3937	0.3527	0.4650	0.4162
Observations	65	65	66	66	66	66	66	66	67	67	63	63	64	64	64	64	63	63

Multivariate analysis of determinants of volume-weighted bond recovery rates– Robustness test Table 4.9 (2/2)

Appendix 4.6: Multivariate analysis of determinants of bond recovery rates – Robustness test Table 4.9

This table reports the regression results of the determinants of recovery rates. The dependent variable is the bond trading price 30 trading days after insolvency filing. Huber–White-heteroscedasticity consistent standard errors are shown in brackets below the coefficients. All independent variables except the dummy variables are winsorized at the 2.5% level on both sides. Investigating the variance inflation factors (VIFs) reveals mean VIF of 2.25 and the maximum VIF of 4.67. ***, **, and * indicate statistical significance of a 1%, 5%, and 10% level, respectively.

	De	pendent variable	s: Bond recovery	rates 30 days a	fter insolvency fi	ling		
Independent variables	Moo	del (1)	Mod	el (2)	Model (3)			
	OLS	2SLS	OSL	2SLS	OSL	2SLS		
Intercept	15.3237 ***	15.3447 ***	11.0264 ***	12.0836 ***	15.7445 ***	15.6900 ***		
	(2.9833)	(3.6057)	(2.8927)	(3.9149)	(3.0558)	(3.4076)		
Collateral Dummy	11.6096 ***	11.7796 ***	11.5334 ***	10.5152 ***	11.8137 ***	11.9270 ***		
	(1.6608)	(2.4856)	(1.6734)	(2.7707)	(1.6702)	(2.1689)		
Mezzanine Dummy	-6.5718 ***	-6.4669 ***	-8.0484 ***	-8.0335 ***	-6.5822 ***	-6.4938 ***		
	(1.8883)	(1.7494)	(1.7859)	(1.9352)	(1.9403)	(1.7263)		
Leverage ratio	-5.5038	-4.2636	-10.1440 **	-9.2945 *	-7.2816 *	-5.8293		
	(4.6183)	(4.7040)	(4.7245)	(5.0400)	(4.2264)	(4.3784)		
Equity ratio	1.3106	1.2963	-5.0369	-7.4905 *				
	(3.3366)	(3.6996)	(4.3025)	(4.1716)				
Return on assets	2.5480	2.1402	0.8681	1.4091				
	(4.0652)	(4.5291)	(5.0585)	(6.4002)				
Tangible assets	-12.5207 ***	-14.1223 ***			-11.8093 ***	-13.4333 ***		
	(3.6691)	(3.7611)			(3.4646)	(3.4598)		
Intangible assets	-17.6461 **	-19.8447 **			-18.0254 **	-19.9697 **		
	(7.1919)	(7.8484)			(7.7415)	(8.5753)		
Net Working Capital ratio			6.1026	7.4027 *				
			(3.7538)	(3.8946)				
Altman Z-Score					0.0344	0.0391		
					(0.1795)	(0.1858)		
Preliminary DIP dummy	4.7741 ***	4.5831	4.6729 ***	1.9706	4.7415 ***	4.5141		
	(1.3506)	(3.3071)	(1.5542)	(3.7725)	(1.3327)	(2.7330)		
Adj. R ²	0.6203	0.5659	0.4620	0.3911	0.5691	0.5093		
Observations	66	66	66	66	66	66		

Proof 2.1: Two-stage Probit model with sample selection

In the following, we introduce the general context of the two-stage Probit model with sample selection which we use in Tables 2.6 and 2.7 of Section 2.6.2. Please find a general and more detailed depiction of this issue in Greene (2012, pp.912-916), Wooldridge (2002, pp.551–571) and Naujoks (2012, pp.79–80). The selection equation on which Equation [2.4] is based upon takes the general form:

$$z_{i}^{*} = w'\gamma + v_{i}, \ z_{i} = 1 \text{ if } z_{i}^{*} > 0 \text{ and } 0 \text{ otherwise;}$$
 [2.9]

The outcome equation on which Equation [2.5] is based upon takes the general form:

$$y_i = x'_i\beta + \varepsilon_i$$
 observed only if $z_i = 1$ [2.10]

with
$$(v_i, \varepsilon_i) \sim \text{bivariate normal} [0, 0, 1, \sigma_{\varepsilon}, \rho]$$
 [2.11]

 y_i is only observed, if $z_i^* > 0$, which means that we can only observe the start of the bond restructuring process in outcome equation [10], if the selection equation [2.9], which estimates the negotiations between issuers and banks, is equal to one. We now want to know the value of y_i on the condition that $z_i^* > 0$, which is formally:

$$E[y_i | z^*_i > 0] \text{ or } E[y_i | -w'\gamma > v_i]$$
 [2.12]

Taking the expected value of Equation [2.12] results in

$$\mathbf{x}'_{i}\boldsymbol{\beta} + [\boldsymbol{\varepsilon}_{i} \mid \boldsymbol{\upsilon}_{i} > \mathbf{w}'\boldsymbol{\gamma}]$$

$$[2.13]$$

We can now rewrite Equation [2.13] as

$$x'_i\beta + \rho\lambda_i$$
 [2.14]

 λ_i is the inverse Mills Ratio, formally defined as

$$\lambda_i = \frac{\phi(\mathbf{w}_i' \mathbf{\gamma})}{\Phi(-\mathbf{w}_i' \mathbf{\gamma})} = \frac{\phi(\mathbf{w}_i' \mathbf{\gamma})}{1 - \Phi(\mathbf{w}_i' \mathbf{\gamma})}$$
^[2.15]

where Φ is the normal cumulative distribution function, while ϕ the normal probability density function. The procedure is as follows: Estimate selection equation [2.9] and based on the results estimate the inverse Mills Ration. Use the Inverse Mills ratio of the Selection Equation as and additional repressor in the outcome equation [2.10], to correct for the sample selection.