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Heterogeneous Beliefs and the Choice between Private Restructuring and Formal Bankruptcy

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Abstract:
We present a novel theory to explain the puzzling issue regarding why certain firms in financial distress, that must renegotiate their debt prefer a formal bankruptcy procedure, which is more costly, over direct negotiations with their debtholders. Specifically, we show that claimholders' heterogeneous beliefs about the possible results of a formal plan – and about judicial discretion in particular – may lead to such a preference. In our model, informal processes are preferred when the total value of all corporate claims in a formal procedure, according to each claimholder's beliefs, is less than the total value of the firm's assets in an informal process. In such a case, all claimholders believe that they will be better off under an informal process because there is a positive surplus that can be divided among the parties (Pareto Improving). The proposed model can predict which resolution would be chosen under any set of claimholders' beliefs about the different determinants driving the outcome of a formal procedure, such as the cost of bankruptcy, the likelihood of deviation from the absolute priority rule in a reorganization plan, and the probability of the court adopting a reorganization plan. An empirical analysis of 252 defaults in Moody's annual reports during the 1996-2011 period supports the argument that heterogeneous beliefs ad creditor coordination problems are important drivers of the decision to restructure under formal bankruptcy procedures rather than through private workouts.

Keywords: Formal procedure, informal process, heterogeneous beliefs, judicial discretion, bankruptcy, liquidation

JEL Classification: G12, G32, G33

1 Introduction

A firm that must restructure its debt during financial distress faces a choice between two alternatives. It can privately renegotiate the debt claims in an informal process[1] or file for formal bankruptcy to resolve its creditor disputes through an in-court proceeding ('litigation'). Financial scholars suggest that it is in the best interest of debtholders and equityholders to agree on an informal reorganization of the firm before deadweight costs are incurred (Haugen and Senbet, 1978, 1988, Jensen, 1989, 1991, and Roe, 1987). Nevertheless, empirical studies show that a substantial percentage of firms file for bankruptcy through formal procedures. Gilson, John and Lang (1990), Franks and Torous (1994), and Yost (2002) report that the percentage of firms that complete a distressed exchange offer (an informal process) approximately equals the percentage of firms that file for bankruptcy under Chapter 11 – the chapter of the U.S. bankruptcy code that governs corporate reorganization (a formal procedure). In more recent studies including that of Jacobs et al. (2012) and ours, the percentage of firms filing for bankruptcy is higher than 70%.

In response to these empirical findings, the theoretical financial literature explains the preference for more costly formal bankruptcy procedures over informal processes by the presence of at least one of the following frictions: asymmetric information, agency problems and creditor conflicts. In this paper, we provide an additional possible explanation for this puzzle. We show that the decision to choose a formal bankruptcy procedure may result from the heterogeneous beliefs of different claimholders with respect to the predicted outcomes of such formal bankruptcy procedures.

As documented by Chang and Schoar (2007) and Bris, Welch, and Zhu (2006), the final outcome of formal bankruptcy procedures is subject to judicial discretion.[2] Posner

[1] Throughout this paper, we use the terms private workout, informal process, or out-of-court renegotiation interchangeably.

[2] Chang and Schoar (2007) and Bris, Welch, and Zhu (2006) empirically document that the percentages paid out to creditors, the duration of Chapter 11 negotiations and violations of the absolute priority rule (hereinafter APR) differ significantly among judges. This evidence is supported by Hotchkiss (1995), who shows that cases filed in the Southern District of New York have a somewhat higher probability of

(2005) notes that judges may nonconsciously interpret the evidence – or even disregard certain inconvenient truths – through the lens of their experiences. Moreover, under many legislative systems the bankruptcy code itself may allow for judicial discretion, i.e., the judge may have the right to force a resolution (even if previously rejected by a claimant) and/or to stop negotiations altogether.

The effect of judicial discretion on formal bankruptcy procedures can be channeled in two ways to generate heterogeneous beliefs among different claimholders. In the first approach, one group of claimholders receives private signals, and these investors are thus more informed than the second group of claimholders (Grossman and Stiglitz, 1980, Hellwig, 1980, Wang, 1993, Shefrin and Statman, 1994, and Duffie and Lando, 2001). In the second approach, different claimholders "agree to disagree" about certain matters and do not learn from one another's behavior (Harris and Raviv, 1993, Zapatero, 1998, Veronesi, 1999, Basak, 2000, Cecchetti, Lam, and Mark, 2000, David, 2008, Duffie, Garleianu, and Pedersen, 2002, Dumas, Kurshev, and Uppal, 2009). Consistent with the second approach, we consider a setting in which claimholders have different estimates about the possible outcomes of formal bankruptcy procedures because of their heterogeneous beliefs about the importance of factors that affect the payoff under such procedures. Such factors include (i) the probability of the court accepting a liquidation procedure (Chapter 7) versus a reorganization (Chapter 11), (ii) the additional cost of the formal bankruptcy process compared with an informal process, and (iii) the extent to which the APR is violated upon reorganization (i.e., the share that the equityholders will receive in a reorganization procedure).

We show that each claimholder decides whether to negotiate informally or formally by calculating the value of her claim in a formal procedure – based on the factors presented above – and being aware of the assessments that are made by other claimholders regarding the values of their claims. We predict that informal processes are preferred only when the total value of all claims in a formal bankruptcy procedure – as perceived by the holders of such claims – is less than the total value of the firm assets in an informal process. Under such

subsequently entering a second bankruptcy or distressed restructuring.

a condition, claimholders may choose an informal process because all parties are better off as a result of the positive surplus that can be divided according to their bargaining power.[3] The condition presented requires that each claimholder perceives the informal restructuring process as a Pareto Improving compared to formal bankruptcy procedures.

Whereas previous models demonstrate that asymmetric information, risk-shifting incentives, and creditor coordination problems may cause inefficiencies that can be mitigated by legal and formal bankruptcy procedures, the formal procedure by itself may encourage claimholders to prefer it over an informal process, even in the absence of such frictions. Using our model, the conditions under which informal processes are preferable and agreed upon by the different claimholders under a Pareto Improving rule may be characterized quantitatively.

The model shows how the claimholders' heterogeneous beliefs about the probability of a reorganization decision by the court, the added cost of formal bankruptcy over an informal process, and the valuation of the APR under formal procedures determine which procedure is chosen. Therefore, the model can identify the chosen solution, which is a necessary condition for policymakers to understand the impact of bankruptcy rules and procedures on social welfare. The testable predictions regarding a firm's choice between in-court and out-of-court procedures are the following. First, we find that when claimholders have different beliefs only about the deviation from the APR, the probability of adopting an informal process decreases as the deviation between bondholders and stockholders beliefs and the probability of adopting a reorganization plan by the court decrease. Moreover, the probability of adopting an informal process increases as the deadweight costs of liquidation increase and as the costs of the formal procedure increase compared with an informal process.

Furthermore, if claimholders believe that the court can enforce the "fair and equitable" rule (i.e., the share of the debtholder in a reorganization is at least as large as her share would

[3] Analyzing the outcome of the restructuring process is beyond the scope of this paper. Fan and Sundaresan (2000), François and Morellec (2004), and Broadie, Chernov, and Sundaresan, (2007) determine that the outcome results from a cooperative game between debtholders and stockholders. Annabi, Breton, and François (2012) show that a non-cooperative game is more appropriate to model Chapter 11 negotiations.

have been had a liquidation procedure been adopted), the choice between a formal procedure and an informal process is determined solely by their heterogeneous beliefs regarding the probability of a reorganization procedure and the creditors' likely share in such event. Moreover, if the fair and equitable rule is imposed, the probability of an informal process decreases for any set of parameters.

Second, we analyze the case in which claimholders have different beliefs regarding only the probability of the court accepting a reorganization procedure. In such case, a sufficient but not necessary condition for an informal process is when creditors perceive a higher probability of reorganization than stockholders. Moreover, we prove that if the fair and equitable rule is imposed, then an informal process would always be preferred over the formal procedure.

Third, we address the case in which claimholders have heterogeneous beliefs about the amount of the deadweight costs in a formal bankruptcy. If claimholders have heterogeneous beliefs only about the amount of such costs, we demonstrate that an informal process would always be preferred. However, if claimholders have heterogeneous beliefs about whether the court will accept a reorganization decision *and* the amount of bankruptcy costs, then the choice of renegotiation procedure depends to a greater extent on the creditor's belief rather than on the stockholder's belief.

We complement our analysis with an empirical investigation into the decision to resolve financial distress through formal bankruptcy or through a private workout. Our contribution is twofold. First, prior empirical work on this topic is somewhat outdated (with the exception of Jacobs et al., 2012, whose data sample ends in 2007, the previous studies of Gilson, John and Lang, 1990; Chatterjee, Dhillon, and Ramirez, 1996; and Yost, 2002, examine U.S. corporate defaults during the 1980's and the 1990's). Our study covering the 1996-2011 period provides updated evidence about decisions to resolve financial distress. Second, we examine the empirical determinants of such decisions in light of our arguments about the heterogeneity in beliefs. The results provide support for the predictions stemming from our arguments based on the heterogeneity in beliefs. They also confirm that creditor

coordination plays an important role in the decision to file for bankruptcy.

The remainder of the paper is organized as follows. Section 2 discusses the literature on the choice between formal bankruptcy and private workout. In section 3, we discuss how bankruptcy law affects bargaining and present two examples that motivate the more general analysis. In Section 4, we develop and calibrate the model that characterizes the different equilibriums. The empirical analysis is presented in Section 5. Concluding remarks are found in Section 6.

2 The choice between private workout and formal bankruptcy

The approach presented belongs to the stream of financial literature that is used to explain the puzzling phenomena in which claimholders prefer a more costly formal bankruptcy procedure to a private workout. The literature explains this puzzle by the presence of at least one of the following frictions: asymmetric information, agency problems, and creditor coordination.

The first explanatory approach relates to contract theory and to the court's screening effect that may minimize asymmetric information between bondholders and stockholders. As argued by Giammarino (1989), Chen (2003), and Heinkel and Zechner (1993), a poor equityholder has an incentive to disguise a firm's true condition in a state of distress to avoid liquidation or to obtain more favorable terms during a restructuring plan. If the court is able to determine the true value of the firm's assets, debtholders would be willing to pay higher costs to mitigate this friction, which would lead them to prefer the formal procedure.

The second approach relates to agency problems. As noted by Jensen and Meckling (1976), an equityholder in financial distress may seek to expropriate wealth from creditors by excessively increasing the risk of the firm's operations. In a court-supervised process, by contrast, additional disclosure rules, such as a detailed inventory and a valuation of all assets, help mitigate the informational disadvantages of outsiders (Berkovitch and Israel, 1998).

A third approach arises from creditor conflicts when there are multiple creditors. If the

restructuring of a debt involves multiple lenders, individual claimants have an incentive to 'hold-out' in the expectation that others will provide the concessions that ensure the success of the restructuring. Because all claimants have similar incentives, however, the restructuring is likely to fail (Roe, 1987, Gertner and Scharfstein, 1991). Typically, the coordination problem is more severe in informal processes in which the adoption of a restructuring plan requires unanimous consent among lenders, whereas in a formal bankruptcy process, the problem is less severe because decisions about how to process the equityholder's estate require only a specified majority of the creditors in each class of claims. Jostarndt and Sautner (2010) provide evidence for a sample of German firms that formal bankruptcy is preferred when creditor coordination is poor.[4]

3 Statement of the problem and motivating examples

In the classical financial literature, in the event of default, equityholders surrender the firm to the bond investors who make use of the remaining assets (Merton 1974, Black and Cox, 1976). However, in distress events, the ability of creditors to extract value through the time-consuming bargaining process among claimholders may vary. The length and the results of the process depend to a great extent on the nature of the formal procedure, which may allow for bargaining among different claimholders and judicial discretion.

The uncertainty that relates to the formal procedure can encourage different claimholders to develop heterogeneous beliefs about the expected results of crucial elements of the procedure. First, there is uncertainty with respect to the added cost of formal over informal procedures, which may result from compensation for lawyers, accountants, consultants, and expert witnesses. The financial literature offers mixed conclusions regarding the amount of such costs. Whereas Altman (1984), Hotchkiss (1995), and Weiss and Wruck (1998), among others, consider Chapter 11 costs to be high (approximately 8% of the pre-bankruptcy

[4] In the U.S., a change in the interest rate, principal amount, or maturity of public debt outside formal bankruptcy requires unanimity. Thus, although it may be public debtholders' interest to agree to avoid bankruptcy, it may be individually rational for bondholders to hold out.

value of the firm's assets), Alderson and Betker (1995), Gilson (1997), and Maksimovic and Phillips (1998) consider such costs to be low (less than 2% of the pre-bankruptcy value of the firm's assets). The variation in costs may be explained by the variation in sample sizes and sample periods. More recently, Bris, Welch, and Zhu (2006) show that bankruptcy costs are heterogeneous, ranging between 0% and 20%. Note also, that the level of uncertainty with respect to the added cost of formal over informal procedures is augmented by the uncertainty about the duration of the bankruptcy process.[5] To the extent that bankruptcy costs increase with the time spent under bankruptcy, the uncertainty about the duration of the bankruptcy process makes bankruptcy costs even harder to estimate.

A second issue relates to the choice between the reorganization and liquidation procedures. U.S. bankruptcy law discourages involuntary filings by leaving the choice of the chapter filing – liquidation under Chapter 7 or reorganization under Chapter 11 – to the manager. However, if a plan is not approved by each impaired class, the court can unilaterally impose or "cram down" the plan on dissenting classes. Thus, the court has the ability to convert a reorganization procedure into a liquidation procedure. At a liquidation event, the firm's assets are sold, and typically, there is no violation of the APR. Moreover, as discovered by Stromberg (2000) and Bris, Welch, and Zhu (2006), the payoff to unsecured debtholders and to stockholders is typically negligible.

The third source in which investors may have heterogeneous beliefs is the degree to which the APR is violated through the reorganization. The APR implies that junior claims do not receive any payment until senior claims are paid in full. A reorganization plan specifies a new capital structure for the firm, describing how creditors are paid in terms of cash or new securities. Such plans, as shown empirically, frequently deviate from the APR. According to Franks and Torous (1989), Eberhart, Moore and Roenfeldt (1990), and Weiss (1990), the priority of claims is violated in three-quarters of Chapter 11 cases. In a more recent

[5] For example, Bris, Welch, and Zhu (2006) find that the time spent by firms under Chapter 11 varies from 2 to 74 months with an average of 27 months and a standard deviation of 13 months. Helwege (1999), Denis and Rodgers (2007), and Kalay et al. (2007) also find a substantial dispersion in the time spent in bankruptcy.

sample, Bris, Welch, and Zhu (2006) find deviation from the APR in only 12% of cases. As with bankruptcy costs, the specific judge is an important factor and has explanatory power in predicting such deviations.

Judicial discretion thus amplifies the uncertainty surrounding the redistribution of reorganized firm value across claimants. First, there is evidence of shareholder-favoring versus creditor-favoring judges (Chang and Schoar, 2007). Second, shareholders can influence the choice of bankruptcy venue – a practice referred to as forum shopping. Eisenberg and LoPucki (1999) provide strong evidence for forum shopping in large bankruptcy reorganizations. Parikh (2012) empirically confirms that forum shopping remains a systemic issue in bankruptcy.

After we review the potential causes for heterogeneous beliefs in a bankruptcy procedure that our model covers, we then illustrate how these beliefs affect claimholders' decisions among formal and informal processes by presenting two hypothetical examples. To simplify matters, we consider a firm that has issued just one zero coupon debt instrument that is supposed to be paid at the current time. The firm has assets with a value equal to 100, which is less than the outstanding debt value; therefore, the firm is economically insolvent. Prior to any action, however, the stockholder and the debtholder attempt to settle out of court to avoid costs. During this bargaining process, we assume that each of the claimholders – the stockholder and the debtholder – can make her own subjective estimation of the value of the different securities that were issued by the firm with full certainty. In addition, we assume that the assessments that are made by each claimholder are transparent to one another.

In the first example, the stockholder is certain that, if the case goes to formal bankruptcy, the court would decide that the debtholder receives securities that are worth 60% of the value of the firm's assets in an informal process, the stockholders would receive 20%, and the remaining 20% would be lost due to bankruptcy costs. The debtholder has different expectations upon formal bankruptcy. She is certain that she would receive 70% of the firm's assets in an informal process, whereas the present value of the bankruptcy costs is 25%, and the residual payoff to the stockholder is equal to only 5%. If the valuations that

are made are transparent to all claimholders, then at equilibrium, the dispute would be solved informally out of court. The sum of the value of the equity, as estimated by the equityholder (20%), and the value of the debt, as estimated by the debtholder (70%), under the formal procedure is below the residual assets of the firm in an informal process (100%). Therefore, both claimholders believe that they may be better off by negotiating out of court, because there is a surplus of 10% that can be divided among the parties. In an informal process, each side can offer its counterpart a payoff that is higher than the payoff that the counterpart expects to receive upon a formal bankruptcy procedure without diminishing her own wealth and according to her belief (Pareto Improving).

In the second contradictory example, the shareholder has the same beliefs as in the first example; she is certain that if the case goes to formal bankruptcy the court would decide that the debtholder would receive 60% of the firm's assets, the stockholder would receive 20%, and the remaining 20% of the firm's assets would be lost due to the expected value of bankruptcy costs. However, in this example, the debtholder's beliefs are changed; she estimates that, under the formal procedure, her share is 90% of the residual assets, whereas the present value of the bankruptcy costs is 5%, and the residual payoff of the stockholder is only 5%. If the valuations that were made are fully transparent to all claimholders, then at equilibrium, the dispute would not be solved informally out of court. Under the formal procedure, the sum of the equity value, as estimated by the stockholder (20%), and the value of the debt, as estimated by the debtholder (90%), is higher than the residual assets of the firm in an informal process (100%). Therefore, both sides believe that they can achieve more by using a formal procedure, and they are aware that there is no place for informal negotiations, because there is no surplus that can be divided.

In practice, the court in a formal bankruptcy procedure hears evidence about the firm's prospects in a valuation hearing and adopts a valuation based on its interpretation of the often conflicting information. In an informal process, when the applicable bankruptcy court is likely to exercise judicial discretion, equityholders and creditors must form opinions about the outcome of the court not only by predicting the outcome using their own knowledge and

understanding of the applicable fact patterns and their understanding of the facts available to the other side, but also by trying to predict the behavior of the court according to their knowledge and assessment capabilities. In the model set forth below and in contrast to Giammarino (1989) and Chen (2004), we do not assume that the stockholder is better informed about the likely outcome of a valuation hearing than the debtholder; instead, we assume that both sides simply have contradictory beliefs about the results of a formal bankruptcy procedure.

4 Heterogeneous beliefs about the formal bankruptcy procedure

In this section we describe the valuation model that is used by claimholders in a formal bankruptcy procedure. All claimholders are using an identical valuation model but may have different assessments of the parameters of such a model.

4.1 The basic model

We consider a firm in financial distress financed by equity and outstanding debt; the debt is currently payable in full. Stockholders are assumed to act as a single class of claimholders; creditors are also assumed to act as a single class.[6] Initially, stockholders claim that they cannot pay the entire debt amount on time and that the firm is thus in default. We assume that the value of the firm assets in an informal process is equal to V. If there is no agreement between the two claimholders on an informal process, then a formal bankruptcy procedure would take place. We assume the additional costs (compared with the costs that would be incurred in a private workout) borne by the firm during formal bankruptcy are a fraction α of the firm's asset value.

[6] As in Giammarino (1989), the manager can be understood as the owner-manager of the firm or as the manager of a widely held firm who acts in the best interest of the firm's shareholders. Similarly, the debtholder can be understood as a single creditor or as an agent acting on behalf of all creditors.

If a formal procedure has been chosen, there is a probability π of the firm entering into structured bargaining, such as U.S. Chapter 11 reorganization, in which a continuation plan is settled and the firm survives as a going concern, and a probability $1-\pi$ of a liquidation decision, pursuant to which there would be a cash auction, such as Chapter 7 of the U.S. bankruptcy code. If the court has decided on a reorganization procedure, there may be a deviation from the APR, and therefore, the debtholders would receive only a portion β of the remaining firm's assets. Otherwise, the firm would be liquidated, and a fraction γ of the remaining firm's asset value would be lost.

All claimholders are risk neutral, and the risk-free rate of return is normalized to zero. The basic model is extended to the case with risk-averse claimholders in the next subsection. Pursuant to a formal bankruptcy procedure, the value of the shareholders' claim (equity), denoted by S, and the value of the creditors's claim (debt), denoted by C, can be expressed as:

$$\begin{aligned} S &= \pi V (1-\alpha)(1-\beta), \\ C &= \pi V (1-\alpha)\beta + (1-\pi) V (1-\alpha)(1-\gamma). \end{aligned}$$

Creditors and stockholders may have heterogeneous beliefs about the important factors that determine the value of the firm's securities. These factors include the costs of formal bankruptcy (α), the probability of a court decision on a reorganization decision (π), and the portion of the firm's assets that would be paid to the debtholders in a reorganization event (β). Therefore, we use subscript s to denote the value of a security according to stockholders' beliefs and the subscript c to denote the value of a security according to creditors' beliefs. The value of the stock and the debt according to each claimholder's beliefs can be written, respectively, as:

$$\widetilde{S} = \pi_s V (1-\alpha_s)(1-\beta_s), \tag{1}$$

$$\widetilde{C} = \pi_c V (1-\alpha_c)\beta_c + (1-\pi_c) V (1-\alpha_c)(1-\gamma). \tag{2}$$

During the first stage of the bargaining, each of the claimholders estimates what would be the value of the claims against the firm if a formal bankruptcy procedure were chosen.

Because we assume that this initial assessment is known to each of the claimholders, then an informal process would take place if and only if the sum of the value of each claim, according to the beliefs of its holder, is less than the value of the firm's assets in an informal process.

Proposition 1 *In a world in which claimholders have heterogeneous beliefs about the outcome of a formal bankruptcy procedure and "agree to disagree" about their difference in beliefs, a necessary and sufficient condition for an informal process to be chosen is*

$$\widetilde{S} + \widetilde{C} \leq V, \tag{3}$$

where $\widetilde{S}$ and $\widetilde{C}$ are given by equations (1) and (2), respectively.

Proof: If $\widetilde{S} + \widetilde{C} \leq V$, then a private workout will be accepted by both parties as soon as shareholders receive $\widetilde{S}$, creditors receive $\widetilde{C}$, and the positive surplus $V - \left(\widetilde{S} + \widetilde{C}\right)$ is shared according to an agreed-upon plan between the claimholders. Conversely, if $\widetilde{S} + \widetilde{C} > V$, then it will be impossible to privately negotiate a sharing rule of the assets' value (V) that leaves both shareholders and creditors better off compared to what they might expect in formal bankruptcy.□

In this model, claimholders with homogenous beliefs will opt for a private workout because the formal bankruptcy entails additional costs (α) and potential liquidation costs (γ) and therefore

$$S + C = V(1 - \alpha)[1 - \gamma(1 - \pi)] < V.$$

Expanding equation (3), private negotiations will take place if and only if the function

$$\begin{aligned} \Psi(\alpha_s, \alpha_c, \beta_s, \beta_c, \pi_s, \pi_c) \quad : \quad &= \pi_s (1 - \alpha_s)(1 - \beta_s) + \pi_c (1 - \alpha_c) \beta_c \\ &+ (1 - \pi_c)(1 - \alpha_c)(1 - \gamma) - 1 \end{aligned}$$

is negative.

The study of function Ψ allows us to characterize how heterogeneity in beliefs determines the type of renegotiation (private or formal). The next propositions provide the results of this study.

Proposition 2 ***APR enforcement.*** *If the court can credibly enforce the APR, then* $\beta_s = \beta_c = 1$*, and claimholders will always prefer to resolve financial distress through a private workout.*

In this case, indeed, we obtain

$$\Psi(\alpha_s, \alpha_c, \beta_s, \beta_c, \pi_s, \pi_c) := (1 - \alpha_c)[1 - \gamma(1 - \pi_c)] - 1 < 0.$$

Proposition 2 offers new insight into the issue of APR enforcement. Violations of APR are commonly understood as an *ex post* inefficiency of formal bankruptcy; they are considered to be concessions that the court must give stockholders to reach an agreement for a reorganization plan. In the "heterogeneous beliefs" argument, APR enforcement is neither efficient nor desirable. The possibility to deviate from the APR makes claimholders consider formal bankruptcy to be potentially more valuable than a private workout.

Proposition 3 ***Heterogeneity in beliefs about the costs of formal bankruptcy.*** *If claimholders only disagree about the costs of formal bankruptcy* $(\alpha_s \neq \alpha_c)$*, then a private workout will always be preferred.*

Proposition 3 immediately follows from inequality $\Psi(\alpha_s, \alpha_c, \beta, \beta, \pi, \pi) \leq 0$. Because both claimholders consider formal bankruptcy to be more costly than a private workout, then regardless of the degree to which they disagree about the magnitude of this extra cost, they will both find a private workout to be a more profitable solution.

Proposition 4 ***Heterogeneity in beliefs about the fraction of firm value allocated to creditors upon reorganization.*** *If claimholders only disagree about the fraction of firm value allocated to creditors upon reorganization* $(\beta_s \neq \beta_c)$*, then a private workout will be preferred if and only if*

$$\beta_c - \beta_s \leq \frac{\alpha}{\pi(1 - \alpha)} + \frac{\gamma(1 - \pi)}{\pi}, \tag{4}$$

where α *and* π *denote the common beliefs about the additional costs of formal bankruptcy and the probability of reorganization, respectively.*

Proposition 4 follows from condition $\Psi(\alpha, \alpha, \beta_s, \beta_c, \pi, \pi) \leq 0$, which is equivalent to claimholders preferring to renegotiate under a private workout. Proposition 4 states that claimholders will utilize formal bankruptcy procedures when creditors are overly optimistic about the share of the firm's asset value that they can obtain from formal bankruptcy ($\beta_c - \beta_s$ sufficiently positive). In this situation, indeed, creditors prefer to abandon private negotiations because they expect to recover more from formal bankruptcy procedures. Note that the condition associated with Proposition 4 does not involve the absolute belief of creditors (β_c) but a difference of opinions instead ($\beta_c - \beta_s$). It is therefore the degree of heterogeneity in beliefs that actually determines the choice between private and formal renegotiations.

Proposition 4 also demonstrates that the indifference threshold for the mode of financial distress resolution (i.e., the right-hand side of inequality (4)) increases with α and γ, but it decreases with π. Consistent with intuition, this result indicates that the likelihood of a private workout increases as formal bankruptcy becomes more expensive (high α or high γ), all else being equal. Similarly, creditors' relative optimism about β will be more important when the probability of reorganization in formal bankruptcy (π) is higher.

In several jurisdictions (including the U.S.), for a reorganization plan to be confirmed, the court must rule that the reorganization being imposed is "fair and equitable". This rule essentially requires that the share of the debtholder be at least as large as her share would have been under a liquidation procedure (Brown, 1989). When the court can credibly enforce a fair and equitable plan, we have the following conditions

$$\begin{aligned} 1 &\geq \beta_s \geq 1 - \gamma, \\ 1 &\geq \beta_c \geq 1 - \gamma, \end{aligned}$$

which entails that

$$-\gamma \leq \beta_c - \beta_s \leq \gamma.$$

We therefore obtain the following corollary.

Corollary 5 ***Fair and equitable plan enforcement.*** *Suppose that claimholders only*

disagree about the fraction of firm value allocated to creditors upon reorganization ($\beta_s \neq \beta_c$), *and suppose that the court can credibly enforce a fair and equitable plan. If*

$$\gamma > \frac{\alpha}{\pi(1-\alpha)} + \frac{\gamma(1-\pi)}{\pi},$$

then the fair and equitable plan enforcement has no impact on claimholders' preference for a private workout. Otherwise, claimholders will always prefer to resolve financial distress through a private workout.

Essentially, fair and equitable plan enforcement reduces the scope for heterogeneity in beliefs across claimholders and makes liquidation costs γ the new upper bound for the difference in opinions about β. If this new constraint is binding, then beliefs are not sufficiently heterogeneous to make formal bankruptcy attractive to claimholders.

However, if claimholders have heterogeneous beliefs about the acceptance of a reorganization decision *and* about the size of the deadweight cost of a formal procedure, then the choice of renegotiation procedure depends to a greater extent on the creditor's belief rather than on the stockholder's belief. This greater impact is illustrated by the following example.

Suppose that the value of the firm's assets in an informal process is 100. The creditor believes that there is a 10% probability of the court accepting a reorganization plan if the formal procedure is chosen, whereas the stockholder believes that there is a 50% chance of the court accepting a reorganization plan. Both claimholders assume that the liquidation costs are 30% of the firm's assets and that the creditor's share in a formal bankruptcy procedure is equal to 20% of the firm's residual assets. Table 1 presents the sum of the values of the claims in a formal procedure as estimated by their holders.

Insert Table 1 here

This example shows that if the stockholder believes that there are no added costs for a formal procedure, formal bankruptcy would be chosen, unless the creditor believes that these costs exceed 7.5%. However, in the opposite case, when the creditor assumes zero added costs

for a formal bankruptcy procedure, the informal process would be chosen, unless the added costs estimated by the stockholders are greater than 12.5%.

Proposition 6 ***Heterogeneity in beliefs about the probability of reorganization.*** *If claimholders only disagree about the probability of reorganization* ($\pi_s \neq \pi_c$)*, then a private workout will be preferred if and only if*

$$\pi_s - \pi_c \frac{1-\gamma-\beta}{(1-\beta)} \leq \frac{\alpha}{(1-\alpha)(1-\beta)} + \frac{\gamma}{(1-\beta)},$$

where β *denotes the common belief about the share of firm value that is allocated to creditors after reorganization.*

Proposition 6 immediately follows from condition $\Psi(\alpha, \alpha, \beta, \beta, \pi_s, \pi_c) \leq 0$, which ensures that claimholders prefer to renegotiate under a private workout.

Consistent with intuition, Proposition 6 states that if creditors are relatively more pessimistic about the likelihood of reorganization (i.e., when π_c is sufficiently smaller than π_s), then a private workout will be the preferred mode of renegotiation.

Proposition 6 also shows that if formal bankruptcy does not entail extra costs ($\alpha = 0$), and if the court can enforce a fair and equitable plan ($\beta \geq 1-\gamma$), then private workout will always be preferred. Indeed, we would then have

$$\begin{aligned} \Psi(0, 0, \beta_s, \beta_c, \pi_s, \pi_c) &= \pi_s(1-\beta) + \pi_c\beta + (1-\pi_c)(1-\gamma) - 1 \\ &\leq \pi_s(1-\beta) + \beta - 1 \leq 0. \end{aligned}$$

Naturally, the same result holds if formal bankruptcy entails additional costs ($\alpha > 0$). Proposition 6 therefore highlights that the existence of heterogeneous beliefs about the likelihood of reorganization is not sufficient to shift equilibrium into formal bankruptcy if the court can impose the fair and equitable rule. Thus, the knowledge about the court and the strictness with which it enforces this rule has an essential impact on the chosen renegotiation procedure.

4.2 Risk-averse claimholders

We extend the previous framework to account for risk-averse claimholders. Specifically, claimholders continue to have their own estimates of the extra costs of formal bankruptcy (α) and creditor recovery upon reorganization (β), but now they evaluate their claims by assigning a utility score that penalizes the uncertainty surrounding the outcome of the bankruptcy process.[7] In the approach involving heterogeneous beliefs, formal bankruptcy appears to be a risky alternative to a private workout. Intuition therefore suggests that the incentives for formal bankruptcy should thus be reduced by claimholders' risk aversion. The aim of this subsection is to gauge this disincentive economically within a simple framework and a proper calibration exercise.

The utility function of economic agent x is denoted by $U_x(.)$. The line of reasoning that led to Proposition 1 now entails that a necessary and sufficient condition for an informal process to be chosen is

$$U_s\left(\widetilde{S}\right) + U_c\left(\widetilde{D}\right) \leq V.$$

Assuming quadratic utility functions, this conditions translates into

$$E_s\left(\widetilde{S}\right) - \frac{\lambda_s}{2} Var\left(\widetilde{S}\right) + E_c\left(\widetilde{D}\right) - \frac{\lambda_c}{2} Var\left(\widetilde{D}\right) \leq V,$$

where λ_x denotes the risk aversion coefficient for agent x. Expanding and simplifying expectations and variances, we obtain the following necessary and sufficient condition for a private workout to be preferred over formal bankruptcy:

$$\begin{aligned} V \quad \geq \quad & \pi_s V (1-\alpha_s)(1-\beta_s)\left(1 - \frac{\lambda_s}{2}(1-\pi_s) V (1-\alpha_s)(1-\beta_s)\right) \\ & + \pi_c V (1-\alpha_c)\beta_c + (1-\pi_c) V (1-\alpha_c)(1-\gamma) \\ & - \frac{\lambda_c}{2}\pi_c (1-\pi_c) V^2 (1-\alpha_c)^2 (\beta_c - (1-\gamma))^2 . \end{aligned}$$

At this point, we can measure the impact of risk aversion on the resolution of financial distress. To this end, we calibrate the values of the parameters of common beliefs by using

[7] A further extension, beyond the scope of this paper, would be to consider that beliefs about additional costs of formal bankruptcy (α) and creditor recovery upon reorganization (β) are also stochastic.

estimates from empirical observation. Table 2 presents the median values for α, β, γ and π, as reported by recent empirical studies on Chapter 11 outcomes.

Insert Table 2 here

For purposes of calibration, we assume that the firm incurs identical indirect costs of financial distress (e.g., loss of investment opportunities) if renegotiations are undertaken in a private workout or under formal bankruptcy. Consequently, the additional costs stemming from formal bankruptcy amount to the direct costs of the formal bankruptcy procedure (such as compensation provided to lawyers, accountants, consultants and expert witnesses). Moreover, Table 1 shows the levels at which we set the extra costs of formal negotiations ($\alpha = 5\%$), the fraction of firm value allocated to creditors upon reorganization ($\beta = 80\%$), the proportional liquidation costs ($\gamma = 5\%$), and the probability of reorganization ($\pi = 80\%$).

Under this set of calibrated values and with no risk aversion ($\lambda_s = \lambda_c = 0$), Propositions 4 and 6 can be explicitly characterized as follows, with private workout being preferred if one of these conditions is satisfied:

$$\begin{aligned} \beta_c - \beta_s &\leq 0.07829, \\ \pi_s - 0.75\pi_c &\leq 0.51316. \end{aligned}$$

These two conditions are illustrated in Figure 1 (straight lines), which shows the domains for a private workout and formal bankruptcy as a function of claimholders' beliefs. As Figure 1 shows, one of the following conditions must be met for formal bankruptcy to be preferred: (i) creditors are more optimistic about the value that they can recover upon reorganization (β_c is above the value shared in the common belief) or (ii) shareholders are substantially more optimistic about the probability of reorganization (π_s is significantly above the value shared in the common belief). As posited by Propositions 4 and 6, homogeneity in beliefs favors the resolution of financial distress through a private workout. Conversely, a certain amount of disagreement among claimholders is required for them to

opt for a formal bankruptcy procedure in the hope that the third party (i.e., the court) will resolve the financial distress according to their beliefs.

When introducing risk aversion in Figure 1 (dashed lines), we observe that the domain for formal bankruptcy shrinks as claimholders become more risk averse. This result confirms the intuition from the heterogeneous beliefs argument, i.e., formal bankruptcy is a risky alternative to private negotiations. Because of the uncertainty surrounding the outcome of formal bankruptcy and its payoffs, risk-averse claimholders will be more prone to resolve financial distress through a private workout.

5 Empirical analysis

The goal of this section is to examine the empirical determinants of the decision to resolve financial distress through formal bankruptcy or through a private restructuring. Following this examination, we will discuss the extent to which these determinants are consistent with the rationale of heterogeneity in beliefs. Admittedly, the scope for disagreement between shareholders and creditors is hardly observable. We therefore use proxies to designate situations in which claimholders' beliefs are heterogeneous.

5.1 Data

The initial sample consists of all defaults (excluding technical defaults such as missed payments) recorded in Moody's annual reports from 1996 to 2011.[8] After matching with available financial data is performed, we are left with 344 reported defaults that are classified as either formal bankruptcy (labeled "Chapter 11", "bankruptcy", or "prepack" in Moody's reports) or private restructurings (labeled "distressed exchange" in Moody's reports). After removing firms with missing values in their financials, the final sample consists of 252 de-

[8] By working with Moody's reported defaults, we are focusing on firms that have both bank debt and outstanding bonds. For firms such as these with multiple classes of debt, the choice between formal and informal restructuring is particularly relevant.

faults that further breaks down into 180 bankruptcy filings and 72 private restructurings.[9] Table 3 provides descriptive statistics for the final sample.

Insert Table 3 here

Table 3 highlights several industry effects on the resolution of financial distress. Firms belonging to the primary sector, in addition to transportation and communications firms, are more prone to restructure privately. All other industries show a mild overrepresentation in bankruptcy filings.

The dependent variable is a dummy taking the value of one (zero) when the defaulting firm files for bankruptcy (undergoes a private restructuring).[10] The dependent variable is referred to as the bankruptcy dummy.

The previous empirical studies from Gilson, John, and Lang (1990), Chatterjee, Dhillon, and Ramirez (1996), Yost (2002), and Jacobs, Karagozoglu, and Layish (2012) identify several key determinants in the decision to opt for formal bankruptcy, including asset tangibility, leverage, growth opportunities, operating performance, debt placement, and the number of debt issues. We therefore include the determinants described below in our regression analysis.

The financial statement data are from Compustat (for North American firms) and Worldscope (for all others) and are collected for the latest available year before default. Other firm-level data (creditor structure, number of subsidiaries) are from Orbis and Mergent Webreports.

Asset tangibility All else being equal, firms with intangible assets are more difficult for outsiders to evaluate. According to the asymmetric information argument, the higher

[9] For comparison, the sample size of the previous empirical studies by Gilson, John, and Lang (1990), Chatterjee, Dhillon, and Ramirez (1996), and Yost (2002) are 169, 202, and 174 defaults, respectively. Jacobs, Karagozoglu and Layish (2012) examine bankruptcy filings and outcomes for a sample of 518 firms during the 1985-2007 period.

[10] As a robustness check, we constructed a similar dummy variable on the sample that excludes prepacks (20 observations); the results (not reported) are qualitatively unchanged.

the ratio of intangible assets is, the stronger the incentive to file for bankruptcy is. We proxy asset tangibility as the ratio of intangible assets over total assets.

Firm leverage All else being equal, a firm with high leverage is more prone to agency conflicts between shareholders and creditors. The agency argument therefore predicts a positive relationship between leverage and preference for formal bankruptcy. Conversely, as noted by Jensen (1989), a higher debt level provides claimholders with a greater incentive to renegotiate, which is consistent with the heterogeneous beliefs argument – the more the firm is leveraged, the more certain claimholders are that formal bankruptcy will be costly. Thus, more debt entails less disagreement and a preference for a private restructuring. We use the ratio of long-term debt over total assets as our proxy for this determinant.

Growth opportunities The presence of growth opportunities (proxied by the market-to-book ratio) can lead to misalignment between shareholder and creditor interests. The agency argument therefore predicts a positive relationship with the bankruptcy dummy; the heterogeneous beliefs argument also predicts the same positive relationship because claimholders will be more likely to disagree about how the court will evaluate these opportunities. We proxy growth opportunities as the difference between the market value of equity and the book value of equity divided by the market value of equity.

Operating performance A defaulting firm with poor operating performance will likely require extensive restructuring, and agency conflicts between shareholders and creditors will be more severe. Moreover, as argued by Yost (2002), the debtor-in-possession rule that is applied in the formal bankruptcy process provides a tool for claimholders to receive additional financing and alleviate agency conflicts. The agency argument therefore predicts a negative relationship between operating performance and the bankruptcy dummy. We argue that firm operating performance is another source of heterogeneity in beliefs. Firms with good operating performance are likely to be reorganized and therefore leave little room for doubt about the outcome of formal bankruptcy. By contrast, shareholders and creditors

are more inclined to disagree about judicial decision making when operating performance is poor. We use return on assets as a proxy for firm operating performance.

Debt placement and multiple creditors We use the amount of defaulted-upon bonds (reported by Moody's) divided by long-term debt – which reflects the fraction of public debt in the debt structure – as one variable, and we use the number of private debt issues as another; these two variables serve as proxies for the difficulty in coordination among creditors. A positive relationship between these variables and the dependent variable is therefore predicted.

Asset liquidity During the resolution of financial distress, claimholders must bargain over the disposal of short-term assets. The more illiquid these assets are, the more disagreement about their liquidation value will result. Thus, according to the heterogeneous beliefs argument, asset liquidity should be negatively linked to the bankruptcy dummy. We use the current ratio as a proxy for asset liquidity.

Creditor protection From Propositions 4 and 6, we argue that a firm is more likely to file for bankruptcy when creditors are optimistic about its recovery. Creditors will expect a higher recovery rate when their debt is secured. However, the recovery on secured debt is subject to judicial discretion. Bankruptcy judges have some latitude to more or less enforce the liquidation of the applicable collateral to pay back secured creditors. A classic example is the practice of "asset stripping" in Chapter 11 cases in which bankruptcy judges reinvest the collateral to overprotect firm assets from a run by creditors (see Weiss and Wruck, 1998, for evidence). The heterogeneous beliefs argument therefore predicts a positive relationship between the proportion of secured debt and the bankruptcy dummy. Thus, we proxy creditor protection with the fraction of secured debt over long-term debt.

Forum shopping Propositions 4 and 6 also predict that a firm is more likely to file for bankruptcy when shareholders are optimistic about the probability of reorganization.

The reorganization decision is made at the bankruptcy judge's discretion. In particular, Gennaioli and Rossi (2011) show that the intensity of judicial discretion depends on shareholders' ability to forum shop (i.e., to choose the bankruptcy venue). Bris et al. (2006) empirically document that the bankruptcy venue has an impact on the probability of reorganization and on creditor recovery. We use the number of the firm's subsidiaries as an indication of shareholders' ability to forum shop. Thus, the heterogeneous beliefs argument predicts a positive relationship between this variable and the bankruptcy dummy.

Table 4 summarizes the variables that are used in the empirical study and their predicted relationships with the likelihood of filing for bankruptcy.

Insert Table 4 here

The set of variables includes six determinants that capture the effects of informational asymmetry, agency, and creditor coordination. Among these, three variables (leverage, growth opportunities, and operating performance) also account for the impact of heterogeneous beliefs, two of which (growth opportunities and operating performance) have similar sign predictions. In other words, these two variables will not allow us to discriminate between the heterogeneous beliefs effect and the effects predicted by other rationales. Notably however, the other third variable (leverage) is predicted to behave in the opposite direction depending on whether the heterogeneous beliefs argument or other rationales hold. Inspection of the estimated coefficient for this variable will therefore be particularly informative of the relative importance of the heterogeneous beliefs argument compared to other rationales. Finally, the set of variables includes three other determinants that specifically capture the effects of heterogeneous beliefs (asset liquidity, creditor protection, and forum shopping).

The descriptive statistics are reported in Table 5. On average, our sample firms are highly leveraged, have poor operating performance, and have assets that are relatively liquid and tangible. There are important discrepancies insofar as growth opportunities are concerned. Creditor coordination looks to be a significant issue because private debt is prominent in liabilities and there are multiple creditors. Most creditors are unsecured, and the large number of subsidiaries might indicate real possibilities for forum shopping.

Insert Table 5 here

5.2 Results

5.2.1 Logit regressions

Table 6 presents the results of the logit regressions.[11] We present five different specifications that each account for time-fixed effects and robust standard errors. In unreported results, we also control for firm size (log of assets) and industry (first digit of SIC code), and we arrive at similar findings. Model (1) includes the three variables whose effects can be exclusively attributed to other rationales (asymmetric information, agency effects, and creditor coordination). Model (2) adds to model (1) the three variables whose effects are jointly explained by heterogeneous beliefs and other rationales. Model (3) includes the three variables whose effects can be exclusively attributed to heterogeneous beliefs. Model (4) adds to model (3) the three variables whose effects are jointly explained by heterogeneous beliefs and other rationales. Model (5) includes all the variables.

Insert Table 6 here

The model with all the variables (model (5)) achieves a relatively good fit with the data and demonstrates a prediction rate of about 83%. All six predictions emanating from the heterogeneous beliefs argument are supported by this regression specification. The likelihood of filing for bankruptcy is negatively related to asset liquidity, operating performance, and leverage, and positively related to growth opportunities (a result that contrasts that of Gilson, John, and Lang, 1990), creditor protection, and forum shopping. Additionally, the negative relationship with leverage is at odds with the agency argument.

The predictions from the heterogeneous beliefs argument lose statistical significance when the argument is taken as a stand-alone rationale. In models (3) and (4), the effects of

[11] Jacobs, Karazoglu, and Layish (2012) show that the logit model performs better than local regression models or neural network approaches with respect to predicting bankruptcy filings.

asset liquidity, creditor protection, and forum shopping cannot be captured at the 10% significance level. Nonetheless, the effects that are jointly explained by heterogeneous beliefs and other rationales remain significant with the sign correctly predicted by the heterogeneous beliefs argument.

As in prior empirical studies, the proxies for creditor coordination ("debt placement" and "multiple creditors") are found to play a significant role in the decision to file for bankruptcy. We see in models (1) and (2) that the creditor coordination argument explains (for the most part) the decision to file for bankruptcy, whereas the informational asymmetry and agency arguments seem to play a minor role in this decision.

5.2.2 Model comparisons

Table 6 also reports metrics for the goodness of fit of the different model specifications, namely, the pseudo R^2, the prediction rate, the Akaike Information Criterion (AIC), and the Bayesian Information Criterion (BIC). All these metrics convey similar indications regarding the classification of model specifications and the quality of their fit to the data. Model (1) – which essentially captures the effects of creditor coordination – has greater explanatory power than models (3) or (4), which exclusively capture the effects of heterogeneous beliefs. The inclusion of agency effects (in models (2) and (4)) hardly improves the specification. Finally, the effects of heterogeneous beliefs provide incremental explanatory power when combined with the effects of creditor coordination (model (5)).

We formally test for the quality of the model fit by using the Likelihood Ratio tests (LR tests), which allow for a comparison between embedded specifications; these results are reported in Table 7.

Insert Table 7 here

The LR tests provide statistical confirmation of our initial assessment of the specifications. Although creditor coordination as a stand-alone argument appears to be an important determinant of the decision to file for bankruptcy, the inclusion of the effects of heterogeneous beliefs enhances the model specification. Heterogeneity in beliefs should therefore be

considered a relevant additional rationale that explains the choice between private restructuring and formal bankruptcy.

6 Conclusion

A firm that must restructure its debt during financial distress faces a choice between two alternatives: privately renegotiate debt claims against it in an informal process (i.e., through an out-of-court workout) or file for bankruptcy to resolve creditor disputes through in-court proceedings. Financial scholars suggest that it is in the best interests of claimholders to agree on an informal reorganization of the firm before incurring any deadweight costs. Nevertheless, empirical studies indicate that a substantial percentage of firms choose formal bankruptcy. The puzzle is explained in the financial literature by the presence of at least one of the following factors: asymmetric information, agency problems and creditors conflicts.

In this paper, we provide an additional explanation for this puzzle. We show that the decision to choose formal bankruptcy procedures may be due to the heterogeneous beliefs of the different claimholders regarding the results of formal bankruptcy procedures. We show that each claimholder decides whether to negotiate informally or formally by estimating the value of her claim in a formal procedure and being aware of the assessments made by the other claimholders for the value of their claims. An informal process is chosen only if the total value of all claims (as perceived by its holders) in a formal bankruptcy procedure is less than the total value of the firm assets in an informal process. In such a case, claimholders believe that they will be better off because of the positive surplus that can be divided according to their bargaining power.

This paper analyzes how different claimholder beliefs about the different determinants driving the outcome of a formal procedure (including the added costs of bankruptcy, the deviation from the APR in a reorganization plan, and the probability of the court accepting a reorganization plan) affect the claimholders' choice between the different types of debt resolution.

Finally, we provide empirical evidence supporting heterogeneity in beliefs as an impor-

tant determinant of the decision to file for bankruptcy. Our findings also confirm that creditor coordination is another key driver in such decisions.

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Tables

		α_s								
		0	2.5	5	7.5	10	12.5	15	17.5	20
α_c	0	105.0	104.0	103.0	102.0	101.0	100.0	99.0	98.0	97.0
	2.5	103.4	102.4	101.4	100.4	99.4	98.4	97.4	96.4	95.4
	5	101.8	100.8	99.8	98.8	97.8	96.8	95.8	94.8	93.8
	7.5	100.1	99.1	98.1	97.1	96.1	95.1	94.1	93.1	92.1
	10	98.5	97.5	96.5	95.5	94.5	93.5	92.5	91.5	90.5
	12.5	96.9	95.9	94.9	93.9	92.9	91.9	90.9	89.9	88.9
	15	95.3	94.3	93.3	92.3	91.3	90.3	89.3	88.3	87.3
	17.5	93.6	92.6	91.6	90.6	89.6	88.6	87.6	86.6	85.6
	20	92.0	91.0	90.0	89.0	88.0	87.0	86.0	85.0	84.0

Table 1: Total value of firm claims in a formal bankruptcy procedure as perceived by its claimholders with heterogeneous beliefs about the costs of formal bankruptcy.

Parameter α_s (resp. α_c) denotes the added cost (in %) of formal bankruptcy according to the stockholder's (resp. creditor's) belief. The value of firm's assets in an informal process is normalized to 100. The bondholder believes that there is a 10% probability that the court will accept a reorganization plan if a formal procedure is chosen, and the stockholder believes that this probability is 50%. Both claimholders assume the liquidation costs are 30% of the firm's assets and that the payoff to the bondholder in formal bankruptcy would be equal to 20% of the firm's residual assets in an informal process. A formal procedure would be chosen whenever the value of assets in a formal procedure is greater than 100.

Authors	Sample size	Sample period	Average value
Panel A: Liquidation rate $(1-\pi)$			
Denis and Rodgers (2007)	224	1985–1994	18%
Kalay, Singhal and Tashjian (2007)	459	1991–1998	20%
Bris, Welch and Zhu (2006)	312	1995–2001	24%
Carapeto (2005)	389	1986–1997	14%
Jacobs, Karagozoglu and Layish (2012)	421	1985–2007	17%
Hotchkiss and Mooradian (2004)	1,770	1979–2002	21%
Panel B: Direct costs of financial distress under Chapter 11 (α)			
Bris, Welch and Zhu (2006)	225	1995–2001	9.5%
LoPucki and Doherty (2004)	48	1998–2002	1.4%
Betker (1997)	75	1986–1993	3.9%
Weiss (1990)	37	1979–1986	3.1%
Panel C: Liquidation costs (γ)			
Bris, Welch and Zhu (2006)	61	1995–2001	8.1%
Lawless and Ferris (1997)	98	1991–1995	6.1%
Ang, Chua and McConnell (1982)	86	1963–1979	7.5%
Panel C: Absolute Priority Rule violations (β)			
Bharath, Panchapagesan and Werner (2010)	531	1991–2005	22%
Bris, Welch and Zhu (2006)	312	1995–2001	12%

Table 2: Empirical estimates of Chapter 11 parameters.

Industry	SIC code	All defaults #	All defaults %	Restructuring #	Restructuring %	Bankruptcy #	Bankruptcy %
Agricultural, mining, construction	1-19	28	11.1	16	22.2	12	6.7
Manufacturing	20-39	91	36.1	20	27.8	71	39.4
Transport, communications	40-49	59	23.4	24	33.4	35	19.4
Wholesale, retail	50-59	30	11.9	2	2.8	28	15.6
Financial	60-69	19	7.5	5	6.9	14	7.8
Services	70-89	25	10.0	5	6.9	20	11.1
Total		252	100	72	100	180	100

Year	Restructurings	Bankruptcies	Total	Year	Restructurings	Bankruptcies	Total
1996	0	4	4	2004	2	11	13
1997	0	8	8	2005	0	8	8
1998	2	10	12	2006	1	5	6
1999	6	15	21	2007	0	3	3
2000	1	12	13	2008	7	12	19
2001	4	27	31	2009	29	28	57
2002	11	13	24	2010	4	4	8
2003	2	14	16	2011	4	5	9

Table 3: Industry classification and year count of sample defaults.

Variable	Proxy	Source	Sign
Intangible assets	Intangible assets over total assets	Compustat / Worldscope	(+)
Leverage	Long term debt over total assets	Compustat / Worldscope	(+) [-]
Growth opportunities	Market-to-book ratio	Compustat / Datastream	(+) [+]
Operating performance	Return on assets	Compustat / Worldscope	(-) [-]
Debt placement	Amount defaulted on bonds over long term debt	Moody's / Compustat	(+)
Multiple creditors	Number of private debt issues	Orbis / Mergent	(+)
Asset liquidity	Current ratio	Compustat / Worldscope	[-]
Creditor protection	Secured debt over long term debt	Compustat / Worldscope	[+]
Forum shopping	Number of subsidiaries	Mergent	[+]

Table 4: Variables used in the empirical study.

The column "Sign" refers to the predicted sign of the relationship between the variable and the probability of filing for bankruptcy. The signs of relationships specifically predicted by the heterogeneous beliefs argument are indicated with square brackets. Sign predictions from other rationales are indicated with round brackets.

Variable	Mean	Median	Std dev	Min	Max
Bankruptcy dummy	0.710	1	0.455	0	1
Intangible assets	0.151	0.070	0.185	0	0.807
Asset liquidity	1.423	1.140	1.416	0	12.630
Leverage	0.699	0.623	0.491	0.010	5.487
Growth opportunities	10.076	0.529	69.669	−163.771	770.415
Operating performance	−0.044	0.005	0.176	−1.252	0.690
Debt placement	0.600	0.588	0.470	0.000	5.122
Multiple creditors	1.734	1	1.813	0	13
Creditor protection	0.347	0.313	0.293	0	0.994
Forum shopping	56.115	16	179.012	0	2529

Table 5: Descriptive statistics.

Table 5 reports the descriptive statistics for the bankruptcy dummy (equal to one when the defaulting firm files for bankruptcy) and for financial characteristics of defaulting firms. The sample consists of 252 defaults (180 bankruptcy filings and 72 private restructurings) recorded in Moody's annual reports from 1996 to 2011. The financial statement data are from Compustat (for North American firms) and Worldscope (for all others) and are collected on the latest available year before default. Other firm-level data (creditor structure, number of subsidiaries) are from Orbis and Mergent Webreports.

	Sign	(1)	(2)	(3)	(4)	(5)
Constant		-1.721^{*}	-1.329	0.269^{*}	0.428	-1.317
		(0.885)	(0.941)	(0.775)	(0.847)	(1.003)
Intangible assets	(+)	-0.269	-0.422			-1.092
		(0.837)	(0.894)			(0.940)
Leverage	(+) [-]		-1.105^{**}		-0.939^{*}	-1.505^{***}
			(0.530)		(0.506)	(0.574)
Growth opportunities	(+) [+]		0.016^{**}		0.018^{**}	0.020^{**}
			(0.008)		(0.009)	(0.009)
Operating performance	(-) [-]		-1.920		-2.809^{**}	-2.357^{*}
			(1.265)		(1.297)	(1.413)
Debt placement	(+)	2.416^{***}	2.452^{***}			3.006^{***}
		(0.503)	(0.519)			(0.566)
Multiple creditors	(+)	0.343^{***}	0.384^{***}			0.318^{**}
		(0.142)	(0.159)			(0.165)
Asset liquidity	[-]			-0.128	-0.143	-0.313^{**}
				(0.125)	(0.110)	(0.128)
Creditor protection	[+]			0.345	0.705	1.170^{*}
				(0.511)	(0.539)	(0.682)
Forum shopping	[+]			0.001	0.001	0.003^{*}
				(0.001)	(0.001)	(0.002)
Pseudo R^2 (%)		25.66	28.74	16.36	20.29	31.60
Pseudo log likelihood		-112.75	-108.09	-126.86	-120.90	-103.75
AIC		263.50	260.18	291.71	285.80	257.49
BIC		330.56	337.82	358.77	363.45	345.73
Prediction rate (%)		82.14	82.54	73.81	73.02	82.94

Table 6: Logit regression results.

The dependent variable is a dummy equal to one when the defaulting firm files for bankruptcy. The column "Sign" refers to the predicted sign of the relationship between the variable and the probability of filing for bankruptcy. The signs of relationships specifically predicted by the heterogeneous beliefs argument are indicated with square brackets. Sign predictions from other rationales are indicated with round brackets. Robust standard errors are in parentheses. The prediction rate is the percentage of observations correctly classified by the model. Superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Model	Statistic	p-value	DF
LR test with respect to model (5)			
Model (1)	18.01	0.0062	6
Model (2)	8.68	0.0338	3
Model (3)	46.22	0	6
Model (4)	34.31	0	3
LR test with respect to model (4)			
Model (3)	11.91	0.0077	3
LR test with respect to model (2)			
Model (1)	9.33	0.0252	3

Table 7: Likelihood Ratio tests.

Table 7 reports the Likelihood Ratio tests comparing different embedded model specifications. Model (1) includes the three variables with effects that can be exclusively attributed to other rationales (asymmetric information, agency effects, and creditor coordination). Model (2) adds to model (1) the three variables whose effects are jointly explained by heterogeneous beliefs and other rationales. Model (3) includes the three variables whose effects can be exclusively attributed to heterogeneous beliefs. Model (4) adds to model (3) the three variables whose effects are jointly explained by heterogeneous beliefs and other rationales. Model (5) includes all the variables. The table reports the test statistics and the corresponding p-value and degrees of freedom (DF).

Figures

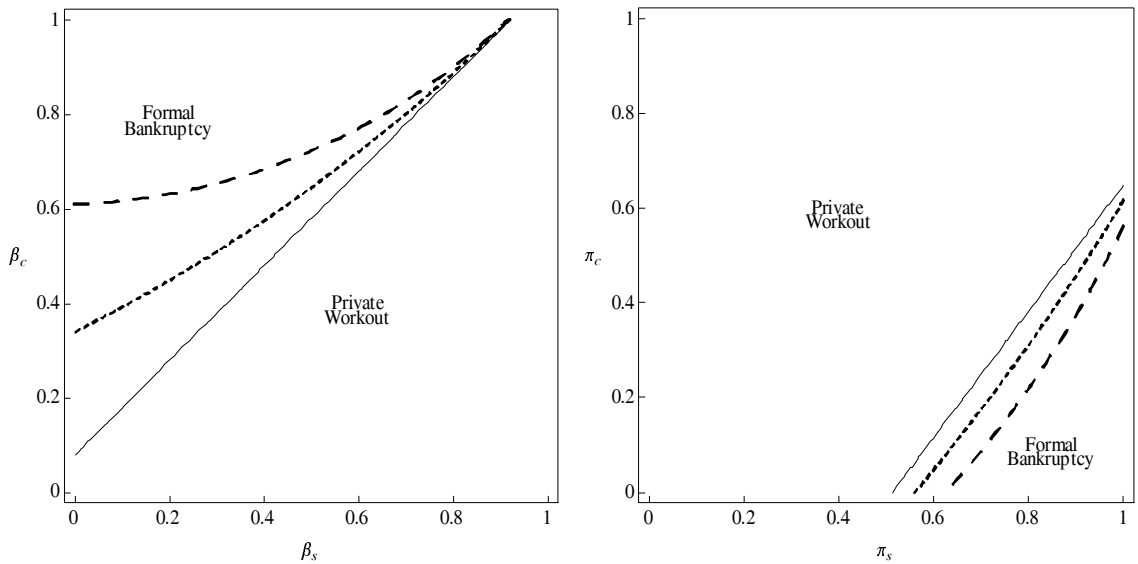

Figure 1: Domains for private workout and formal bankruptcy.

The figures show the domains for formal bankruptcy and private workout when claimholders beliefs are heterogeneous. In the left graph, shareholders and creditors have their own subjective beliefs β_s and β_c about the fraction of the firm's assets that will be paid to the creditors in a reorganization. In the right graph, shareholders and creditors have their own subjective beliefs π_s and π_c about the probability of reorganization. Common belief parameters include the following: the extra costs of formal negotiations ($\alpha = 5\%$), the fraction of firm value allocated to creditors upon reorganization ($\beta = 80\%$), the proportional liquidation costs ($\gamma = 5\%$), and the probability of reorganization ($\pi = 80\%$). The straight line represents the case for risk-neutral claimholders ($\lambda_s = \lambda_c = 0$). The short dashed line represents the case for moderately risk-averse claimholders ($\lambda_s = \lambda_c = 2$). The long dashed line represents the case for highly risk-averse claimholders ($\lambda_s = \lambda_c = 5$).