

The Role of Institutional Investors in Financial Distress Resolution*

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Abstract

We analyze the distressed firm's decision between Chapter 11 and an exchange offer. We construct a comprehensive data set on the financial characteristics and capital structure at 269 distressed firms, which, unlike previous studies, uses quarterly information and includes exhaustive data on equity and bond ownership by institutional investors. Logit and lasso regressions indicate several novel findings. We uncover strong relationships between (i) share ownership one quarter before restructuring and an exchange offer; (ii) between bond ownership one year before restructuring and Chapter 11. The timing of equity ownership differs across investors: corporations, governments, insurance companies, and pension fund effects occur early in the process, while hedge fund, individual, investment advisor, and venture capital/private equity effects occur late in the process. We also find that aggregate hedge fund share holdings are significantly related to exchange offers while aggregate hedge fund bond holdings are significantly associated with Chapter 11.

JEL classification: G21, G23, G33

Keywords: Out-of-court restructuring, exchange offer, Chapter 11, institutional investors.

*The authors would like to thank Thibault Laberty, Manlin Luo, Zhiyinh Ma, Juan Wen Xu, and Tailai Zhang and for research assistance. Martel would also like to acknowledge the ESSEC Research Center (CERESSEC) for financial support.

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Draft version: January 13, 2022.

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1. Introduction

Over the last decades, an important literature has highlighted the main differences in bankruptcy laws across countries and the way they impact on the outcome of financial reorganization (La Porta et al., 1997, 1998; Claessens and Klapper, 2005; Davydenko and Franks, 2008; Hotchkiss et al., 2008; Djankov et al., 2008). While the resolution of financial distress varies from one country to another, a distressed firm typically faces two alternatives when it comes to rearranging its capital structure. First, it can undertake a *formal* court-supervised bankruptcy procedure under the general setting of a national bankruptcy law. Second, it can engage in an *informal* out-of-court debt restructuring with its creditors. This procedure is commonly called a ‘workout’ arrangement, whereby the terms of existing debt contracts are modified or new securities (debt or equity) are issued in exchange for existing debt.

As pointed out by Bratton and Levitin (2017), the two procedures follow a different philosophy. On the one hand, a court-supervised reorganization, such as Chapter 11 in the U.S., rests on the unilateral decision of a debtor to freeze the right of creditors to enforce contracts, forcing creditors to negotiate a new deal.¹ On the other hand, a workout calls for more cooperation between the debtor and its creditors in order to find an acceptable new capital structure for all parties.

In one respect, creditors and equity holders, represented by the firm’s management, share an interest to avoid the higher bankruptcy costs associated with court-supervised reorganization (Haugen and Senbet, 1978, 1988; Roe, 1983; Jensen, 1989, 1991; White, 1989; Gilson et al., 1990; Betker, 1997; Fisher and Martel, 2005; Bris et al., 2006). Yet, in the U.S., thousands of firms file for Chapter 11 every year. There are many potential reasons why one procedure may be chosen over the other at a distressed firm. For example, a number of legal scholars (Roe, 1987; Brudney, 1992) point out that the workout process is dysfunctional, especially when bonds are involved. In the U.S., Section 316(b) of the 1939 Trust and Indenture Act (TIA) prohibits majority-vote amendments that would modify the ‘core’ terms (principal, interest rate, or maturity) of a bond contract. The restriction is designed to prevent equity holders and a subset of creditors from combining to force unfavourable new terms on bondholders. Thus, any change to an indenture requires the unanimous consent of creditors. As a result, debt is typically restructured via an ‘exchange offer’ in which bondholders agree to a

¹Note that prepackaged and pre-negotiated Chapter 11 cases involve negotiations between the debtor and creditors prior to filing.

new package of securities against the old bonds.

Yet, exchange offers are prone to a number of impediments linked to the presence of asymmetric information between informed managers and less well informed creditors, heterogeneous beliefs among investors, and coordination problems, especially in the presence of a large number of creditors (Haugen and Senbet, 1978; Roe, 1987; Giammarino, 1989; Gertner and Scharfstein, 1991; Mooradian, 1994; Detragiache and Garella, 1996; Hege, 2003; Carapeto, 2005; François and Raviv, 2017).² Indeed, given that participation in an exchange offer is voluntary, each creditor has an incentive to withhold consent and retain their right to seek full repayment, creating a holdout problem. While an exchange offer can be structured to penalize holdout—e.g., by replacing the old bonds with more senior bonds having a shorter maturity or by eliminating important covenants—its success depends on satisfying a sufficient majority of bondholders. In practice (Bratton and Levitin, 2017), debtors typically impose a 90% minimum tender condition in order to reduce the impact of holdouts, paradoxically increasing the likelihood that the offer fails.³

However, Bratton and Levitin (2017) argue that this view no longer prevails. Based on a new sample of bond workouts, the authors find that over the last decade, workouts have become more flexible, with a reduction in the minimum tender conditions, while the closing rate has significantly increased. This would suggest that the attractiveness of exchange offers as a mean to resolve financial distress may have increased in the last decade.

Further, over the last 20 years, a consensus has emerged among legal scholars that Chapter 11 has fallen under secured creditor control, especially with the increasing use of DIP financing usually provided by secured creditors (Skeel, 2003; Baird and Rasmussen, 2002, 2003, 2006; Harner, 2008b,a; Ayotte and Morrison, 2009; Tabb, 2019). To the extent that secured creditors have gained an advantage over other stakeholders in Chapter 11, one would expect disadvantaged groups to pursue their interests outside of bankruptcy, which would suggest a higher incidence of exchange offers. Over the same period, innovations in credit markets and emerging strategies by institutional lenders and investors are also likely to have influenced the balance between Chapter 11 and out-of-court restructurings. As reported by Harner (2008b), 66% of investors in distressed firms believe that distressed debt investment is used to influence board or management decisions.

²See also Hotchkiss et al. (2008) for a survey of the impediments to workout arrangements.

³For empirical evidence, see: Brown (1989); Gilson et al. (1990); Franks and Torous (1989, 1994); Asquith et al. (1994); Chatterjee et al. (1995, 1996); James (1996); Betker (1997); Lie et al.; Mooradian and Ryan (2005); Daniels and Ramirez (2007).

Lastly, generally speaking, creditors and equity holders have conflicting interests in distressed firms. The combination of limited liability and the presence of debt introduces convexity into the equity holders profit function. Because equity represents a call option on the firm's cash flow, equity holders favour continuation and risk-taking activities outside of bankruptcy. Moreover, the application of absolute priority in Chapter 11 means that equity is often eliminated. Thus, equity holders have a preference to avoid Chapter 11. On the other hand, risk-taking by equity holders may reduce the recovery rate on creditor claims, implying creditors bear all the downside risk of continuation. The profit function for creditors is concave, reflecting risk aversion. Moreover, debt claims have priority in Chapter 11, especially if the claims are secured, and replaced by new securities (debt or equity). Thus, overall creditors may feel better protected under a court-supervised reorganization procedure like Chapter 11.

The many rival explanations for the two methods of distress resolution have given rise to a diverse empirical literature. Early studies that look at the determinants of a firm's decision between the two approaches to debt restructuring are Gilson et al. (1990), Asquith et al. (1994), Franks and Torous (1994), Chatterjee et al. (1996), and Hotchkiss and Mooradian (1997).⁴ Recently, attention has focussed on the role of pivotal creditors, investors, or assets. For example, Demiroglu and James (2015) assesses the impact of bank lenders, syndicated loans, and CLOs on the nature of troubled debt restructurings. They find that traditional bank loans are easier to restructure outside bankruptcy than institutional loans and that the likelihood of a prepackaged Chapter 11 procedure increases with CLOs. Lim (2015) focuses on the role of activist hedge funds in the restructuring decision, finding that the involvement of hedge funds in restructuring increases the likelihood of a prepack reorganization. The author also finds that financial distress is resolved more quickly when hedge funds are active secured creditors, suggesting that hedge funds may mitigate the holdout problem through their activism. Jiang et al. (2012) focuses on how hedge funds, which are present in most of the Chapter 11 cases in their sample, may attempt to use Chapter 11 to increase their control. The hedge fund strategy is to acquire unsecured debt prior to reorganization in order to increase the likelihood that the plan is accepted and the newly acquired debt is transformed into equity. The authors confirm earlier findings by Harner (2008a,b, 2011) on the development of the distressed debt market for firms in Chapter 11 and the strategies adopted by institutional

⁴See also Brunner and Krahnert (2008) and Jostarndt and Sautner (2010) for Germany and Blazy et al. (2014) for France.

investors to influence corporate decisions.⁵

Recent papers have turned to the role of other institutional investors: Li and Wang (2016) examines Chapter 11 loan-to-loan (LTL) strategies used by banks with secured loans and loan-to-own (LTO) strategies adopted by activist investors such as hedge funds and PE funds. The objective of an LTO strategy is to replace the senior debt with new equity upon Chapter 11 emergence in order to gain control over the existing board and management. Li and Wang (2016) find that the presence of LTO strategies increases the role of activist investors in Chapter 11 and the probability of CEO turnover. Finally, Chu et al. (2019) examines the impact of simultaneous debt and equity holdings, concluding that simultaneous holdings of different types of securities (loans, bonds, and equity) increases the likelihood of out-of-court restructuring over Chapter 11.

Studies of distressed exchanges often focus on the role of banks. Asquith et al. (1994) and James (1996) document the importance of bank participation in workout arrangements.⁶ Mooradian and Ryan (2005) examines the relation between investment bank participation in public-debt exchange offers and the composition and outcome of the offers. Their results suggest that financially distressed firms hire an investment bank when the firm's capital structure is complex in order to deal with the potential coordination and holdout problems. More recently, a strand of the literature has focussed of the pivotal role of creditors insured through a CDS, yielding the empty creditor hypothesis.⁷ Although Mengle (2009), Aspeli and Iden (2010) and Bedendo et al. (2016) find no empirical evidence to support the hypothesis, Danis (2016) concludes that the existence of CDS contracts makes it more difficult for financially distressed firms to reduce debt in an exchange offer, thereby increasing the likelihood of filing for bankruptcy in the future.

To summarize, the relevant empirical literature on debt restructuring tends to focus either on court-supervised procedures or distressed exchanges, or on the roles of particular investors or creditors, or on the impact of specific assets. In our extensive review of the literature, we have been unable to uncover any empirical work that considers the joint impact of contem-

⁵This view is reflected in the mission statement of the American Bankruptcy Institute Commission to Study the Reform of Chapter 11 which states: "In light of the expansion of the use of secured credit, the growth of distressed-debt markets and other externalities that have affected the effectiveness of the current Bankruptcy Code, the Commission will study and propose reforms to Chapter 11 ...". See also Harner (2014).

⁶See also Leyman and Schoors (2008), Brunner and Krahnert (2008), and Mayr et al. (2020) for empirical evidence on bank debt restructuring in Belgium, Germany and Austria.

⁷The hypothesis conjectures that insured creditors of a financially distressed firm have a strong incentive to favor bankruptcy over a debt restructure when the CDS payoff in bankruptcy is larger than the post-negotiation value of debt. See Hu and Black (2008a,b).

poraneous asset holdings by all investors on the choice between Chapter 11 and out-of-court restructuring. The goal of the present paper is to empirically assess the impact of all of these conflicting influences on the resolution of financial distress within a broad focus on the role of institutional lenders, investors, and creditors.

The contributions of our approach are twofold. Firstly, we assemble financial and procedural data on Chapter 11 firms and exchange offer firms. We then match the firms to information on equity and bond holdings by individual investors for the four quarters prior to the filing of a Chapter 11 plan or the announcement of an exchange offer. Thus, we have detailed information on firms undergoing both kinds of restructuring procedure as well as investor equity and bond holding data for each investor in each firm for the four quarters leading up to restructuring, yielding a comprehensive set of data relevant to the restructuring decision. Secondly, in econometric terms, the data should provide a less biased and more robust analysis of the restructuring decision. Because the extant empirical literature has tended to consider only one or two aspects of the restructuring decision at a time, there is always a lingering question over whether the earlier results are driven by the partial nature of the analysis.

The main findings of the paper are as follows. Overall, the models fit the data well, endorsing our approach of considering all investor groups and asset types at once. In particular, we find that investor groups have divergent effects on the restructuring decision and that bond holdings have a different impact than equity holdings. We believe it is the first evidence of such effects in a comprehensive analysis. We also find that the timing of the impacts of both investor groups and asset types differs as the firms approach restructuring. We believe this is the first time evidence of such dynamic effects has been documented in the context of financial restructuring. Lastly, we are able to discern different impacts for various investor groups: the impact of hedge fund holdings is quite different from that of insurance companies, which is different again for banks, corporations, and government investors. Our results are plausible but not always compatible with previous empirical findings, which is consistent with concerns about the partial nature of the analysis in earlier work.

In section 2, we discuss how we assembled the comprehensive restructuring data set. Section 3 describes the contents of the data. Section 4 begins to unpack the detail provided in the data on financial characteristics, capital structure, bond and equity ownership, and procedural detail on the Chapter 11 and exchange offer firms. We are particularly interested, of course, in differences between the two groups of firms, so much of the analysis in section 4 takes the form of mean comparison and difference-in-difference tests. In section 5, we proceed to the

body of the paper, where we use logit regression to consider the roles of assets and investor types in the firm's decision between Chapter 11 and exchange offer while controlling for financial characteristics, capital structure, and ownership by institutional investor types. Owing to the possibility of multicollinearity, we investigate robustness of the logit regressions by using the lasso variable selection procedure to select the subset of relevant covariates. Section 6 includes a detailed discussion of the results, with a particular focus on the impact of investor holdings on restructuring.

2. Sample

We follow the Demiroglu and James (2015) two-step sampling procedure.⁸ First, we identify a sample of U.S. firms in financial distress from January 1, 2000, to December 31, 2016, using recent stock price performance (CRSP), leverage, interest coverage ratio and size (Compustat).⁹ We then focus on firms with average assets of at least \$100m (2000, Q2 dollars) over the 3 years prior to distress.¹⁰ Based on this procedure, we identify 840 distressed firms.¹¹

Second, for each firm in the sample, we search for evidence on the type of debt restructuring, either through an exchange offer or a Chapter 11 filing, over a 2-year window either side of the date of financial distress. We search in the LoPucki Bankruptcy Research Data (BRD) to identify firms which filed for Chapter 11. All types of Chapter 11 proceedings (prepackaged, free fall, pre-negotiated, and §363 sales) are considered. We also match our sample of distressed firms with a list of firms reported in BankruptcyData.com, Moody's Default and Recovery Database (MDRD), Fitch, and Standard & Poors to identify additional Chapter 11 cases. Finally, we conduct an extensive search of EDGAR 8-K filings and Capital IQ for each distressed firm not already identified. Excluding 49 firms which filed for Chapter 11 outside the 2-year window, 69 firms in distress for consecutive years but with a single Chapter 11 procedure and 27 firms with missing financial, equity, or bond holdings information, brings our final Chapter 11 sample to 131 firms.

We then search Factiva news stories to identify out-of-court debt restructurings. For each

⁸This approach is a variant of the methodology used in Gilson (1989) and Gilson et al. (1990).

⁹This is done by calculating the three-year cumulative common stock return for all SIC codes, excluding utilities and financial firms, and selecting firms that ranked in the bottom 5% of the CRSP universe for each calendar year over the sample period. Firms with book leverage ratio below 30% and an interest coverage ratio (EBITDA / interest expenses) greater than three are also excluded since they are considered 'unlikely' to be financially distressed.

¹⁰This explains why our sample is smaller than Hu and Black (2008a), which restricts the sample to firms with at least \$50 million in book value of assets.

¹¹Some firms appear more than once in the sample because they are in distress for more than one year. For example, Ambassadors International Inc., considered to be in distress in 2008, 2009, and 2010, appears three times in the sample.

distressed firm in the original sample, we conduct a word search for ‘exchange offer’ and ‘debt restructuring’ during the 2-year window around financial distress. We restrict our sample to cases related to an actual (or anticipated) default, including: (1) reduced principal or interest payments on the debt, (2) accepted equity securities (or securities convertible into equity) for some or all of the outstanding debt claims, and (3) extended maturity of debt. We complement this procedure by searching EDGAR 8-K filings, MDRD, and by referring to the samples reported by Danis (2016) and Bratton and Levitin (2017).¹² Excluding 4 firms which filed for an exchange offer outside the 2-year window, 58 firms in distress for consecutive years but with a single exchange offer procedure and 7 firms with missing financial information, equity, or bond holding information, brings our exchange offers sample to 138 firms.¹³

Table 1 lists the number of Chapter 11 and exchange offer cases by year of filing and year of distress, also illustrated in Figures 1 and 2. There are clear peaks after the dot-com bubble and market crash of 2000, the 2008 financial crisis and the highly volatile stock markets of 2015 and 2016.¹⁴ This is consistent with the distribution of cases reported by Demiroglu and James (2015) for the 1999-2011 period. At the quarterly level, negative market events seem to impact exchange offers more quickly than Chapter 11 filings. For instance, 7 of the 10 exchange offers in 2000 took place in the quarter immediately following the March 2000 stock market crash. By contrast, only one Chapter 11 case was filed in the same quarter; the bulk of the Chapter 11 cases occurred in the following three years. Similarly, we observe a significant increase in exchange offer filings during the 2008 financial crisis, while the increase in Chapter 11 filings is not until 2009. Unsurprisingly, the data reveal that, at the time of filing, all but one of the Chapter 11 firms were in distress, compared with 72% of the exchange offer firms. Distressed firms planning for bankruptcy have a strong incentive to buy time before filing, whereas firms that want to avoid bankruptcy are likely to pursue a rapid solution with creditors.

Figure 3 shows the distribution of cases by industry classification. Three industry areas—manufacturing; mining; transportation, communications, electric, gas and sanitary services—account for roughly three-quarters of the cases for both samples.

¹²We would like to thank William Bratton and Adam Levitin for access to their sample.

¹³In some cases, an exchange offer is followed by a Chapter 11 filing. These are considered to be separate events if the exchange offer was accepted by the creditors before the Chapter 11 filing. In our analysis below, these *dual* procedures are captured by a dummy variable equal to 1 if the time difference between the two procedures is less than 2 years. There are 35 dual procedures and the average time between the two procedures is 277 days.

¹⁴We split the sample into four periods: before 2008, 2008-09, 2010-14, and after 2014. There is no statistical difference between the proportion of Chapter 11 and exchange offers cases across the periods.

3. Data

The data include quarterly financial information on each firm for the four quarters prior to filing for Chapter 11 or an exchange offer.¹⁵ We source financial variables from Compustat, detailed debt information from the Capital IQ *Capital Structure Summary*, and equity data from the Capital IQ *Balance Sheet, Supplemental Items*. Table 2 displays a list and description of the key variables.

Given our focus on the impact of institutional investors on the firm's restructuring decision, we add detailed equity and bond holding information to the financial data. The Capital IQ capital structure information is reported in the aggregate and does not facilitate the identification of individual equity holders or bond holders. Thus, we collect detailed share holdings from the Capital IQ *Public Ownership* add-on.¹⁶ For each firm, we record the name of each shareholder, number of common shares held, and owner type for each of the four quarters prior to filing. Because owner types vary between Capital IQ and Bloomberg, we create a standardized list of types, as shown in Table 3.

We collect detailed bond holdings from historical bond data in Bloomberg.¹⁷ For each bond reported in Bloomberg, we record the rank of the bond (e.g., senior, subordinated, etc.), the coupon rate, the maturity, the amount issued (which Bloomberg reports at face value in thousands of dollars), and whether the bond is in default at the time of filing. We also record the name of each bond holder, the holder's institutional type, and the number of bonds held in each of the four quarters prior to filing. We ignore bonds that lack detailed holding information in Bloomberg. Table 4 displays a typical example of the bond holding data, in this case for a single bond (CUSIP 02076XAD4) issued by Alpha Natural Resources Inc., which filed for Chapter 11 on August 3, 2015. For example, we see that Allianz SE is reported holding 2,960 bonds at Q3, implying a bond position of \$2,960,000 three quarters before Alpha's filing.

Given the importance of individual bond holdings in our analysis, a few remarks are in order. Bloomberg collects bond positions from a variety of sources including TRACE.¹⁸ Mutual fund disclosure requirements are regulated by the Securities Act of 1933, the Securities Exchange Act of 1934, and the Investment Company Act of 1940. Periodically, managers of

¹⁵We ignore financial data from the filing quarter because it may reflect post-filing information.

¹⁶The ownership data is sourced from SEC 13Fs, 13Ds, 13Gs, Proxies, N30Ds and SEDAR filings.

¹⁷Historical corporate bond holdings are available in Bloomberg using the SRCH command.

¹⁸The Trade Reporting and Compliance Engine (TRACE) database is maintained by the Financial Regulatory Authority (FINRA), which provides transaction information on the universe of U.S. corporate bonds. Broker-dealers have an obligation to report all transactions (within 15 minutes) to TRACE (Jankowitsch et al., 2014).

mutual funds are required to report quarterly holdings by completing N-Q, N-CSR, or 13F forms.¹⁹ These mandatory disclosure requirements prevail mainly for the equity holdings of mutual funds. However, our sample identifies 15 investor types with bond positions, including mutual funds, hedge funds, private equity funds, pension funds, insurance companies, and so on. It follows that much of the Bloomberg bond holdings data are self-reported.

Biases from self-reporting are numerous and have been widely examined, although the magnitude and direction of the effects are hard to determine. Agarwal et al. (2013) examine the bias associated with hedge funds self-reporting equity holdings. In a nutshell, self-reporting is driven by a trade-off that balances the costs of reporting and lost secrecy of the fund against the enhanced exposure to potential investors. Agarwal et al. (2013) finds that young and medium-size funds with more diversified strategies and higher turnover trading strategies have a higher propensity to self-report equity holdings. We suspect similar trade-offs exist in the bond market, but given the absence of empirical evidence, we are unable to dismiss the possibility of reporting bias in the Bloomberg bond data. Nonetheless, as we discuss below, we are confident that the Bloomberg bond data are informative.

Matching data from several sources is tricky and requires attention to detail. Company names may change over time and names reported in Lopucki BRD, Capital IQ, Bloomberg and Factiva may differ. Investor names for bonds and equity present similar challenges. Thus, manual matching of company, share holder, and bond holder names was necessary to arrive at a complete and consistent list of investors for all firms. In some cases, holdings were reported at the fund level while in other cases reporting was at the group level. When it is accurate and feasible, positions are merged; otherwise, holdings are reported separately.

Another issue arises in the reporting frequency for bond and equity holdings. While most bond investors report positions quarterly, some seem to follow a different disclosure rhythm. A typical example is provided by Mediolanum International Funds, which reports quarterly positions in Allegiance Telecom Inc. of [250, 0, 250, 0], strongly suggesting that Mediolanum reported its bond positions semi-annually. In this case, Mediolanum's bond positions were changed to [250, 250, 250, 250]; similar adjustments were carried out for other investors.

¹⁹The N-CSR form must be filed by registered investment management companies within 10 days of the publication of semi-annual and annual reports to shareholders. The N-Q form applies to the same companies but must be filed no later than 60 days after the end of the first and third quarters of the fiscal year. The forms are filed by all mutual funds at the individual fund level and cover all securities. A 13F form is filed on a quarterly basis, with no more than a 45-day delay, by institutional investment managers with at least \$100 million of assets under management. 13Fs are reported at the company level and cover equities, convertible bonds, and traded options. See Wermers (1999), Agarwal et al. (2015), and SEC IC-26372 (May 10, 2004): <http://www.sec.gov/rules/final/33-8393.htm>.

Bond positions for all investors in all firms were inspected and cleaned, when necessary, according to the pre-defined protocol detailed in Appendix 1.

In the case of equity, the cleaning process is different because the data were sourced directly from 13F files, yielding more consistent information. Nevertheless, we faced two problems. Capital IQ does not always report the total number of shares or the list of all investors and holdings for all quarters prior to filing. In such cases, missing information was completed using the Appendix 1 protocol. Lastly, the total number of shares reported in Capital IQ did not always reflect stock splits or the issue of new shares during the sample period. Thus, the share data for 19 Chapter 11 firms and 63 exchange offer firms that used either procedure during the four quarters prior to the event were manually corrected to ensure consistent information.

The summary of the investor data in Table 5 shows that the sample contains 8,214 unique investors: 1,370 unique bond holders and 6,844 unique equity holders.²⁰ The vast majority of bond investors—over 80%—are insurance companies and investment advisors. For equity, the largest investor category is the individual/insider group (45%), which typically comprises the firm’s top management, followed by investment advisors (31%) and hedge funds (11%).²¹ In total, the sample includes 208,000 firm-bondholder-equityholder-quarterly observations—78,072 Chapter 11 observations and 130,028 exchange offer observations—covering the period January 1, 2000, to March 31, 2018.

4. Summary Statistics

The data set includes detailed firm- and investor-level information on financial characteristics, capital structure, ownership, debt, and restructuring procedure. The purpose of this section is to provide an overview of these various aspects of the data.

4.1. Financial characteristics

Table 6 summarizes the firm-level financial information at Q1, the quarter prior to the restructuring event. It also contains p-values for the mean and median differences between the Chapter 11 and exchange offer firms.²² Given the sample selection procedure, it is no surprise that firms in the sample are very large. There are clear differences between the two groups:

²⁰There are 933 investors with simultaneous bond and equity positions in at least one of the four quarters prior to the event in Chapter 11 firms and 1,563 such investors in exchange offer firms.

²¹Government claims represent interests held by five U.S. state governments (California, Michigan, New York, Texas and Wisconsin).

²²Following Conroy (2012), we use quantile regression to test for the equality of medians rather than the (often wrongly-applied) Wilcoxon rank-sum (aka Mann-Whitney) test.

the mean assets for exchange offer firms (\$2.5 billion) is roughly 80% higher than Chapter 11 firms (\$1.4 billion), mean revenue (\$352 million vs. \$199 million) shows a similar pattern, while mean liabilities are 40% larger for exchange offer firms compared with Chapter 11 firms. Interestingly, Demiroglu and James (2015) and Chu et al. (2019) find higher, not lower, revenue for Chapter 11 firms, which both interpret as reflecting an incentive for ‘small’ firms to restructure out-of-court to avoid large fixed bankruptcy costs. Notwithstanding our position that the restructuring decision depends on many factors besides bankruptcy costs, the samples in Demiroglu and James (2015), Chu et al. (2019), and our paper are limited to listed firms with assets and liabilities over \$1 billion and sales over \$100 million, which hardly qualify as ‘small’ firms.

Particularly striking in Table 6 are the much higher mean and median current liabilities and current portion of long-term debt at Chapter 11 firms. A similar pattern prevails for mean debt ratios relative to total liabilities: the current liabilities ratio is 65% for Chapter 11 cases versus 34% for exchange offers; the current portion of long term debt ratio is 42% for Chapter 11 firms and 11% for exchange offer firms. The median differences are even higher. The differences suggests that short-term debt repayment is a greater concern for Chapter 11 firms. By contrast, both the level of long-term debt and its ratio to total liabilities are significantly higher for exchange offer firms (\$1.3 billion and 54%) compared with Chapter 11 firms (\$398 million and 25%). This is also the case for the ratio of long term debt to total assets (50% vs. 36%).²³ These differences suggest that exchange offer firms are focused on long-term debt issues.

Differences in asset composition between the two sets of firms are less pronounced than differences in debt. Exchange offer firms have higher current assets, cash and equivalent assets, and property, plant, and equipment than Chapter 11 firms. This is consistent with exchange offer firms having a lower liquidity shortfall and more fixed assets (PPE), a potential source of collateral. While the mean and median differences for the three variables relative to assets are not statistically significant, the assets to liabilities ratio is 132% for exchange offer firms and only 89% for Chapter 11 firms, suggesting greater overall financial difficulties for Chapter 11 firms.²⁴

More than 95% of firms restructuring under Chapter 11 and 75% of the exchange offer firms report negative net income, explaining the negative means for net income in both groups. Both groups show positive EBITDA and negative EBIT, on average, with exchange offer firms

²³Hu and Black (2008a) find precisely the opposite.

²⁴PPE/Assets>100% in Table 6 because we use gross, rather than net, PPE.

far from significantly better. Differences in the EBIT and EBITDA margins as well as in the interest coverage ratio are significant only for median values.

To highlight the progression in the firms' financial positions, Table 7 reports the changes in the financial variables between the fourth (Q4) and first (Q1) quarters prior to the restructuring event as well as the differences in the changes between the Chapter 11 and exchange offer firms. On the assets side, all aggregates are decreasing in absolute value. While there are no significant differences between the two samples, the falls in assets between Q4 and Q1 are statistically significant at the 5% level for the Chapter 11 sample. Interestingly, for both samples, cash, current assets, and PPE all are increasing as a percentage of assets. This suggests that the drop in total assets is mainly explained by a reduction in long term investment (i.e., marketable securities) between Q4 and Q1 as firms concentrate their resources on restructuring. On average, both groups of firms see a significant reduction in their assets to liabilities ratio with the decrease significantly less pronounced for exchange offer firms.

On the liabilities side, Chapter 11 firms have lower total liabilities at Q1 compared to Q4 than exchange offer firms, although the difference is not significant. Comparing Q1 with Q4 for Chapter 11 firms, the current portion of long term debt and current liabilities are significantly higher (in levels and relative to total liabilities) while long term debt is significantly lower for Chapter 11 firms. The large increases in the current portion of long term debt and current liabilities and large decreases in long term debt between Q4 and Q1 for the Chapter 11 firms could explain the level differences in these three measures of liabilities noted for Q1 in Table 6. Nothing like the same dynamic is being played out in the exchange offer firms, where there are no significant differences in the levels and only small differences in the ratios of the three measures of liabilities between Q4 and Q1. Overall, the changes at Chapter 11 firms drive significant differences in the changes in liabilities between the two groups of firms and will be investigated more thoroughly below the multivariate analysis. By contrast, Table 7 shows that there are few changes or differences between the two groups in the income statement apart from an almost identical drop in total revenue.

4.2. Capital structure

Table 8 summarizes the firms' capital structure. As a general comment, the differences between Chapter 11 and exchange offer firms are much less pronounced for capital structure than they were for the financial characteristics. For example, exchange offer firms report an average of almost \$1.5 billion total outstanding debt, which represents 68% of total liabilities. Chapter 11 firms average more than \$1.1 billion in outstanding debt representing 71%

of total liabilities. The difference between the two samples is not statistically significant. Yet, outstanding debt, expressed as a percentage of total assets, is significantly higher for Chapter 11 than exchange offer firms. For Chapter 11 firms, outstanding debt exceeds 100% of the value of assets, leaving little room for new collateral on future loans. This is confirmed by the ratio of secured debt to total assets, which is also significantly higher for Chapter 11 firms.

Exchange offer firms are also larger than Chapter 11 firms in terms of the different types of debt but, except for bonds and notes and unsecured debt, the differences are not significant. The debt differences hold up when the various types of debt are expressed as a percentage of outstanding debt. Note that bonds and notes and bank debt represent the largest proportions of total debt. Around 85% of debt is senior, 50-60% is unsecured, and 21% is convertible.²⁵ Exchange offer firms report, on average, 93 million outstanding common shares compared to 68 million for Chapter 11 firms; the difference is not statistically significant.

The debt progression for the firms summarized in Table 9 shows that the debt structure for exchange offer firms is relatively stable over the year prior to filing. Chapter 11 firms exhibit significant changes in bank, secured, and unsecured debt as well as in bonds and notes. The two samples differ only in the changes to bonds and notes and bank debt, though neither are significant when expressed as a percentage of outstanding debt. Indeed, there are no significant changes over the year prior to filing in any ratio for either Chapter 11 or exchange offer firms and no significant differences between the two groups. The only significant changes and differences are for the ratios of outstanding debt and secured debt to assets, which show increases for both groups and larger increases for the Chapter 11 firms. Again these changes from Q4 to Q1 are consistent with the level differences noted in Table 8. Lastly, there is no significant difference between the two samples in the change in the number of outstanding common shares.

4.3. Bond and equity ownership

Table 10 reports the number of Chapter 11 and exchange offer firms with positive bond and equity holdings by investor type for the four quarters prior to filing.²⁶ At Q1, about 73% (96/131) of the Chapter 11 firms and 72% (100/138) of the exchange offer firms have bonds reported in Bloomberg, and while the numbers vary slightly across the four quarters, the differences between the two groups are not statistically significant. For both groups, the four

²⁵The ratios are similar to those reported by Demiroglu and James (2015), although their ratios are relative to total liabilities.

²⁶In total, there are 312 bonds issued by Chapter 11 firms and 514 bonds issued by exchange offer firms.

largest bond holder investor types are investment advisors, insurance companies, banks, and hedge funds. The picture is slightly different for equity holdings. Investment advisors are present in almost all restructuring procedures, closely followed by individual investors (mostly comprising top management), banks, hedge funds, pension funds, family offices, and insurance companies. Not surprisingly, bond holdings are more concentrated among fewer investor types. Similar to Jiang et al. (2012), we find that hedge funds have a strong presence on both the debt side and equity side of restructuring firms.

Table 11 summarizes more detailed bond information for Q1, the quarter prior to filing. Clearly, exchange offer firms have, on average, issued significantly more bonds in value (\$2.3 billion vs. \$1.2 billion) and in number (5.1 vs. 3.2), have a larger number of bondholders (132 vs. 72) and a higher total value of bond holdings reported by investors (\$508 million vs. \$273 million) than Chapter 11 firms. Total share holdings by investors are significantly larger for exchange offers (55 million) compared with Chapter 11 firms (30 million). These differences are consistent with the larger size of the exchange offer firms noted in Table 6.

There does not appear to be a difference in the distributions of bond classes between procedures.²⁷ Senior unsecured bonds represent roughly two-thirds of all bonds reported for both Chapter 11 and exchange offer firms, followed by senior subordinated (9% for Chapter 11; 8% for exchange offer), second lien (8%; 6%) and first lien (6%; 5%). Notably, over 85% of the bonds issued by Chapter 11 firms are in default one quarter prior to filing compared to less than 11% of the bonds issued by exchange offer firms. Demiroglu and James (2015) report a similar default rate for Chapter 11 but a much higher (63%) default rate for out-of-court restructuring, probably due to the fact that Demiroglu and James (2015) consider loans while we focus on bonds.

One of the key features of our data is the detailed information on bond and equity holdings by different investor types in the 4 quarters leading up to the restructuring event. Bloomberg reports the total dollar value of bonds issued by each firm. The number of bond units held by each investor in each of the four quarters prior to filing is multiplied by 1,000 (the nominal value of a bond unit) to determine the total dollar position of each investor. For each quarter, we aggregate the bond positions by investor type across all the bonds issued by the firm and divide the aggregate bond holdings of each investor type by the total value of bonds issued by the firm. Thus, for each firm we have a measure of the proportion of bonds held by each in-

²⁷The information in this paragraph is not shown in the tables.

vestor type. Similarly, we construct a measure of the proportion of equity held by each investor type by dividing the number of shares held by each type by the total number of outstanding shares in the firm.

Tables 12 and 13 report, respectively, bond holdings and changes in bond holdings by investor type for the four quarters prior to filing. At Q1, total investor-reported bond holdings represent around 25% (24%) of the total value of bonds issued for Chapter 11 (exchange offer) firms, with no significant difference between the two. Investment advisors (11.8%) hold the largest proportion of bonds issued by Chapter 11 firms, followed by hedge funds (7.2%), insurance companies (3.2%) and banks (2.1%). At Q1, the five largest investors hold 20% of the bonds issued by Chapter 11 firms while the ten largest hold about 23%. For exchange offer firms at Q1, investment advisors hold 13% of the bonds issued, followed by insurance companies (5.1%), hedge funds (2.7%) and banks (2.3%). The five largest investors hold 17% of the bonds issued by exchange offer firms while the ten largest hold 20%. Only the bond holdings for hedge funds and insurance companies are significantly different between the two groups, being significantly lower at insurance companies (in Q1 and Q2) and significantly higher at hedge funds (in all four quarters) for Chapter 11 firms. This is consistent with the Jiang et al. (2012) position that hedge funds are active in the distressed debt market, seeking out opportunities where debt may be converted into new equity and, thereby, gain control of the restructured firm.

Table 13 reveals that the ratio of reported bond holdings to bonds issued decreases significantly between Q4 and Q1 for Chapter 11 firms, especially for banks, insurance companies, and investment advisors. Interestingly, on average, hedge funds and the other types of investor hold on to their reported positions as the firms get closer to filing for Chapter 11. For exchange offer firms, significant changes in bond holdings between Q4 and Q1 are apparent only for hedge funds and (weakly) for pension funds.

The picture for equity holdings in Tables 14 and 15 is again different. Table 14 shows, at Q1, that exchange offer investors report a significantly higher proportion (66% vs. 45%) of total share holdings than Chapter 11 investors. The same pattern holds for the other three quarters, although the differences are not as large. For both groups of firms, the largest shareholders are investment advisors, individual investors, hedge funds, banks, corporations, and VC/PE firms. Share ownership by investment advisors and pension funds is significantly larger for exchange offers than for Chapter 11 firms for all four quarters before filing, while banks and governments have higher ownership for three quarters before filing, as do hedge funds in

the last quarter before filing. Share holdings in exchange offer firms are more concentrated: at Q1, the largest five (ten) shareholders hold 34% (39%) of the outstanding shares in Chapter 11 compared with 39% (50%) for exchange offer firms.

Lastly, Table 15 shows that the total number of shares reported by investors for Chapter 11 firms decreases significantly between Q4 and Q1 for banks, hedge funds, insurance companies, investment advisors, and pension funds. The changes for investment advisors and pension funds are similar, though smaller, for exchange offer firms. Interestingly for exchange offer firms, the proportion of shares reported by banks or hedge funds does not fall significantly between Q4 and Q1 and the proportion held by corporations increases.

4.4. Under-reporting of bond and equity ownership

As mentioned above, reported bond and equity positions vary over time. For Chapter 11 firms, the percentage of bonds issued self-reported by investors and recorded by Bloomberg falls from 30.4% at Q4 to 24.8% at Q1; for exchange offers, it falls from 24.2% at Q4 to 23.8% at Q1. Share holdings are also subject to under-reporting, though it is less pronounced than for bonds. For Chapter 11, the percentage of outstanding shares self-reported by investors falls from 64.5% at Q4 to 44.8% at Q1; for exchange offers, it falls from 74.4% at Q4 to 66.0% at Q1. Compared with bonds, higher reported share ownership most likely reflects the fact that reporting equity holdings is compulsory for institutional investors whereas reporting bond holdings is voluntary.

Under-reporting raises an important question about the interpretation of changes in observed ownership over time. Let us focus on bonds for the sake of clarity. Given that a bond sale by one investor must be matched by an equal bond purchase by other investors, quarter-to-quarter changes in reported bond ownership may be explained in one of three ways. First, a firm may have called some of its bonds before maturity. Given our sample is limited to firms in financial distress, this explanation may not be relevant. Second, the original investor may have sold their bonds to an investor who chooses not to report the new holdings. Third, the original investor may have simply decided to stop reporting its bond holdings.

The impact of under-reporting depends on the reason why an investor may choose not to report a position prior to debt restructuring. Given the firm is in distress, investors may consider reporting bond holdings to be a waste of time and effort, which we refer to as a *non-strategic* motive. Alternatively, consistent with Jiang et al. (2012) and Harner (2008a,b), investors may hide their holdings from competitors to gain an advantage prior to debt restructuring, hoping to influence or profit from the process by transforming their debt into equity.

We refer to this as a *strategic* motive.

The data are not informative on the reason some investors choose not to report their holdings. The question is whether under-reporting is related to the firm's decision between Chapter 11 and an exchange offer. To the extent that most investors have a non-strategic motive, under-reporting is essentially uncorrelated with the debt restructuring process, so the proportion of bond holdings by institutional investors should be unrelated to the firm's decision. However, if many investors have a strategic motive, then under-reporting may well be correlated with the debt restructuring process and reported bond holdings (the complement of non-reported holdings) may be related to the firm's decision. We will return to this important issue in the results section below.

While the reporting issue is also relevant to equity, there are two mitigating factors. First, as previously mentioned, equity reporting is compulsory for mutual funds and other large institutional investors. While small investors, including retail investors, are under no obligation to report holdings, individually they are unlikely to be pivotal to a firm's restructuring decision. Second, in the majority of Chapter 11 procedures, equity is wiped out due to strict application of the absolute priority rule (see next section). Knowing their equity will be erased reduces the incentive for investors to report positions, which may explain the large difference in equity holdings between Chapter 11 and exchange offers, especially in the quarter before filing.

4.5. Procedures

The majority of Chapter 11 cases are free fall (56.5%), followed by pre-negotiated (28.2%) and prepack (15.3%) plans.²⁸ This is consistent with Demiroglu and James (2015), where traditional Chapter 11 filings represent 64% of the sample with the rest (36%) being prepacked procedures.²⁹ More than 82% of the procedures have a creditors' committee, 56% involve debtor in possession (DIP) financing, and 52% involved some asset sales.³⁰ A detailed textual analysis of the cases reveals that around 20% of the Chapter 11 cases report a deviation from absolute priority (AP).³¹ Close to 70% of the firms in the sample emerge successfully from Chapter 11, spending an average of 309 days in bankruptcy before emerging. Lastly, firms restructuring under an exchange offer report a success rate of 81% with an average of 88 days

²⁸The information in this paragraph is not shown in the tables.

²⁹Free fall plans are traditional Chapter 11 procedures. A pre-negotiated plan is an agreement between the debtor and a key group of creditors without any solicitation of votes prior to bankruptcy filing. A prepack plan is an agreement between the debtor and creditors with solicitation of votes prior to bankruptcy filing.

³⁰Source: Capital IQ *Transactions/Bankruptcies*, Lopucki BRD and Edgar.

³¹AP violations occur when junior security holders receive compensation before the claims of senior creditors have been fully reimbursed. We do not examine AP violations among different classes of creditors.

for creditor approval.³²

5. Econometric Analysis

While the univariate results provide useful background, they are clearly no substitute for multivariate analysis. In this section, we consider a logit model of the firm's restructuring decision. The dependent variable is 1 if a firm restructures its debt through an out-of-court exchange offer and 0 if it opts for a court-supervised Chapter 11 procedure. We build the regression in four steps. Following the empirical bankruptcy literature, we first consider financial variables and a set of dummy variables to capture the 2008-09 financial crisis.³³ Second, we add measures of types of debt (e.g., bonds and notes, bank debt, secured debt) and the total number of outstanding shares. Third, we add reported share holdings by investor type (e.g., banks, investment advisors, hedge funds, etc.). Fourth, we add reported bond holdings by investor type. Initially, we measure all variables at Q1, the quarter prior to filing. We proceed to investigate the impact of changing the quarter bond and share holdings are measured.

The data have a vast amount of information on individual firms and investors, presenting three related challenges to the logit analysis: the possibility of overfitting, selection of covariates, and multicollinearity. Because the number of potential covariates (p) is greater than the number of observations (n), it is possible to get a perfect fit in the logit regression in the sense of completely predicting a firm's choice between Chapter 11 and exchange offer. Clearly, we would learn nothing from such an approach. Given the danger of overfitting, the critical question is how to reduce dimensionality, i.e., how to select (or screen) the appropriate variables that determine the restructuring decision. Related to variable selection is the possibility of multicollinearity, which may compromise the accuracy of the estimated marginal effects of individual variables. To address these concerns, we supplement the logit regressions with lasso regression (discussed in detail below), which is designed for the estimation of models that require variable selection in the presence of multicollinearity.

5.1. Logit results

Table 16 reports the logit results following the four-step procedure described above. In contrast to the common approach of using financial information from the last annual report

³²Unlike Gilson et al. (1990), which defines a private debt restructuring plan to be successful if the firm does not file for bankruptcy within a year of the restructuring, we define success to be when the proposed exchange offer is accepted by creditors and implemented.

³³A pre-crisis dummy is equal to 1 if the year of filing is before 2008, a crisis dummy is equal to 1 if the year of filing is 2008 or 2009, and a post-crisis dummy is equal to 1 if the year of filing is between 2010 and 2014.

before the restructuring decision, we consider information from one, two, three and four quarters before restructuring. Since Q1 financial information produces R^2 values that are 2-3 times higher than any of the other quarters, Table 16 reports only the results with the Q1 financial variables.³⁴

For the base model, the probability of an exchange offer is positively related to size, measured by total revenue, and the firm's financial health, measured by the assets to liabilities ratio and the interest coverage ratio. Exchange offers are also negatively associated with the ratio of current portion of long term debt to total liabilities and the EBIT margin. The financial crisis dummy variables are not statistically significant.

In the second column of Table 16, we add the debt variables (outstanding, term loan, bonds and notes, senior, convertible, bank, and secured debt) and the number of outstanding shares. The results are very similar to the base model, except for the current long term debt ratio dropping from significance. The only significant effect among the added variables is the (log) number of shares outstanding, which is negatively related to the probability of an exchange offer. The lack of significance among the debt variables suggests that debt is not strongly related to the probability of an exchange offer, which is not consistent with Demiroglu and James (2015) or Chu et al. (2019).³⁵

In the third column of Table 16, we add Q1 equity holding information and a measure of share concentration among the 10 largest equity investors. The estimates for the financial and debt variables are very similar to the two earlier models. It also reveals that the probability of an exchange offer increases with the proportion of shares held by all investor types except family trusts and insurance companies.³⁶ Adding the equity variables also confirms the apparent irrelevance of debt structure for the restructuring decision. Notice that firms with more concentrated equity ownership are significantly less likely to be associated with an exchange offer.

In the last column of Table 16, we add Q1 bond holding information, bond concentration among the 10 largest bond holders, the number of bonds issued by the firm, the (log) total value of bonds issued, the total number of bond holders, the number of subordinated bonds,

³⁴Note that Q1 financial information does not correspond, except by coincidence, to the most recent annual report. A problem with using data from the annual report is that the timing of the information prior to restructuring would not be standardized across firms.

³⁵To investigate, we ran four logit regressions (one for each of the four quarters prior to the event) on the debt variables alone. The marginal effects for the debt variables are very weak, rarely significant, and become even weaker when the financial variables are added to the regressions.

³⁶Equity holdings for endowments, foundations, and sovereign funds are dropped from the regression because each type has equity in less than four Chapter 11 firms.

and the number of secured bonds issued by the firm.³⁷ The pattern of significance for the equity estimates from the previous regression is unaffected (excepting corporations). While none of the bond ownership variables are statistically significant, the probability of an exchange offer increases with the numbers of bonds and subordinated bonds and decreases with the value of bonds issued and the number of bond holders. Notice also that the revenue size effect drops away in the last column of Table 16, to be replaced by two new size effects: assets (positive) and liabilities (negative).

A common view (Demiroglu and James, 2015; Chu et al., 2019) is that the probability of an exchange offer decreases with the complexity of the restructuring as measured by firm size.³⁸ We find mixed evidence in this regard, since the probability of an exchange offer increases with total assets but decreases with total liabilities. Further, the probability of an exchange offer increases with the the number of bonds but decreases with the total value of bonds issued and the number of bondholders.

While debt and equity investors in distressed firms often have conflicting incentives, Chu et al. (2019) argue that simultaneous holdings of debt and equity in the same firm mitigate this conflict. Their empirical analysis supports this argument: simultaneous debt and equity ownership increases the probability of out-of-court restructuring. We examine the Chu et al. (2019) finding by adding measures of the proportion of shares (bonds) held by institutional investors with contemporaneous bond (equity) holdings for each firm in the sample.³⁹ We find no evidence that simultaneous bond and equity holdings are related to the restructuring decision. To further investigate, we supplement the model in the fourth column of Table 16 with one of the four quarterly measures of either *edual* or *ddual*. We find *bdual* is never significant while *edual* is significant when measured at Q2 (10% level), Q3 (1% level), and Q4 (5% level).

While we are settled on the use of Q1 financial information, it is an open question as to which quarterly measures of equity and bond holdings provide the best fit. Investors able to anticipate financial distress may modify their positions either directly to influence the firm's decision or indirectly to profit from it. Moreover, because the equity market is more active

³⁷Investor types with fewer than 10 observations of positive bond or equity holdings are excluded. Thus, bond holdings for brokerage firms, endowments, individual investors, others, and sovereign funds and equity holdings for endowments, foundations, and sovereign funds are dropped from the regression.

³⁸Chu et al. (2019) also defines complexity as one hundred times the number of debt claimants divided by total liabilities.

³⁹Thus, *edual* measures the proportion of shares in a firm held by investors that also hold bonds; *bdual* measures the proportion of a firm's bonds held by investors that also hold equity.

than the bond market and shares are more liquid than bonds, there is no reason to expect that the chosen quarters will be the same. Therefore, we consider all 16 possible combinations of the 4 quarterly equity holdings and 4 quarterly bond holdings measures. Tables 17 and 18 report the estimates from the 16 regressions. For continuity, the last column of Table 16, corresponding to Q1 equity holdings and Q1 bond holdings, is reproduced as the first column in Table 17.

The first striking feature of Tables 17 and 18 is that effects of the financial variables are robust to changes in the quarters for equity and bond holdings. In terms of magnitude and significance, the impact of the financial variables is more or less uniform across the 16 models and reflects the results reported in the last column of Table 16. Likewise, the debt variables largely are not significant, with the exception of the negative estimate for outstanding debt. The lack of significance among the debt variables is at odds with Demiroglu and James (2015), which finds that the likelihood of court-supervised restructuring increases with the proportion of traditional bank loans and decreases with the proportion of institutional loans and loans held by CLOs. The discrepancy could be due to the highly decomposed loan data in Demiroglu and James (2015) (loans are separated into bank, institutional, CLO, etc. components) compared with our aggregate loan measures. In support of this explanation, Demiroglu and James (2015) find no effect when using broadly defined bank loans. In all regressions, outstanding shares are strongly positively associated with Chapter 11 while the financial crisis dummy variables are mostly not significant.

While the regressions in Tables 17 and 18 are non-nested because the quarters for the bond and equity holding measures differ, the dependent variable, sample size, and list of variables are identical across the 16 models. Thus, we may use goodness of fit (in this case the pseudo R^2) to determine the 'best' quarters for bond and equity holding information. Figures 4 and 5 show the regression pseudo- R^2 values from Tables 17 and 18 for different combinations of quarters for equity and bond holding. Figure 4 shows the R^2 are higher when bond positions are measured at Q4 compared with any other quarter, irrespective of the equity quarter. Figure 5 shows the R^2 are higher when equity positions are measured at Q1 compared with any other quarter, irrespective of the bond quarter. Thus, the highest explanatory power is achieved when equity positions are measured at Q1 and bond positions at Q4, shown by the estimates in the fourth column in Table 17.

The goodness of fit findings are reflected in the Table 17 and 18 estimates, which show the Q1 equity holding variables are strongly significant for most investor types (first 4 columns

of Table 17) while, for bond holdings, Q4 produces the most significant variables (columns 4 and 8 in both Table 17 and Table 18). Thus, the probability of an exchange offer increases with the proportion of shares held by all investor types with the exception of corporations, family trusts and insurance companies. For bond holdings, there is evidence of a negative association for banks, insurance companies, and hedge funds (at Q2), along with a positive association for corporations. In terms of ownership, more concentrated share holdings are associated with Chapter 11 whereas more concentrated bond holdings have little impact. Lastly, the likelihood of an exchange offer increases with the numbers of subordinated and secured bonds.

5.2. Lasso results

As mentioned above, the large number of right-hand side variables in the logit regressions raises concerns about high standard errors and imprecise estimates due to multicollinearity. While there is clear evidence that the equity holding variables are strongly associated with exchange offers, the weaker performance of the bond holding variables as a group is potentially a side effect of multicollinearity.⁴⁰ Any attempt to reduce multicollinearity by eliminating covariates is fraught by the subjective order of elimination. For example, the debt variables as a group are candidates for removal, given their lack of significance, but the same could be said of the four financial variables that are not significant across the 16 regressions. Eliminating variables is also open to ‘selective inference’ and related doubts about model robustness. Thus, we turn to lasso (least absolute shrinkage and selection operator) estimation, the chief advantage of which is a systematic, algorithm-driven method for variable selection.

The lasso (Tibshirani, 1996) method is designed to remove variables in a multiple regression that are not truly associated with the response, leading to a model that is more readily interpreted. The lasso coefficients $\gamma = (\gamma_0, \gamma_1, \dots, \gamma_p)$, with γ_0 as the intercept, minimize

$$-L(\gamma) + \lambda \sum_{j=1}^p |\gamma_j|$$

where L is the log-likelihood from logistic regression and λ is the lasso ‘penalty’ parameter.

When $\lambda = 0$, the lasso optimization reduces to the maximum likelihood logistic regression estimator. As λ increases, the ‘cost’ of each non-zero γ_j increases and the coefficients are ‘shrunk’ towards zero. Because the penalty term includes the absolute value of each γ_j , it has a kink at zero, which causes some of the estimated coefficients to be exactly zero at the optimal

⁴⁰Given the profusion of debt-related variables in the logit regressions, it is more likely that bond holdings are subject to collinearity than equity holdings.

solution. For a large enough λ , the penalty term is so high that the optimization leads all of the estimated coefficients to be exactly zero. As λ decreases below this value, the number of non-zero coefficients increases. Selection follows optimization: variables with non-zero coefficients are selected; variables coefficients of zero are not selected.

The value for λ must be chosen before optimization. There are several ways to choose λ ; we choose cross-validation (CV).⁴¹ CV finds the λ that minimizes the out-of-sample mean-squared error (MSE) of the predictions. For a given λ , the sample is randomly divided into K sub-samples or ‘folds’. For a single fold k , the mean squared error, MSE_k , is computed using the γ estimated from the data in the other $K-1$ folds. The procedure is repeated K times, resulting in K estimates of the MSE. Averaging the K MSE values yields the out-of-sample prediction error for the given λ . Using a grid search over λ , the value that produces the smallest average out-of-sample MSE is chosen to be the optimal λ .⁴²

The results from lasso variable selection are summarized in Table 19.⁴³ Because the lasso penalty parameter is chosen by CV, each time lasso is executed results in potentially a different set of selected variables. Thus, we repeat lasso estimation 50 times, resulting in 50 sets of selected variables. As it happens, a core of 15 variables are selected by lasso in each of the 50 passes, denoted with an ‘X’ in the column headed 15 in Table 19. The exact configuration of 15 variables is selected only once, as indicated by the ‘1’ in column 15 for frequency combination selected. Similarly, 16 variables are selected 19 times—the core plus bank debt to outstanding debt ratio; 17 variables are selected 16 times—the 16 variables plus the percentage of shares held by venture capital/private equity funds; 20 variables are selected 11 times—the 17 plus the cash to assets ratio and the percentage of bond holdings by investment advisors and venture capital/private equity funds; and 21 variables are selected 3 times—the 20 plus the secured debt to outstanding debt ratio. It is worth noting that the lasso always selects at least one variable from each broad class—financial variables, debt variables, share holdings, bond holdings, and bond number variables—which endorses the overall approach to the specification of the variables in the model.

Following Paraschiv et al. (2020) and others, we use the variables selected by lasso to estimate parsimonious logit regressions. The marginal effects are reported in Table 20. Compared

⁴¹The Bayesian information criterion and the Akaike information criterion are also used to choose λ .

⁴²There are many implementations of the lasso algorithm: we use the lasso command in Stata 17. For further detail on the lasso estimator in Stata, see the reference manual StataCorp (2021).

⁴³To conserve space, we consider only the regression using Q1 equity holdings and Q4 bond holdings, which was the most preferred model from Tables 17 and 18.

to the earlier results, the log-likelihood is higher and the pseudo R^2 is lower, which follows from the smaller number of covariates, while the adjusted pseudo R^2 , AIC, and BIC all show substantial improvements over Tables 17 and 18.⁴⁴ Thus, controlling for the number of covariates, the fit substantially improves over the larger models. Interestingly, two of the variables selected by lasso, the current portion of LTD to liabilities ratio and bank debt to outstanding debt ratio, reverse sign and become statistically significant in the post-lasso specification. More than likely this is due to the reduction in multicollinearity that follows from the parsimonious specification and illustrates our motivation for using the lasso approach.

If we compare across the models reported in Table 20, the log-likelihood and pseudo R^2 for 21 variables is the highest, as expected, whereas the adjusted pseudo R^2 and AIC favour the model with 17 variables, and the BIC favours the model with 21 variables. Overall, there is little to choose between the models: the differences in the AIC, for example, between the best- and worst-performing models is less than 1%. Most importantly, the marginal effects are stable and the pattern of statistical significance is similar across the models, demonstrating that the results are robust to variations in specification. Note also that the lasso selects 4-5 of the share holdings variables and 4-6 of the bond holding variables, validating the key finding that asset ownership is an important factor in decisions at restructuring firms.

At the investor type level, it is apparent that all five of the share holdings variables are positively associated with exchange offers. Relatively higher share holdings by governments, hedge funds, investment advisors, pension funds, and venture capital/private equity funds are all positively associated with exchange offers (or negatively with Chapter 11). For bond holdings the picture is slightly more mixed: higher bonds holdings by banks, hedge funds, insurance companies, investment advisors, and venture capital/private equity funds are all negatively associated with exchange offers (or positively with Chapter 11), while corporation bond holdings have the opposite association. Overall, therefore, it appears that larger equity positions and smaller bond positions are associated with exchange offers.

Ignoring venture capital/private equity funds, where the estimates are weak (or zero for the models with fewer than 17 variables), only hedge funds and investment advisors appear in both share and bond holdings. This suggests two things. First, to the extent that investor types hold shares and bonds, they seem to pick one asset or the other to exert influence. For example, banks, corporations, and insurance companies appear to use bond holdings to exert

⁴⁴Akaike information criterion (AIC) and Bayes Information criterion (BIC) are fit criteria to choose between models in Lasso regression.

influence while governments and pension funds use share holdings. Second, given they both have bond and share holdings associated with the restructuring decision, hedge funds and investment advisors seem to be more active than other investor types. The case of hedge funds is especially interesting: share holdings by hedge funds are positively associated with exchange offers, whereas bond holdings by hedge funds are positively associated with Chapter 11. An explanation is that hedge funds behave opportunistically in restructuring depending on the circumstances, using bond holdings to support Chapter 11 and share holdings to support an exchange offer. This is consistent with the active role of hedge funds mentioned earlier.

6. Discussion

One of the contributions of our work is the use of quarterly data on levels of stock and bond ownership for all categories of investors. This allows us to determine the impact of ownership levels not merely just at a single point in time but over the entire four quarters preceding the reorganization decision. The 16 regressions (4 quarterly equity measures \times 4 quarterly bond measures), however, does make it a little difficult to see the quarter-by-quarter dynamics of the ownership effects. To overcome this difficulty, we summarize the signs and significance levels of the ownership estimates.

Table 21 summarizes the sign counts (negative ‘-’ or positive ‘+’) of the marginal effects in Tables 17 and 18 (where bond ownership is measured relative to bonds issued). Table 21 is arranged with bond quarters listed in columns (separately for negative and positive) and equity quarters listed in rows. In the ‘shares’ panel of Table 21, note that the entry corresponding to a negative sign for bond Q3 and equity Q3 (i.e., in the regression using the bond and equity measures for 3 quarters prior to restructuring) is a 5. This means 5 of the 10 equity investor types share holdings were *negatively* associated with the reorganization decision (i.e., Chapter 11). Because there are 10 equity investor types, it follows that 5 of the 10 equity investor type share holdings were *positively* associated with the decision (i.e., exchange offer), as displayed in corresponding cell for bond Q3 and equity Q3 under the ‘+’. Similarly, in the ‘bonds’ panel of Table 21, e.g., for bond Q4 and equity Q2, the bond holdings of 4 of the 6 investor types are negatively associated with the decision (i.e., Chapter 11), while the bond holdings of 2 types are positively associated with the decision (i.e., exchange offer).

An interesting feature of Table 21 is the pattern in the values. For the shares panel, the values are the same row-by-row for either positive or negative signs, with only one exception. For example, for equity Q2, there are 3 negative marginal effects and 7 positive marginal

effects regardless of the bond quarter. Similarly for equity Q1 and Q4, where the numbers of negative (or positive) marginal effects are the same across all bond quarters. The only exception is equity Q3, where there are 5 negative and 5 positive marginal effects for bond Q3 compared with 4 negative and 6 positive effects for each of the three other bond quarters. For the bonds panel, the values are the same column-by-column for either positive or negative signs, with three exceptions. For example, for bond Q2, there are 5 negative marginal effects and 1 positive marginal effect regardless of the equity quarter. For each of the other bond quarters, the numbers of positive and negative effects are the same for three of the four equity quarters.

Thus, in Table 21, the row pattern in the shares panel indicates that the direction of the association of equity ownership does not depend on the bond quarter, while the column pattern in the bonds panel indicates the direction of the association of bond ownership does not depend on the equity quarter. It follows that the bond and equity ownership associations with restructuring are independent of one another. Independence of equity ownership and bond ownership in the restructuring decision suggests, at least at the aggregate level, that investor groups focus their attempts to affect the process on either one instrument or the other.

The second pattern that emerges from Table 21 concerns the timing of the associations between ownership and restructuring. For the shares panel, the number of negative (positive) associations between levels of equity ownership and restructuring changes from 7 (3) at equity Q4, to 4-5 (6-5) at equity Q3, to 3 (7) at equity Q2, and lastly to zero (10) at equity Q1. In other words, the closer to the decision, the greater the proportion of positive associations; at Q1, higher share holdings of all 10 institutional investors are associated with an exchange offer. In Table 22, which shows counts of statistical significance, 7-8 of the effects (depending on the bond quarter) are significant at the 10% level, indicating strong effects of share ownership just before restructuring on exchange offer as the final decision.

For bonds, the pattern is the opposite: bond ownership associations are significant further from restructuring, not closer to it, and the effects are associated with Chapter 11, not an exchange offer. From the bonds panel in Table 21, the number of negative (positive) associations between levels of bond ownership and restructuring changes from 4-5 (1-2) at bond Q4 and bond Q3, to 5 (1) at bond Q2, and lastly to 1-2 (4-5) at bond Q1. Table 22 shows that almost none of the positive marginal effects are significant while the largest number of significant negative effects (3) occurs at bond Q4, while none of the negative effects are significant either for bond Q1. Thus, the further from the decision, the greater the proportion of negative associ-

ations such that, at Q4, 5 of the 6 institutional investor bond levels are associated with Chapter 11. In other words, for all investors higher bond ownership one year before restructuring is associated with Chapter 11 as the final decision.

Several remarks follow from these patterns. First, *ceteris paribus*, it follows that the preferred regression from the 16 regressions across Tables 17 and 18 corresponds to that with the equity Q1 and bond Q4 measures, which confirms the earlier conclusion from the BIC. The Table 22 summary of statistical significance indicates that, the closer to Q1 (Q4), the more equity ownership gains (loses) importance, while more bond ownership loses (gains) importance.

This leads to the second remark: equity and bond ownership each play different roles depending on the time remaining before the decision. Besides endorsing our use of quarterly data, it implies that understanding asset ownership across time is important to gain a full understanding of the restructuring process. Much of the literature that takes a ‘snapshot’ approach by considering variables measured at a single period prior to restructuring (typically either 3 months, 6 months, or 12 months prior) is likely to miss relevant detail on the dynamics of the process.

A third remark is that, because both shares and bonds are linked to restructuring, it is important to consider data on ownership across different types of investment (bonds and equity) as well as different types of investor in empirical work. This endorses our approach of considering all possible influences at once, as opposed to concentrating on specific combined investment-investor effects, such as loans by banks, or shares held by hedge funds, in isolation.

Lastly, control of a firm through equity, which on average is associated with exchange offers, and control of the firm through bonds, which on average is associated with Chapter 11, are demonstrably different in terms of their impact on restructuring. These findings potentially pose fertile ground for future research into more general issues of ownership and control at firms beyond the restructuring process.

Additional findings around timing and the restructuring decision in Tables 17 and 18 follow from a closer look at individual investor effects. In terms of timing, equity ownership by corporations, governments, insurance companies, and pension funds is significantly related to the decision two to four quarters before the decision, whereas the effects for hedge funds, individuals, investment advisors, and venture capital/private equity are significant only in the last quarter before the decision. This is consistent with different investors moving to assert their ownership rights on the decision at different times: some early in the process and some later. This stands in contrast to the timing of bond ownership effects, which for banks, hedge

funds, and insurance companies are significant only for two or more quarters preceding the decision.

In terms of the decision, the analysis uncovers some interesting findings for particular investors. In particular, aggregate hedge fund share holdings are significantly related to exchange offers while aggregate hedge fund bond holdings are significantly associated with Chapter 11. This is very interesting, and is consistent with hedge funds, on average, targeting the restructuring decision explicitly to profit from the outcome as opposed to simply protecting their investments. Since this finding is unique to hedge funds, it is also consistent with all of the other creditors, on average, seeking protection for their positions as opposed to actively seeking out restructuring as an opportunity. What does this say about individual hedge funds? At present, we are unable to answer this question because in this paper hedge fund holdings are measured in the aggregate.⁴⁵

Holdings by corporations are also associated with exchange offers as shareholders and Chapter 11 as bondholders, but their bondholder effects are weak. Arguably, corporations are involved in restructuring by default through subsidiaries or partners, placing them in a different class to other investors (including hedge funds). For example, a corporation might have a particular interest in saving a subsidiary that provides key inputs or expertise. While plausible, however, that would not explain why corporate ownership behaves differently across shares and bonds as the results indicate.

Government share holdings are strongly related to exchange offers, which is consistent with the default 'job saving' position of governments as well as with the political considerations that arise from shares ownership in the first place, given that public ownership is rare in the U.S., where it would seem anomalous for a large shareholder to favour bankruptcy.

Lastly, to the extent that insurance company holdings are related to the decision, it is only apparent for three to four quarters before restructuring; insurance company marginal effects are never significant for either asset one or two quarters before restructuring. This is consistent with insurance companies moving early in the restructuring process for both equity and bonds. Moreover, regardless of the asset, insurance companies holdings are always associated with Chapter 11. It remains an open question as to whether there is an intrinsic reason why insurance companies move early, which could be related to regulatory requirements in that industry.

⁴⁵Our data include individual hedge fund holdings and we plan to examine the issue in future work.

7. Conclusion

We analyze the financially distressed firm's restructuring decision between Chapter 11 and an exchange offer. We control for a comprehensive set of factors that could influence the decision, such as financial characteristics and capital structure, but, unlike previous studies, we also include exhaustive data on equity and bond ownership by institutional investors. Also unlike earlier work, we use quarterly data, which allows us to begin to understand the complex relationships at play in what is a complex setting. We believe we have uncovered some genuinely new and interesting findings. Generally speaking, bond holders favour Chapter 11 and equity holders favour exchange offers. Nevertheless there is much heterogeneity across investors: the holdings of individual investors have different associations with restructuring, endorsing our approach of considering all investor types at once, as opposed to concentrating on individual investors that are viewed to be pivotal. Our analysis uncovers different behaviour across time, across investors, and across the assets controlled by those investors. To fully understand the complex restructuring process it is necessary to consider all of these angles. Investors have different objectives based on different motivations, all of which are obscured by an aggregate view that does not account for individual investor holdings.

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Table 1: Number of Chapter 11 and Exchange Offer cases by year

Year	Year of Filing		Year of Distress	
	Chapter 11	Exchange Offer	Chapter 11	Exchange Offer
1999	0	3	0	0
2000	2	10	11	12
2001	12	8	22	15
2002	14	10	9	6
2003	13	7	6	6
2004	6	3	5	6
2005	5	10	2	3
2006	2	2	1	1
2007	1	2	6	10
2008	2	11	14	13
2009	17	15	3	7
2010	5	4	6	8
2011	4	7	5	1
2012	7	6	7	8
2013	6	6	5	6
2014	5	4	12	5
2015	10	9	11	18
2016	15	18	6	13
2017	4	3	0	0
2018	1	0	0	0
Total	131	138	131	138

Figure 1: Chapter 11 and Exchange Offer cases by year of distress

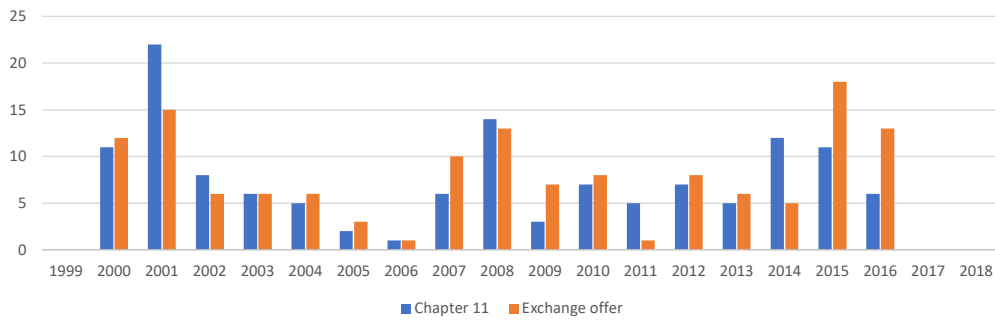


Figure 2: Chapter 11 and Exchange Offer cases by year of filing

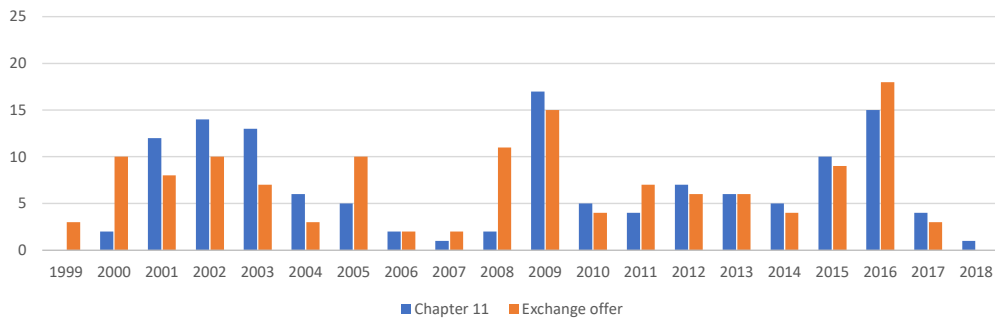


Figure 3: Chapter 11 and Exchange Offer cases by industry

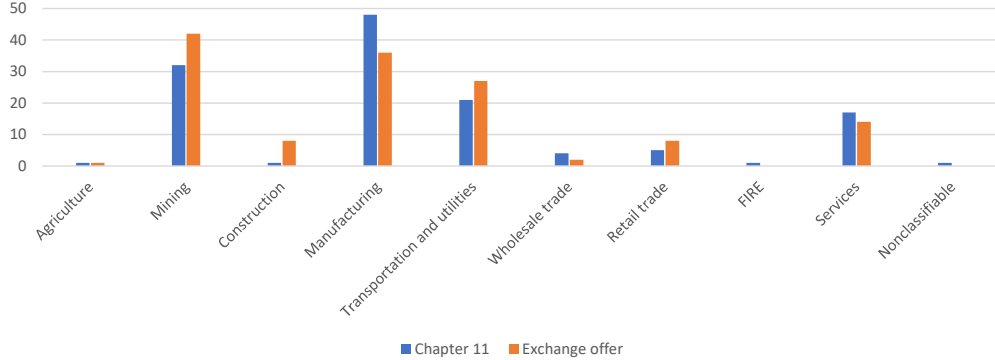


Table 2: Variable list and description

Variable name	Description
<i>Balance Sheet</i> ¹	
cash	Real total cash and short-term investments
ca	Real total current assets
ppe	Real gross property, plant and equipment
ta	Real total assets
citax	Real current income taxes payable
cltd	Real current portion of long term debt (due in 1 year)
cl	Real total current liabilities
ltd	Real long term debt
tl	Real total liabilities
<i>Income Statement</i> ¹	
rev	Real total revenue
int	Real interest expenses
ni	Real net income
ebit	Real earnings before interests and taxes
ebitda	Real earnings before interests, taxes, depreciation and amortization
<i>Capital Structure</i> ¹	
termloan	Real term loans
bondsnotes	Real total bonds and notes (senior, unsecured, secured)
senior	Real total senior debt
convert	Real total convertible debt
bank	Real total bank debt
sec	Real total secured debt
unsec	Real total unsecured debt
debtout	Real total debt outstanding
sharesout	Number of common shares outstanding (Balance Sheet / 10Q)
<i>Filing information</i>	
filing	Dummy variable: 1 if exchange offer; 0 if Chapter 11
ydistress	Year of distress
yfiling	Year of filing for Chapter 11 or exchange offer
qfiling	Quarter of filing
success	Dummy variable: 1 if succeed in Chapter 11 or exchange offer; 0 otherwise
dual	Dummy variable: 0 if EO or Chapter 11 alone; 1 if EO followed by Chapter 11 (< 730 days)
time	Number of days between the EO and Chapter 11, if applicable (-99 otherwise)
daysem	Number of days to emerge from Chapter 11 or exchange offer
prepack	Dummy variable: 1 if prepack plan in Chapter 11; 0 otherwise
preneg	Dummy variable: 1 if pre-negotiated plan in Chapter 11; 0 otherwise
freefall	Dummy variable: 1 if free fall plan in Chapter 11; 0 otherwise
sales	Dummy variable: 1 if sales of assets in Chapter 11; 0 otherwise
aprdev	Dummy variable: 1 if APR deviation for equityholders in Chapter 11; 0 otherwise
dipfin	Dummy variable: 1 if DIP financing in Chapter 11; 0 otherwise
sic	Standard Industrial Classification

continued on next page

Table 2: continued from previous page

Variable name	Description
<i>Equity holdings²</i>	
tsharehold	Total number of shares held by investors
peBAN	Percentage of shares outstanding held by banks
peBRO	Percentage of shares outstanding held by brokerage firms
peCOR	Percentage of shares outstanding held by corporations
peEND	Percentage of shares outstanding held by endowments
peFAM	Percentage of shares outstanding held by family offices
peFOU	Percentage of shares outstanding held by foundations
peGOV	Percentage of shares outstanding held by government
peHED	Percentage of shares outstanding held by hedge funds
peIND	Percentage of shares outstanding held by individuals and insiders
peINS	Percentage of shares outstanding held by insurance companies
peINV	Percentage of shares outstanding held by investment advisors
peOTH	Percentage of shares outstanding held by others
pePEN	Percentage of shares outstanding held by pension funds
peSOV	Percentage of shares outstanding held by sovereign funds
peVCP	Percentage of shares outstanding held by vc-pe firms
shares5	Total share holdings by top 5 shareholders (Q1)
shares10	Total share holdings by top 10 shareholders (Q1)
pshares5	Percentage of shares outstanding held by top 5 shareholders (Q1)
pshares10	Percentage of shares outstanding held by top 10 shareholders (Q1)
<i>Bonds issued³</i>	
dbi	Dummy variable if the firm has bonds reported in Bloomberg
bondissue	Total market value of bonds issued by the company
nbonds	Total number of bonds
nbholders	Total number of bondholders
ndefault	Total number of bonds in default
nsubord	Total number of subordinate bonds
nsrsubord	Total number of senior subordinate bonds
nunsec	Total number of unsecured bonds
nsrunsec	Total number of senior unsecured bonds
nsec	Total number of secured bonds
nsrsec	Total number of senior secured bonds
n1lien	Total number of 1st lien bonds
n1.5lien	Total number of 1.5 lien bonds
n2lien	Total number of 2nd lien bonds
n3lien	Total number of 3rd lien bonds

continued on next page

Table 2: continued from previous page

Variable name	Description
<i>Bond holdings</i> ¹	
tbdhold	Total value of bonds held by investors
pbrBAN	Percentage of bonds held by banks over total bond holdings reported
pbrBRO	Percentage of bonds held by brokerage firms over total bond holdings reported
pbrCOR	Percentage of bonds held by corporations over total bond holdings reported
pbrEND	Percentage of bonds held by endowments over total bond holdings reported
pbrFAM	Percentage of bonds held by family offices over total bond holdings reported
pbrFOU	Percentage of bonds held by foundations over total bond holdings reported
pbrGOV	Percentage of bonds held by governments over total bond holdings reported
pbrHED	Percentage of bonds held by hedge funds over total bond holdings reported
pbrIND	Percentage of bonds held by individuals and insiders over total bond holdings reported
pbrINS	Percentage of bonds held by insurance companies over total bond holdings reported
pbrINV	Percentage of bonds held by investment advisors over total bond holdings reported
pbrOTH	Percentage of bonds held by others over total bond holdings reported
pbrPEN	Percentage of bonds held by pension funds over total bond holdings reported
pbrSOV	Percentage of bonds held by sovereign funds over total bond holdings reported
pbrVCP	Percentage of bonds held by vc-pe firms over total bond holdings reported
pbiBAN	Percentage of bonds held by banks over total bonds issued
pbiBRO	Percentage of bonds held by brokerage firms over total bonds issued
pbiCOR	Percentage of bonds held by corporations over total bonds issued
pbiEND	Percentage of bonds held by endowments over total bonds issued
pbiFAM	Percentage of bonds held by family offices over total bonds issued
pbiFOU	Percentage of bonds held by foundations over total bonds issued
pbiGOV	Percentage of bonds held by governments over total bonds issued
pbiHED	Percentage of bonds held by hedge funds over total bond issued
pbiIND	Percentage of bonds held by individuals and insiders over total bonds issued
pbiINS	Percentage of bonds held by insurance companies over total bonds issued
pbiINV	Percentage of bonds held by investment advisors over total bonds issued
pbiOTH	Percentage of bonds held by others over total bonds issued
pbiPEN	Percentage of bonds held by pension funds over total bonds issued
pbiSOV	Percentage of bonds held by sovereign funds over total bonds issued
pbiVCP	Percentage of bonds held by vc-pe firms over total bonds issued
bond5	Total bonds held by top 5 bondholders (Q1)
bond10	Total bonds held by top 10 bondholders (Q1)
pbond5i	Percentage of bonds held by top 5 bondholders (Q1) over total value of bond issued
pbond10i	Percentage of bonds held by top 10 bondholders (Q1) over total value of bond issued
bdual	Percentage of bonds issued held by investor types with simultaneous bonds and equity holdings
edual	Percentage of shares held by investor types with simultaneous bonds and equity holdings

¹ Source: Capital IQ *Balance Sheet, Income Statement, Capital Structure Summary*.

² Source: Capital IQ *Public Ownership / Detailed*.

³ Source: Bloomberg.

Table 3: List of standardized investor types used in the paper

Reported investor type (Source)	Standardized type
Banks/Investment Banks (CIQ)	Bank
Bank (Bloomberg)	Bank
Bank/Investment Advisor (Bloomberg)	Bank
Brokerage (CIQ and Bloomberg)	Brokerage
Business Development Corp (Bloomberg)	Corporation
Corporations (Bloomberg)	Corporation
Corporations - Private (CIQ)	Corporation
Corporations - Public (CIQ)	Corporation
Holding Company (Bloomberg)	Corporation
Endowment (Bloomberg)	Endowment
Educational/Cultural Endowments (CIQ)	Endowment
Family Offices/Trusts (CIQ)	Family Offices/Trusts
Trust (Bloomberg)	Family Offices/Trusts
Charitable Foundations (CIQ)	Foundation
Foundations (Bloomberg)	Foundation
Company Controlled Foundations (CIQ)	Foundation
Government (Bloomberg)	Government
Hedge Fund (Bloomberg)	Hedge Fund
Hedge Fund Managers (< 5% stake) (CIQ)	Hedge Fund
Hedge Fund Managers (> 5% stake) (CIQ)	Hedge Fund
Individuals/Insiders (CIQ)	Individual/Insider
Chairman of the Board (Bloomberg)	Individual/Insider
Insurance Companies (CIQ)	Insurance Company
Insurance Company (Bloomberg)	Insurance Company
Investment advisor (Bloomberg)	Investment Advisor
REITs (CIQ)	Investment Advisor
Traditional Investment Managers (CIQ)	Investment Advisor
Other (Bloomberg)	Other
Unclassified (CIQ)	Other
Unknown (CIQ)	Other
Corporate Pension Sponsors (CIQ)	Pension Fund
Government Pension Sponsors (CIQ)	Pension Fund
Pension Fund (Bloomberg)	Pension Fund
Union Pension Sponsors (CIQ)	Pension Fund
Sovereign Wealth Funds (< 5% stake) (CIQ)	Sovereign Wealth Fund
Sovereign Wealth Fund (Bloomberg)	Sovereign Wealth Fund
Private Equity (Bloomberg)	VC/PE Firm
VC/PE Firms (< 5% stake) (CIQ)	VC/PE Firm
VC/PE Firms (> 5% stake) (CIQ)	VC/PE Firm
Venture capital (Bloomberg)	VC/PE Firm

Table 4: Alpha Natural Resources Inc., bond holdings¹

Investor	Q4	Q3	Q2	Q1
ALLIANZ SE	0	2,960	2,860	2,860
AMERICAN MONEY MANAGEMENT LLC	206	206	206	206
AMERIPRISE FIN GRP	9,600	5,200	5,200	5,200
AUTOMOBILE CLUB MICHIGAN GROUP	600	0	0	0
BARCLAYS PLC	650	650	650	650
BLACKROCK	350	350	350	0
CAPITAL GROUP COMPANIES INC	105,650	104,550	0	0
CATALYST CAPITAL ADV LLC	2,930	2,930	4,787	5,571
DIAMOND INSURANCE COMPANY	428	428	428	428
EUROMOBILIARE INTERNATIONAL FUND	1,130	0	0	0
FIL LIMITED	70	27	27	7,089
FMR LLC	4,807	4,557	4,766	4,804
GERMANIA INSURANCE GROUP	180	180	180	0
GUGGENHEIMINVESTMENT ADVISOR	0	0	0	1,250
INVESCO LTD	8	8	8	0
JACKSON NATIONAL GROUP	10,000	10,000	10,000	10,000
JPMORGAN CHASE & CO	85	0	0	0
KORNITZER CAPITAL MANAGEMENT INC	12,000	12,000	12,000	12,000
MOTORISTS MUTUAL GROUP	110	110	110	0
NATIONAL ASSET MANAGEMENT INC	0	4,500	0	0
NEUBERGER BERMAN GROUP LLC	75,906	8,976	0	0
NOMURA	850	925	3,025	3,025
NOMURA CORP RESEARCH & ASSET	5,000	5,000	5,000	100
NORD EST ASSET MANAGEMENT SA	1,050	1,050	1,050	1,050
NORTHERN TRUST CORPORATION	795	0	0	0
PHILADELPHIA INDEMNITY INSURANCE	0	0	100	100
PRINCIPAL FINANCIAL GROUP INC	1,925	0	0	0
PRUDENTIAL PLC	5,000	5,350	5,350	5,350
SAFETY NATIONAL CASUALTY CORP	0	225	225	225
SMH CAPITAL ADVISORS INC	3,669	3,515	3,515	3,515
STATE OF CALIFORNIA	525	525	525	809
STATE STREET CORP	250	15,115	16,115	1,884
SUMMIT SECURITIES GROUP LLC	50	50	50	0
SWISS LIFE AG	3,000	3,000	3,000	3,000
UNITED SERVICES AUTOMOBILE ASSOC	5,000	4,000	4,000	4,000
WBL GROUP	2,610	2,610	2,610	2,610
YORKTOWN MANAGEMENT & RESEARCH C	1,000	1,000	0	0

¹ CUSIP: 02076XAD4; Amount issued: 500M; Coupon rate: 9.75%; Rank: Sr. unsecured; Maturity: April 15, 2018.

Table 5: Number of bond holders and equity holders by investor type

Investor type	Bondholder	Equityholder	Total
Bank	45	137	182
Brokerage	5	4	9
Corporation	16	126	141
Endowment	1	13	14
Family office or trust	3	251	254
Foundation	7	11	18
Government	3	4	7
Hedge fund	153	777	930
Individual investor	1	3,056	3,057
Insurance company	642	142	784
Investment advisor	465	2,121	2,586
Other	6	8	14
Pension fund	12	68	80
Sovereign wealth fund	1	7	8
VC/PE firm	11	119	130
Total	1,370	6,844	8,214

Table 6: Descriptive statistics: Financial variables at Q1

Variable ¹	Chapter 11 (n = 131)				Exchange Offer (n = 138)				test for difference ²	
	Mean	Median	Std. dev.		Mean	Median	Std. dev.		mean ³	median ⁴
<i>Balance sheet</i>										
Total assets	1,382.6	574.6	2,275.2		2,521.1	955.4	3,940.2		***	**
Cash and equivalent	103.2	27.6	194.5		239.7	53.7	892.4		*	**
Current assets	372.0	173.1	547.7		700.8	188.2	1,312.0		***	***
Property, plant and equipment	1,428.1	444.7	2,514.2		2,088.5	521.9	3,585.9		*	*
Cash and equivalent / Assets	9.7	5.4	13.2		12.8	5.6	19.4			
Current assets / Assets	35.3	30.4	21.8		35.7	27.0	26.5			
PPE / Assets	118.7	78.1	152.8		105.8	71.5	142.7			
Total liabilities	1,566.8	637.6	2,318.7		2,136.0	721.2	3,262.3		*	*
Current portion LTD	649.5	205.9	1,128.3		125.2	5.1	504.9		***	***
Current liabilities	926.1	376.5	1,423.2		483.0	160.8	849.9		***	***
Long term debt	398.1	23.1	1,110.3		1,323.0	408.9	2,182.8		***	***
Current portion LTD / Liabilities	42.3	44.9	35.0		11.2	0.5	24.2		***	***
Current liabilities / Liabilities	64.6	79.3	33.6		34.3	19.9	30.8		***	***
LTD / Liabilities	24.6	3.5	31.7		54.3	63.7	29.9		***	***
Assets / Liabilities	89.1	86.9	36.8		132.4	115.1	89.7		***	***
<i>Income statement</i>										
Revenue	198.9	85.9	310.6		351.7	102.8	695.8		**	**
EBIT	-55.4	-8.0	296.1		-7.4	-1.9	115.7		*	*
EBITDA	3.1	-0.5	47.7		28.7	10.6	114.3		**	***
Interest expense	24.6	12.3	33.6		29.0	10.3	45.8			
Net income	-157.4	-40.2	400.0		-124.1	-20.4	318.3			
EBIT / Revenue	-46.0	-14.8	135.8		-57.5	-3.0	375.2			**
EBITDA / Revenue	-13.6	-1.0	55.8		-6.2	6.8	170.5			***
EBITDA / Interest expense	-66.7	-0.4	376.6		-9.7	65.8	1,235.5			***
Interest expense / Revenue	26.8	14.5	37.5		22.2	10.7	35.8			

¹ Levels are reported in millions of 2nd quarter, 2002 U.S. dollars, deflated by the (seasonally adjusted) GDP price deflator; ratios are reported in percent. (Source: Capital IQ.)

² Statistical significance denoted by *** at the 1% level, ** at the 5% level, and * at the 10% level.

³ Mean comparison *t* test.

⁴ Quantile regression *t* test for equality of medians.

Table 7: Descriptive statistics: Change in financial variables (Q1 – Q4)

Variable ¹	Chapter 11 (n = 131)			Exchange Offer (n = 138)			test for difference ²	
	Mean ³	Median	Std. dev.	Mean ³	Median	Std. dev.	mean ⁴	median ⁵
<i>Balance sheet</i>								
ΔTotal assets	-463.2**	-164.9	754.2	-222.8	-74.3	1,643.8		**
ΔCash and equivalent	-24.9**	-4.9	142.3	-13.6	-3.2	460.6		**
ΔCurrent assets	-88.1**	-25.0	201.6	-45.4	-23.1	503.1		
ΔProperty, plant and equipment	-151.4**	-7.3	731.2	-4.0	-0.3	1,303.0		
ΔCash and equivalent / Assets	0.0	0.1	7.7	0.3	-0.1	8.3		
ΔCurrent assets / Assets	2.3**	1.0	10.7	0.9	-0.3	10.6		
ΔPPE / Assets	33.2***	10.5	101.3	19.6***	4.8	83.6		
ΔTotal liabilities	-33.6*	-7.6	217.8	39.4	-4.9	963.3		***
ΔCurrent portion LTD	594.1***	135.4	1,134.1	51.0	0.0	535.8		***
ΔCurrent liabilities	585.0***	121.0	1,183.2	38.8	-2.5	576.9		***
ΔLong term debt	-628.6**	-143.7	1,161.0	-4.2	-3.6	880.4		***
ΔCurrent LTD / Liabilities	34.9***	29.9	37.6	5.9***	0.0	25.4		***
ΔCurrent liabilities / Liabilities	34.6***	27.8	37.6	4.7**	-0.1	26.6		***
ΔLTD / Liabilities	-35.6***	-38.5	36.4	-4.1*	0.1	25.7		***
ΔAssets / Liabilities	-31.3***	-23.6	32.9	-14.8***	-13.8	43.4		***
<i>Income statement</i>								
ΔRevenue	-40.1***	-11.3	107.9	-41.0***	-4.9	158.7		
ΔEBIT	-25.2	0.1	327.8	-4.8	-0.9	153.2		*
ΔEBITDA	-7.4	-2.3	56.7	-9.1	-2.1	140.2		***
ΔInterest expense	0.0	0.3	8.5	2.0	0.2	18.0		
ΔNet income	-56.5	-3.7	444.8	-49.8	-0.9	384.9		
ΔEBIT / Revenue	166.1	-1.0	2,017.8	2.4	-2.4	451.9		**
ΔEBITDA / Revenue	30.6	-1.9	353.9	19.5	-2.7	271.1		***
ΔEBITDA / Interest expense	75.9	-21.7	686.2	-54.7	-51.7	1,835.1		***
ΔInterest expense / Revenue	5.2**	2.1	24.7	-2.3	1.6	75.7		***

¹ Levels are reported in millions of 2nd quarter, 2002 U.S. dollars, deflated by the (seasonally adjusted) GDP price deflator; ratios are reported in percent. (Source: Capital IQ.)

² Statistical significance denoted by *** at the 1% level, ** at the 5% level, and * at the 10% level.

³ Mean comparison *t* test for Q1 and Q4.

⁴ Mean comparison *t* test for difference in the mean Q1-Q4 change between Chapter 11 and Exchange offer firms.

⁵ Quantile regression *t* test for difference in the median Q1-Q4 change between Chapter 11 and Exchange offer firms.

Table 8: Descriptive statistics: Capital structure at Q1¹

Variable ¹	Chapter 11 ($n = 131$)			Exchange Offer ($n = 138$)			test for difference ²	
	Mean	Median	Std. dev.	Mean	Median	Std. dev.	mean ³	median ⁴
<i>Debt</i>								
Debt outstanding	1,105.8	453.2	1,595.2	1,489.3	470.3	2,277.7		
Term loans	220.5	5.5	476.4	246.2	0.0	537.7		
Bonds and notes	741.7	286.2	1,174.8	1,091.1	368.1	1,683.8	**	
Senior debt	1,003.2	406.9	1,526.4	1,305.7	438.8	2,115.6		
Convertible debt	114.8	0.0	190.6	163.4	0.0	391.5		
Bank debt	351.3	121.8	591.6	363.7	57.0	711.1		
Secured debt	489.4	201.7	762.6	439.7	162.4	678.1		
Unsecured debt	625.0	219.6	1,067.9	1,075.6	350.8	1,882.9	**	*
Term loans / Debt out.	17.5	3.1	24.1	13.1	0.0	22.9		*
Bonds and notes / Debt out.	62.9	68.8	36.3	68.6	80.4	35.8		
Senior debt / Debt out.	85.0	100.0	28.6	84.1	100.0	35.9		
Convertible debt / Debt out.	21.2	0.0	33.5	21.0	0.0	36.8		**
Bank debt / Debt out.	33.1	27.6	31.3	27.0	14.7	30.8		**
Secured debt / Debt out.	47.9	46.9	33.8	40.8	34.4	35.6	*	**
Unsecured debt / Debt out.	53.6	55.7	33.9	60.2	66.7	38.9		*
Debt out. / Liabilities	71.2	77.2	19.5	68.1	73.2	20.4		*
Debt out. / Assets	103.2	84.7	84.1	66.5	60.8	48.4	***	***
Secured debt / Assets	47.9	29.8	52.3	28.2	19.6	32.1	***	*
<i>Equity</i>								
Number of shares outstanding	67.5	38.3	97.0	93.2	29.4	329.3		

¹ Levels are reported in millions of 2nd quarter, 2002 U.S. dollars, deflated by the (seasonally adjusted) GDP price deflator; ratios are reported in percent. The number of shares outstanding is reported in millions. (Source: Capital IQ, Balance Sheet, Supplemental Items.)

² Statistical significance denoted by *** at the 1% level, ** at the 5% level, and * at the 10% level.

³ Mean comparison t test.

⁴ Quantile regression t test for equality of medians.

Table 9: Descriptive statistics: Change in capital structure (Q1 – Q4)

Variable ¹	Chapter 11 ($n = 131$)			Exchange Offer ($n = 138$)			test for difference ²	
	Mean ³	Median	Std. dev.	Mean ³	Median	Std. dev.	mean ⁴	median ⁵
<i>Debt</i>								
Δ Debt outstanding	-3.4	-1.8	167.8	43.4	-2.3	753.7		
Δ Term loans	29.5	0.0	203.9	-7.2	0.0	185.1		
Δ Bonds and notes	-35.0*	-5.7	224.5	76.9	-2.5	603.4	**	
Δ Senior debt	-0.2	-2.3	172.4	62.8	0.0	637.5		
Δ Convertible debt	-10.7	0.0	94.8	7.9	0.0	201.7		
Δ Bank debt	60.0***	0.0	234.8	-38.4*	0.0	253.2	***	
Δ Secured debt	73.1**	0.0	395.7	60.9*	0.0	364.3		
Δ Unsecured debt	-80.7**	-3.0	407.7	12.5	-1.1	727.4		
Δ Term loans / Debt out.	1.5	0.0	11.2	-19.1	0.0	208.8		
Δ Bonds and notes / Debt out.	-2.2	-0.2	24.1	-0.2	0.0	37.6		
Δ Senior debt / Debt out.	-1.2	0.0	12.7	-18.7	0.0	211.1		
Δ Convertible debt / Debt out.	-0.4	0.0	11.9	-3.9	0.0	40.6		
Δ Bank debt / Debt out.	0.9	0.0	17.0	-19.6	0.0	200.6		
Δ Secured debt / Debt out.	1.2	0.0	15.4	-18.0	0.0	212.5		
Δ Unsecured debt / Debt out.	-2.4	0.0	21.7	-0.6	0.0	23.7		
Δ Debt out. / Liabilities	1.2	1.6	9.4	1.7*	0.8	12.1		
Δ Debt out. / Assets	35.4***	17.6	57.9	12.0***	8.0	40.2	***	***
Δ Secured debt / Assets	17.2***	7.3	36.1	5.8***	1.2	21.8	***	***
<i>Equity</i>								
Δ Number of shares outstanding	3.7*	0.2	23.3	22.8	0.2	184.4		

¹ Changes in levels are reported in millions of 2nd quarter, 2002 U.S. dollars, deflated by the (seasonally adjusted) GDP price deflator; changes in ratios are reported in percent. (Source: Capital IQ, Balance Sheet, Supplemental Items.)

² Statistical significance denoted by *** at the 1% level, ** at the 5% level, and * at the 10% level.

³ Mean comparison t test for Q1 and Q4.

⁴ Mean comparison t test for difference in the mean Q1-Q4 change between Chapter 11 and Exchange offer firms.

⁵ Quantile regression t test for difference in the median Q1-Q4 change between Chapter 11 and Exchange offer firms.

Table 10: Chapter 11 and Exchange Offer cases with reported bond or equity holdings, by investor type

Variable	Chapter 11 (<i>n</i> = 131)				Exchange Offer (<i>n</i> = 138)			
	Q4	Q3	Q2	Q1	Q4	Q3	Q2	Q1
<i>Bonds</i>	97	97	97	96	95	99	99	100
Bank	80	76	75	72	83	87	86	87
Brokerage	7	7	7	5	0	1	1	1
Corporation	20	20	17	15	38	40	40	39
Endowment	0	0	0	0	0	0	1	1
Family office	12	11	9	8	13	13	13	16
Foundation	11	11	9	9	14	15	14	13
Government	17	17	15	14	17	16	16	17
Hedge fund	55	57	58	53	63	64	64	66
Individual investor	3	3	2	1	0	0	0	0
Insurance company	80	82	81	80	83	88	88	92
Investment advisor	94	95	94	94	95	98	99	97
Others	0	0	2	1	2	1	1	2
Pension fund	6	6	8	9	7	9	10	14
Sovereign fund	0	0	0	0	0	0	1	1
VC/PE firm	19	17	19	17	12	15	16	18
<i>Equity</i>	131	131	131	131	138	138	138	138
Bank	125	123	119	113	135	132	131	127
Brokerage	25	22	16	14	31	36	26	25
Corporation	39	42	39	38	51	54	54	56
Endowment	15	10	7	3	41	35	31	24
Family office	75	72	63	65	91	95	93	88
Foundation	3	5	5	3	9	9	10	8
Government	28	29	30	27	41	42	43	40
Hedge fund	112	109	110	102	122	121	125	123
Individual investor	123	125	126	124	120	124	124	128
Insurance company	72	66	61	50	91	91	87	79
Investment advisor	131	131	130	129	137	137	138	138
Others	25	34	32	35	9	9	11	16
Pension fund	96	92	90	88	112	112	113	114
Sovereign fund	4	3	2	1	8	8	8	10
VC/PE firm	53	45	39	37	62	60	51	56

Table 11: Bonds issued and shares outstanding at Q1

Variable	Chapter 11				Exchange Offer				test for difference ²	
	Mean	Median	Std. dev.	Mean	Median	Std. dev.	mean ³	median ⁴		
<i>Bonds</i> ¹										
Value of bonds issued	1,192.2	538.6	1,711.1	2,256.5	1,015.0	2,956.7	***	**		
Number of bonds issued	3.2	2	2.7	5.1	3	4.0	***	*		
Amount issued per bond	302.6	279.9	208.5	348.8	271.2	232.5	***	***		
Number of bondholders	71.8	33.0	101.5	132.2	69.5	169.7	***	***		
Amount issued per bondholder	25.4	16.0	31.4	21.5	16.0	15.6	***	***		
Value of bonds reported	272.9	101.6	463.4	507.6	204.3	757.7	**	**		
% Bonds in default	85.7			10.8						
<i>Equity</i> ⁵										
Number of shares outstanding	67.5	38.3	97.0	93.2	29.4	329.3				
Number of shares reported	30.1	15.1	55.2	54.8	15.0	146.6	*	*		

¹ Based on 97 Chapter 11 firms and 100 Exchange Offer firms that issued bonds. Value of bonds issued is the total value of bonds issued by the company (Bloomberg historical data). Number of bond holders and value of reported bonds are based on self-reported holdings at Q1. Bond values are in millions of current U.S. dollars.

² Statistical significance denoted by *** at the 1% level, ** at the 5% level, and * at the 10% level.

³ Mean comparison t test.

⁴ Quantile regression t test for equality of medians.

⁵ Based on 131 Chapter 11 and 138 Exchange Offer firms. Number of shares reported is based on self-reported holdings at Q1. Share numbers are in millions of shares.

Table 12: Bond holdings (percent of total issue) reported by investor type¹

Investor type	Chapter 11								Exchange offer				difference: Exof – Ch11 ²			
	Q4	Q3	Q2	Q1	Q4	Q3	Q2	Q1	Q4	Q3	Q2	Q1	Q4	Q3	Q2	Q1
<i>n</i>	97	97	97	96	95	99	99	100								
Bank	3.29	2.52	3.14	2.09	2.74	2.63	2.64	2.31	-0.55	0.11	-0.50	0.22				
Corporation	0.13	0.17	0.15	0.14	0.37	0.32	0.36	0.33	0.24	0.16	0.21	0.18				
Hedge fund	7.28	7.76	7.48	7.22	3.41	3.18	2.90	2.65	-3.87**	-4.58**	-4.58**	-4.56**				
Insurance company	4.97	3.88	3.73	3.17	4.99	4.56	4.99	5.05	0.03	0.67	1.26*	1.88**				
Investment advisor	14.30	13.88	14.17	11.84	12.51	12.43	12.95	13.00	-1.79	-1.45	-1.22	1.16				
Pension fund	0.02	0.02	0.02	0.01	0.01	0.01	0.02	0.02	-0.004	-0.004	0.004	0.01				
VC/PE firm	0.27	0.26	0.27	0.27	0.12	0.12	0.15	0.21	-0.15	-0.14	-0.12	-0.05				
The rest	0.12	0.11	0.10	0.08	0.07	0.07	0.23	0.23	-0.05	-0.04	0.12	0.15				
Total	30.39	28.60	29.06	24.82	24.23	23.33	24.24	23.80	-6.15	-5.28	-4.82	-1.01				

¹ For each firm, the holding by type of investor is the face value of bonds reported by the investor type in a given quarter divided by the total value of bonds issued by the firm.

² Statistical significance denoted by *** at the 1% level, ** at the 5% level, and * at the 10% level.

Table 13: Change in bond holdings (percent of total issue, Q1 – Q4)¹

Variable	Chapter 11			Exchange Offer			test for difference ²	
	Mean ³	Median	Std. dev.	Mean ³	Median	Std. dev.	mean ⁴	median ⁵
<i>Δ Bond holdings</i>								
Δ Bank	-1.24**	-0.32	4.69	-0.30	0	2.09	*	**
Δ Corporation	0.01	0	0.54	-0.03	0	0.55		
Δ Hedge fund	-0.14	0	6.85	-0.59**	0	2.80		
Δ Insurance company	-1.85***	0.34	6.33	0.31	0	6.45	**	**
Δ Investment advisor	-2.61**	-1.68	9.80	1.11	-0.45	11.14	**	**
Δ Pension fund	0	0	0.03	0.01*	0	0.04	*	
Δ VC/PE firm	-0.01	0	0.59	0.10	0	0.61		
Δ The rest	-0.05**	0	0.21	0.16	0	1.35		
Δ Total	-5.88***	-3.95	11.99	0.78	-0.08	15.05	***	***

¹ Based on the 96 Chapter 11 firms and 100 Exchange Offer firms with bonds at Q1.

² Statistical significance denoted by *** at the 1% level, ** at the 5% level, and * at the 10% level.

Table 14: Share holdings (percent of total outstanding) reported by investor type¹

Investor type	Chapter 11 (n = 131)				Exchange offer (n = 138)				difference: Exof - Ch11 ²			
	Q4	Q3	Q2	Q1	Q4	Q3	Q2	Q1	Q4	Q3	Q2	Q1
Bank	5.34	4.55	3.95	3.16	6.35	5.99	5.58	5.58	1.01	1.44*	1.64**	2.42***
Corporation	4.82	4.91	4.72	4.39	2.33	2.50	2.54	3.63	-2.49	-2.42	-2.18	-0.75
Family office	0.68	0.68	0.66	0.68	0.85	0.77	0.76	0.75	0.17	0.09	0.10	0.07
Government	0.26	0.24	0.15	0.20	0.62	0.65	0.66	0.69	0.36	0.41*	0.51**	0.49**
Hedge fund	9.69	9.05	7.68	5.28	10.63	11.25	9.46	9.04	0.94	2.19	1.78	3.76***
Individual	9.39	9.62	9.91	10.17	9.58	9.77	10.10	10.35	0.19	0.15	0.19	0.18
Insurance company	0.98	1.11	0.91	0.68	0.63	0.64	0.76	0.63	-0.35	-0.48	-0.15	-0.04
Investment advisor	27.50	23.95	19.99	15.41	38.12	37.70	34.89	30.35	10.63***	13.75***	14.90***	14.93***
Pension fund	0.93	0.94	0.73	0.65	1.90	1.79	1.76	1.64	0.96**	0.85**	1.03***	1.00***
VC/PE firm	4.67	4.75	4.62	3.94	3.07	3.05	2.98	3.07	-1.60	-1.70	-1.64	-0.87
The rest	0.26	0.35	0.28	0.25	0.30	0.24	0.21	0.24	-0.14	-0.22	-0.18	-0.15
Total	64.53	60.16	53.60	44.81	74.38	74.34	69.72	65.97	9.85**	14.19***	16.12***	21.16***

¹ For each firm, the holding by type of investor is the total number of shares held by the investor type in a given quarter divided by the total number of shares outstanding at the firm.

² Statistical significance denoted by *** at the 1% level, ** at the 5% level, and * at the 10% level.

Table 15: Change in share holdings (percent of total outstanding, Q1 – Q4)

Variable ¹	Chapter 11 (n = 131)			Exchange Offer (n = 138)			test for difference ²		
	Mean ³	Median	Std. dev.	Mean ³	Median	Std. dev.	mean ⁴	median ⁵	
<i>Share holdings</i>									
Δ Bank	-2.18***	-0.77	5.18	-0.77	-0.24	7.75	**	*	*
Δ Corporation	-0.43	0	3.40	1.30*	0	9.07	**		
Δ Family office	0	0	1.58	-0.09	0	1.71			
Δ Government	-0.07	0	1.16	0.07	0	0.71			
Δ Hedge Fund	-4.41***	-0.33	9.90	-1.59	-0.08	11.40	***		
Δ Individual	0.78	-0.05	9.31	0.77	0	6.78			
Δ Insurance company	-0.30**	0	1.60	0	0	1.81			
Δ Investment advisor	-12.08***	-8.79	15.31	-7.78***	-4.28	21.79	**	**	**
Δ Pension fund	-0.29***	0	0.72	-0.25***	-0.03	0.97			
Δ VC/PE firm	-0.73	0	6.16	0	0	2.31	*		*
Δ The rest	-0.01	0	0.45	-0.06	0	0.56			
Δ Total	-19.72***	-17.14	23.36	-8.40***	-4.50	29.03	***	***	***

¹ Statistical significance denoted by *** at the 1% level, ** at the 5% level, and * at the 10% level.

Table 16: Logit marginal effects for basic models ($n = 269$)

Variable	Equity quarter:		Q1	
	Bonds quarter:			Q1
Total assets	0.081	0.081	0.071	0.16*
Total liabilities	-0.096	-0.081	-0.08	-0.206*
Revenue	0.187*	0.229**	0.192**	0.106
Cash / Assets	0.348	0.484	0.275	0.202
Current assets / Assets	-0.041	-0.139	-0.048	0.141
PPE / Assets	-0.005	-0.011	-0.015	-0.025
Current liabilities / Liabilities	0.189	0.173	0.371	0.414
Current LTD / Liabilities	-0.481**	-0.172	-0.366	-0.076
LTD / Liabilities	0.491	0.758*	0.75	1.07*
Assets / Liabilities	0.428***	0.436***	0.453***	0.35*
EBIT / Revenue	-0.036***	-0.041***	-0.05***	-0.039***
EBITDA / Revenue	0.05	0.038	0.009	-0.003
EBITDA / Interest expense	0.015**	0.014**	0.021***	0.021***
Debt outstanding / Liabilities		-0.388	-0.366	-0.672
Term loan / Debt outstanding		-0.08	0.044	-0.036
Bonds and notes / Debt outstanding		0.107	0.231	0.232
Senior debt / Debt outstanding		-0.201	-0.157	-0.129
Convertible debt / Debt outstanding		-0.039	0.075	0.038
Bank debt / Debt outstanding		0.089	-0.027	-0.027
Secured debt / Debt outstanding		-0.046	-0.01	-0.17
Shares outstanding		-0.108***	-0.141***	-0.175***
% shares Banks			2.541*	3.098*
% shares Corporations			2.263*	2.696
% shares Family trusts			1.64	3.253
% shares Governments			9.156***	9.616***
% shares Hedge funds			3.185**	3.697**
% shares Individuals			3.007**	3.869**
% shares Insurance companies			1.091	1.804
% shares Investment advisors			2.185**	2.921*
% shares Pension funds			5.79**	10.344**
% shares VC/PE firms			3.343***	3.825**
% shares held by bond investors			-0.246	-0.157
% shares Top 10			-2.5**	-3.212*
% bonds Banks				-2.257
% bonds Corporations				5.267
% bonds Hedge funds				-1.223
% bonds Insurance companies				0.111
% bonds Investment advisors				0.736
% bonds VC/PE firms				5.527
% bonds held by equity investors				-0.849
% bonds Top 5				-0.356
No. of bonds				0.116***
Value of bonds issued				-0.031**
No. of bondholders				-0.002*
No. of subordinate b				0.338**
No. of secured bonds				0.129
Pre-crisis dummy	-0.092	-0.144	0.085	-0.084
Crisis dummy	0.003	0.03	0.123	0.196
Post-crisis dummy	-0.092	-0.039	-0.026	-0.022
log L	-132.053	-124.654	-105.014	-90.373
pseudo-R ²	0.291	0.331	0.437	0.515
adjusted pseudo-R ²	0.200	0.197	0.238	0.247
AIC	1.108	1.113	1.056	1.044
BIC	-1145.761	-1115.801	-1087.944	-1044.495
k	16	24	36	49

Table 17: Logit marginal effects for bond ownership relative to bonds issued—equity Q1 and Q2 ($n = 269, k = 49$)

Variable	Equity quarter:								
	Q1		Q2						
	Q1	Q2	Q3	Q4					
Bonds quarter:									
Total assets	0.16*	0.173**	0.159*	0.157*	0.147*	0.182**	0.167**	0.167**	0.167**
Total liabilities	-0.206*	-0.22**	-0.217**	-0.226**	-0.199**	-0.246***	-0.241***	-0.241***	-0.252***
Revenue	0.106	0.139	0.143	0.162	0.319	0.414**	0.432**	0.478**	0.478**
Cash / Assets	0.202	0.659	0.549	0.662	0.524	1.002**	0.958**	0.958**	1.146**
Current assets / Assets	0.141	-0.097	0.102	0.016	0.007	-0.268	-0.066	-0.066	-0.173
PPE / Assets	-0.025	-0.042	-0.009	-0.013	-0.03	-0.051	-0.019	-0.019	-0.022
Current liabilities / Liabilities	0.414	0.436	0.415	0.454	0.554	0.519	0.56	0.56	0.581
Current LTD / Liabilities	-0.076	-0.195	-0.054	-0.143	0.126	0	0.184	0.184	0.063
LTD / Liabilities	1.07*	1.054*	1.097**	1.109**	1.423***	1.391**	1.519**	1.482***	1.482***
Assets / Liabilities	0.35*	0.266*	0.283	0.276*	0.437**	0.316*	0.334**	0.334**	0.333**
EBIT / Revenue	-0.039**	-0.04**	-0.033**	-0.034**	-0.044**	-0.048**	-0.041**	-0.041**	-0.044**
EBITDA / Revenue	-0.003	0.033	0.01	0.011	0.018	0.046	0.034	0.034	0.035
EBITDA / Interest expense	0.021***	0.019**	0.021***	0.021***	0.018**	0.015**	0.017***	0.017***	0.017***
Debt outstanding / Liabilities	-0.672	-0.619	-0.672*	-0.65	-0.976**	-0.878**	-1.023***	-1.023***	-0.951**
Term loan / Debt outstanding	-0.036	-0.017	-0.008	-0.026	-0.013	0.026	-0.016	-0.016	-0.029
Bonds and notes / Debt outstanding	0.232	0.207	0.19	0.266	0.236	0.163	0.163	0.163	0.236
Senior debt / Debt outstanding	-0.129	-0.148	-0.173	-0.132	-0.179	-0.168	-0.203	-0.203	-0.169
Convertible debt / Debt outstanding	0.038	0.082	0.07	-0.026	0.004	0.09	0.068	0.068	-0.024
Bank debt / Debt outstanding	-0.027	0.04	-0.01	0.038	-0.013	-0.042	0.002	0.002	0.032
Secured debt / Debt outstanding	-0.17	-0.21	-0.186	-0.248	-0.234	-0.273	-0.251	-0.251	-0.311*
Shares outstanding	-0.175***	-0.191***	-0.174***	-0.175***	-0.145***	-0.174***	-0.151***	-0.151***	-0.156***
% shares Banks	3.098*	2.842	3.193*	3.106*	-0.838	-0.948	-0.849	-0.849	-0.871
% shares Corporations	2.696	2.595	2.968*	2.98	-1.254*	-1.055*	-1.061*	-1.061*	-1.097*
% shares Family trusts	3.253	2.819	2.896	2.896	1.961	2.146	1.053	1.053	1.176
% shares Governments	9.616***	9.466**	9.658***	9.835**	10.087**	11.047**	10.217**	10.217**	10.925*
% shares Hedge funds	3.697**	3.475**	3.945**	4.132**	0.339	0.238	0.258	0.258	0.289
% shares Individuals	3.869**	3.67**	4.002**	4.016**	0.388	0.469	0.386	0.386	0.425
% shares Insurance companies	1.804	1.822	2.288	2.235	-1.549	-1.24	-1.298	-1.298	-1.477
% shares Investment advisors	2.921*	2.702*	3.231**	3.298**	0.293	0.391	0.519	0.519	0.561
% shares Pension funds	10.344**	11.649**	9.703**	11.398**	10.425**	10.133**	9.683**	10.541**	10.541**
% shares VC/PE firms	3.825**	3.653**	3.994**	4.163**	0.402	0.445	0.393	0.393	0.523
% shares held by bond investors	-0.157	0.43	-0.334	-0.376	-0.354	-0.036	-0.486	-0.486	-0.635
% shares Top 10	-3.212*	-3.165*	-3.482**	-3.611*	0.432	0.228	0.355	0.355	0.233
% bonds Banks	-2.257	-3.711*	-3.772**	-4.27**	-3.207	-5.315***	-5.428**	-5.428**	-6.112***
% bonds Corporations	5.267	9.582	12.194*	12.913**	2.961	5.24	7.911	7.899	7.899
% bonds Hedge funds	-1.223	-1.937**	-1.06	-1.215*	-0.24	-1.811**	-1.225**	-1.225**	-1.378**
% bonds Insurance companies	0.111	-1.762	-1.953	-2.542*	1.745	-0.957	-1.175	-1.175	-1.955**
% bonds Investment advisors	0.736	-0.844	0.032	0.386	1.501	-0.673	-0.149	-0.149	0.083
% bonds VC/PE firms	5.527	-7.82	-5.263	-0.723	5.807	-8.286	-6.471	-6.471	-3.292
% bonds held by equity investors	-0.849	-1.288	-0.217	-0.277	-0.53	-1.05	0.135	0.135	-0.193
% bonds Top 5	-0.356	1.609*	-0.089	-0.027	-1.214	1.391*	0.027	0.027	0.286
No. of bonds	0.116**	0.121***	0.105**	0.108**	0.089**	0.086**	0.081**	0.081**	0.084**
Value of bonds issued	-0.031**	-0.028*	-0.022	-0.023	-0.029**	-0.024*	-0.019	-0.019	-0.019
No. of bondholders	-0.002*	-0.002*	-0.002	-0.002	-0.002*	-0.001	-0.001	-0.001	-0.001
No. of subordinate bonds	0.338**	0.294**	0.301**	0.316*	0.319**	0.255*	0.279**	0.279**	0.297*
No. of secured bonds	0.129	0.12	0.125	0.206**	0.087	0.083	0.073	0.073	0.141
Pre-crisis dummy	-0.084	-0.059	-0.092	-0.027	-0.287	-0.282	-0.328	-0.328	-0.299
Crisis dummy	0.196	0.289	0.268	0.176	0.264	0.224	0.249	0.249	0.249
Post-crisis dummy	-0.022	0.001	-0.011	0.052	-0.029	0.01	-0.022	-0.022	0.016
log L	-90.373	-85.922	-87.614	-84.703	-95.139	-91.061	-93.118	-93.118	-89.653
pseudo-R ²	0.515	0.539	0.530	0.546	0.490	0.511	0.500	0.500	0.519
adjusted pseudo-R ²	0.247	0.271	0.262	0.277	0.221	0.243	0.232	0.232	0.251
AIC	1.044	1.011	1.023	1.002	1.079	1.049	1.064	1.064	1.038
BIC	-1044.495	-1053.398	-1050.014	-1055.835	-1034.964	-1043.121	-1039.007	-1039.007	-1045.936

Table 18: Logit marginal effects for bond ownership relative to bonds issued—equity Q3 and Q4 ($n = 269, k = 49$)

Variable	Equity quarter:							
	Q3		Q4					
	Q1	Q2	Q3	Q4				
Bonds quarter:								
Total assets	0.164*	0.216**	0.177**	0.189**	0.159*	0.189**	0.164*	0.165*
Total liabilities	-0.223**	-0.291***	-0.262***	-0.285***	-0.218**	-0.256**	-0.236**	-0.247**
Revenue	0.354*	0.454**	0.486**	0.536**	0.264	0.343*	0.378**	0.415**
Cash / Assets	0.501	0.957**	0.966**	1.205**	0.443	0.85*	0.901*	1.148**
Current assets / Assets	0.058	-0.206	-0.061	-0.163	0.087	-0.139	0.018	-0.093
PPE / Assets	-0.018	-0.03	0.002	-0.02	-0.024	-0.052	-0.01	-0.012
Current liabilities / Liabilities	0.494	0.42	0.449	0.452	0.495	0.418	0.499	0.49
Current LTD / Liabilities	0.047	-0.04	0.112	-0.02	-0.01	-0.1	0.054	-0.058
LTD / Liabilities	1.323***	1.254**	1.353**	1.291**	1.266**	1.199**	1.345**	1.264**
Assets / Liabilities	0.462	0.334*	0.389**	0.376**	0.525**	0.401**	0.448**	0.439**
EBIT / Revenue	-0.039***	-0.045***	-0.036***	-0.041***	-0.042	-0.047***	-0.039***	-0.04***
EBITDA / Revenue	0.019	0.053*	0.037	0.036	0.011	0.044	0.031	0.03
EBITDA / Interest expense	0.018	0.015**	0.018	0.017**	0.02	0.017**	0.02	0.019**
Debt outstanding / Liabilities	-0.936**	-0.884**	-1.036**	-0.928**	-0.943**	-0.851*	-1.043**	-0.964**
Term loan / Debt outstanding	0.044	0.053	0.011	0.008	0.025	0.058	-0.007	-0.016
Bonds and notes / Debt outstanding	0.318	0.246	0.273	0.36	0.271	0.305	0.305	0.39
Senior debt / Debt outstanding	-0.224	-0.233	-0.259	-0.251	-0.23	-0.211	-0.252	-0.239
Convertible debt / Debt outstanding	-0.032	0.057	0	-0.1	-0.106	0.023	-0.036	-0.141
Bank debt / Debt outstanding	0.022	0.012	0.073	0.1	0.028	-0.012	0.085	0.122
Secured debt / Debt outstanding	-0.231	-0.263	-0.271	-0.308	-0.172	-0.195	-0.213	-0.262
Shares outstanding	-0.135**	-0.157***	-0.149**	-0.149**	-0.141**	-0.163***	-0.153**	-0.158**
% shares Banks	-1.136	-1.234	-1.119	-1.166	-1.021	-1.13	-1.126	-1.019
% shares Corporations	-1.621***	-1.382***	-1.506**	-1.52**	-2.201***	-2.018**	-2.058**	-2.12***
% shares Family trusts	0.167	0.643	-0.366	-0.149	0.488	0.8	0.004	0.26
% shares Governments	8.052**	8.164**	7.825**	8.482**	7.938**	7.733**	7.282**	7.83**
% shares Hedge funds	0.258	0.195	0.191	0.184	-0.337	-0.425	-0.421	-0.488
% shares Individuals	0.031	0.154	0.043	0.116	-0.149	-0.012	-0.17	-0.188
% shares Insurance companies	-3.074**	-3.288**	-3.123**	-3.373**	-2.448**	-2.301**	-2.324**	-2.481**
% shares Investment advisors	0.124	0.222	0.28	0.373	-0.302	-0.189	-0.209	-0.165
% shares Pension funds	1.094	0.975	0.7	1.232	12.513***	11.282**	10.789**	10.862**
% shares VC/PE firms	-0.065	-0.011	-0.031	0.087	-0.238	-0.177	-0.215	-0.131
% shares held by bond investors	-0.544	-0.293	-0.864	-0.97	-0.233	0.233	-0.365	-0.425
% shares Top 10	0.807**	0.636*	0.782**	0.636	1.015**	0.811**	1.018**	0.916**
% bonds Banks	-2	-4.752**	-4.728**	-5.571***	-2.302	-4.674**	-4.948**	-5.855***
% bonds Corporations	5.07	7.491	8.456	8.051	6.813	8.43	10.171	9.793
% bonds Hedge funds	-0.025	-1.751**	-1.328**	-1.411**	0.526	-1.558**	-1.137*	-1.229**
% bonds Insurance companies	1.904	-1.084	-1.442	-2.243**	2.433	-0.532	-0.886	-1.784**
% bonds Investment advisors	1.673	-0.921	-0.531	-0.17	2.341	-0.327	-0.173	0.139
% bonds VC/PE firms	3.508	-12.598	-7.283	-3.08	4.113	-10.443	-8.318	-3.128
% bonds held by equity investors	-0.551	-0.749	0.592	-0.063	-0.688	-1.234	0.442	-0.081
% bonds Top 5	-1.332	1.442*	0.221	0.551	-1.884	1.249	0.023	0.293
No. of bonds	0.081**	0.073*	0.074*	0.073*	0.083*	0.081*	0.074*	0.075*
Value of bonds issued	-0.029**	-0.021	-0.017	-0.018	-0.031**	-0.025*	-0.019	-0.019
No. of bondholders	-0.001	0	0	0	-0.001	-0.001	-0.001	0
No. of subordinate bonds	0.313**	0.282**	0.282**	0.293*	0.369**	0.319**	0.31**	0.318*
No. of secured bonds	0.072	0.057	0.05	0.122	0.069	0.044	0.035	0.103
Pre-crisis dummy	-0.416*	-0.394*	-0.464*	-0.422*	-0.369	-0.349	-0.431*	-0.406
Crisis dummy	0.063	0.152	0.108	0.143	0.244	0.297	0.254	0.279
Post-crisis dummy	-0.109	-0.064	-0.092	-0.052	-0.02	0.019	-0.003	0.029
log L	-97.051	-93.006	-94.835	-91.365	-93.268	-90.466	-92.260	-89.155
pseudo-R ²	0.479	0.501	0.491	0.510	0.500	0.515	0.505	0.522
adjusted pseudo-R ²	0.211	0.233	0.223	0.242	0.231	0.246	0.237	0.253
AIC	1.093	1.063	1.077	1.051	1.065	1.044	1.058	1.035
BIC	-1031.140	-1039.230	-1035.573	-1042.512	-1038.707	-1044.309	-1040.723	-1046.932

Figure 4: Impact of change in quarter for equity reporting



Figure 5: Impact of change in quarter for bonds reporting

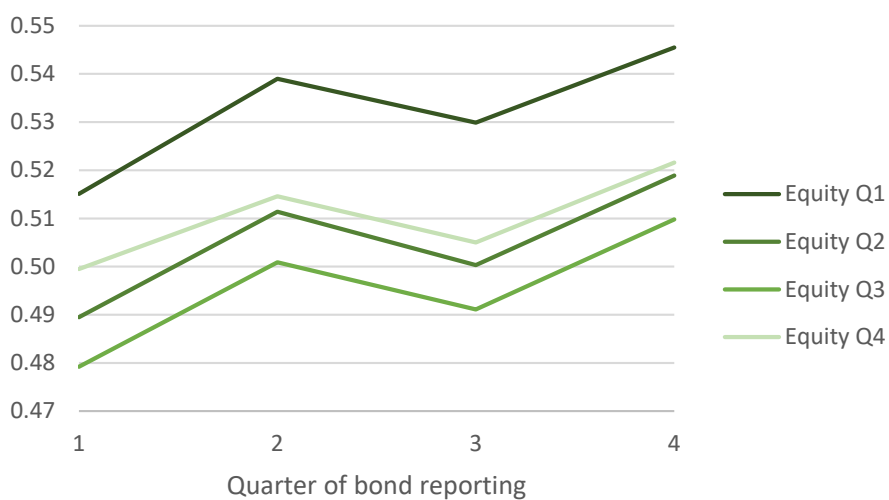


Table 19: Variables selected by the lasso¹ (50 repetitions)

Variable	Number variables selected				
	15	16	17	20	21
Cash / Assets				X	X
Current LTD / Liabilities	X	X	X	X	X
LTD / Liabilities	X	X	X	X	X
Assets / Liabilities	X	X	X	X	X
EBIT / Revenue	X	X	X	X	X
Bank debt / Debt outstanding		X	X	X	X
Secured debt / Debt outstanding					X
Shares outstanding	X	X	X	X	X
% shares Governments	X	X	X	X	X
% shares Hedge funds	X	X	X	X	X
% shares Investment advisors	X	X	X	X	X
% shares Pension funds	X	X	X	X	X
% shares VC/PE firms			X	X	X
% bonds Banks	X	X	X	X	X
% bonds Corporations	X	X	X	X	X
% bonds Hedge funds	X	X	X	X	X
% bonds Insurance companies	X	X	X	X	X
% bonds Investment advisors				X	X
% bonds VC/PE firms				X	X
Number of bonds	X	X	X	X	X
Number of subordinate bonds	X	X	X	X	X
Frequency combination selected	1	19	16	11	3

¹ 'X' denotes the variable in the corresponding row is selected by lasso.

Table 20: Post-lasso logit marginal effects for equity Q1 and bonds Q4 ($n = 269$)

Variable	Number variables selected				
	15	16	17	20	21
Cash / Assets				0.488*	0.495*
Current LTD / Liabilities	-0.385*	-0.363*	-0.369*	-0.315	-0.325
LTD / Liabilities	0.484***	0.497***	0.496***	0.524***	0.514***
Assets / Liabilities	0.385***	0.407***	0.428***	0.435***	0.418***
EBIT / Revenue	-0.0290***	-0.0293***	-0.0304***	-0.0286***	-0.0288***
Bank debt / Debt outstanding		-0.300*	-0.294*	-0.251	-0.192
Secured debt / Debt outstanding					-0.151
Shares outstanding	-0.113***	-0.117***	-0.117***	-0.121***	-0.129***
% shares Governments	5.299**	6.318***	6.627***	6.507***	6.298**
% shares Hedge funds	0.686*	0.791*	0.788*	0.870*	0.970*
% shares Investment advisors	0.510	0.524	0.557*	0.556*	0.548*
% shares Pension funds	7.158	7.214	7.390	7.783	7.948*
% shares VC/PE firms			0.618	0.602	0.677
% bonds Banks	-2.192**	-2.780**	-2.700**	-3.263**	-3.298**
% bonds Corporations	8.144*	7.949*	8.154*	11.80**	11.53**
% bonds Hedge funds	-0.734*	-0.829*	-0.790	-0.720	-0.754
% bonds Insurance companies	-1.770***	-1.658***	-1.604**	-1.549**	-1.716**
% bonds Investment advisors				-0.241	-0.249
% bonds VC/PE firms				-15.71*	-14.64
Number of bonds	0.0271*	0.0198	0.0219	0.0275*	0.0293*
Number of subordinate bonds	0.169	0.171	0.176	0.155	0.151
$\log L$	-109.9498	-108.105	-107.016	-104.693	-104.192
pseudo- R^2	0.410	0.420	0.426	0.438	0.441
adjusted pseudo- R^2	0.324	0.329	0.329	0.326	0.323
AIC	0.936	0.930	0.929	0.935	0.938
BIC	-1195.5624	-1193.657	-1190.240	-1178.103	-1173.509
k	15	16	17	20	21

Table 21: Counts of signs of marginal effects in Tables 17 and 18

Ownership	Sign: Decision:	-				+			
		Chapter 11				Exchange offer			
	Bond quarter:	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	Equity quarter:								
shares									
(k = 10) ¹	Q1	0	0	0	0	10	10	10	10
	Q2	3	3	3	3	7	7	7	7
	Q3	4	4	5	4	6	6	5	6
	Q4	7	7	7	7	3	3	3	3
bonds									
(k = 6) ²	Q1	2	5	4	4	4	1	2	2
	Q2	2	5	5	4	4	1	1	2
	Q3	2	5	5	5	4	1	1	1
	Q4	1	5	5	4	5	1	1	2

¹ The ten equity owner types are: Banks, Corporations, Family trusts, Governments, Hedge funds, Individuals, Insurance companies, Investment advisors, Pension funds, VC/PE firms.

² The six bond owner types are: Banks, Corporations, Hedge funds, Insurance companies, Investment advisors, VC/PE firms.

Table 22: Counts of significance (10% level) of marginal effects in Tables 17 and 19

Ownership	Sign: Decision:	-				+			
		Chapter 11				Exchange offer			
	Bond quarter:	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	Equity quarter:								
shares									
(k = 10)	Q1	0	0	0	0	7	7	8	7
	Q2	1	1	1	1	2	2	2	2
	Q3	2	2	2	2	1	1	1	1
	Q4	2	2	2	2	2	2	2	2
bonds									
(k = 6)	Q1	0	2	1	3	0	0	1	1
	Q2	0	2	2	3	0	0	0	0
	Q3	0	2	2	3	0	0	0	0
	Q4	0	2	2	3	0	0	0	0

Appendix

Reported	Rule adopted
Bonds	
No reporting for 1 quarter [100, 0, 400, 500, 500]	Extrapolate the data from the previous quarter [100, 100, 400, 500, 500]
No reporting for 2 quarters [100, 0, 0, 400, 300]	Extrapolate the data from two previous quarters [100, 100, 100, 400, 300]
Data reported on a 6-months basis [100, 0, 100, 0, 100]	Extrapolate the data for the missing quarters [100, 100, 100, 100, 100]
Data reported on a yearly basis [100, 0, 0, 0, 100]	Extrapolate the data for the missing quarters [100, 100, 100, 100, 100]
Bonds that have been issued in the case of an exchange offer and replace existing bonds	Keep the two bonds separate. The positions of each investors are reported for the original bond before the exchange offer and for the new bond after the exchange offer
Equity	
CIQ does not report the total number of shares for some quarters prior to the event.	Two possibilities: i) If the Excel file with detailed shareholding by individual investors is available in CIQ, sum the shares held by investors and divide by the percentage of common shares outstanding. ii) If the Excel file with detailed shareholding by individual is not available in CIQ, use the information for the most recent quarter available.
Equity holdings before March 2003	CIQ does not report detailed equity holdings before March 2003. The information is collected from Bloomberg.