

Adverse selection and the costs of financial distress

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Abstract

Previous work suggests that, when the debtor has private information on the future profitability of the firm, financial distress is costly even if debt can be renegotiated. This paper shows that adverse selection problems can be completely avoided by offering creditors a mix of cash and equity in the renegotiation. Empirical evidence indicates that this is common practice in corporate debt workouts. However, asymmetric information leads to inefficiencies if equity is not treated as the residual claim in bankruptcy. In this case, equilibria exist in which distressed firms go to court too often.

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1. Introduction

Research in corporate finance has long tried to identify the costs of financial distress. Understanding the nature of such costs is necessary both to

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explain the role of debt in the optimal capital structure of the firm and to design optimal bankruptcy laws based on economic principles¹.

Companies in financial distress typically need to renegotiate their contractual obligations with creditors. As Haugen and Senbet (1978) showed, if all debt can be efficiently renegotiated the costs of financial distress are not paid in equilibrium. Hence, theoretical models often assume that efficient recontracting is prevented either by coordination failures among creditors or by asymmetries of information. In particular, various authors have pointed out that insiders to the firm, while possessing superior information as to the future prospects of the business, have little incentive to share their knowledge with creditors: announcing high future profitability discourages creditors from granting debt forgiveness, while revealing too little of it induces creditors to force a liquidation (Wruck, 1990, Gilson et al., 1990). Giammarino (1989) and Webb (1987) analyze this situation in models in which a bankruptcy filing results in costly state verification. Both authors show that financial distress leads to inefficiencies because adverse selection causes verification costs to be paid in equilibrium.

This paper reconsiders the role of adverse selection in generating costs of financial distress. In the model, when the debtor is worth more in bankruptcy than as a going concern (the firm is non-viable) creditors have no reason to grant debt forgiveness. On the other hand, as Myers (1977) has shown, the firm may be viable, but the debt overhang may be so large that new investment benefits only creditors. In this case, creditors should grant debt forgiveness to ensure that equity will put new resources into the business, and take advantage of profitable investment opportunities. As in Giammarino (1989) and Webb (1987), asymmetric information is introduced by assuming that creditors know neither the profitability of new investment nor the value of the firm in bankruptcy, while the debtor does. As a result, creditors do not know that making concessions is in their best interest, nor, if it is, how much debt they should forgive.

In contrast with previous studies, here workout proposals are allowed to consist of a mix of cash and equity. This is quite realistic, since in most real-world debt restructurings creditors do in fact receive some equity-type claims (Gilson, 1990, Weiss, 1990). As it turns out, in this framework inefficiencies due to adverse selection completely disappear. The intuition is as follows: if the indebted firm is viable but not very profitable, then it must obtain substantial debt forgiveness to stay in business. Creditors, however, will refuse to make large concessions if they believe that the debtor is quite

¹ On financial distress and the role of debt in the capital structure, see for instance Haugen and Senbet (1978), Giammarino (1989), Hart and Moore (1990), Bergman and Callen (1991). On optimal bankruptcy laws, see Bulow and Shoven (1978), Brown (1988), White (1980, 1989), Gertner and Scharfstein (1991), Aghion et al. (1993), Bradley and Rosenzweig (1992).

profitable, and that their payoff in bankruptcy exceeds the value of the debt remaining after concessions are made. With pure debt (or pure cash) offers, a viable but not very profitable firm cannot convince creditors that it is in their best interest to forgive most of the debt. If the debtor can also offer an equity stake in the company, less profitable firms can screen themselves out by offering a lot of equity, since equity is more valuable the larger future expected profits. As it turns out, if workout offers can include a mix of debt and equity, then all Bayesian-Nash equilibria in undominated strategies of the debt renegotiation game are such that non-viable firms file for bankruptcy while viable firms continue as going concerns, hence there are no costs to financial distress. This is true for an arbitrary number of types of debtor. This result extends that of Haugen and Senbet (1978) to an environment with one-sided asymmetric information.

In the discussion above bankruptcy has been implicitly identified with liquidation. Another interpretation is that bankruptcy is a procedure for “costly state verification”, as in Giammarino (1989) and Webb (1987): in court creditors learn the hidden information by forcing the debtor to make disclosures, by asking management to testify under oath, and by hearing the testimony of expert witnesses. In this case, bankruptcy results in liquidation only if the firm is not viable, while viable firms will emerge from bankruptcy as going concerns. Then, the costs of financial distress should be understood as deadweight verification costs.

Interpreting bankruptcy as costly state verification does not change the results derived above as long as equityholders are treated as residual claimants in bankruptcy, as implied by contractual priority. However, if contractual priority is violated, and equity receives a stake in the bankrupt firm, the costs of financial distress due to asymmetric information reappear even if workout offers can include equity claims. The intuition is as follows: with asymmetric information, equityholders of a viable but not very profitable firm must offer creditors a large enough equity participation to convince them that debt forgiveness is really needed to stay in business. In other words, they must give up rents to signal their identity. If creditors have a strong prior that the firm is highly profitable, equityholders end up with very little in a private workout, and they are better off going to court. Since verification costs are deadweight costs, the resolution of financial distress is no longer efficient.

While contractual priority is generally respected in liquidations, evidence from Chapter 11 corporate reorganizations in the U.S. shows that equityholders often receive positive payoffs even if creditors make substantial concessions (Eberhart et al., 1990, Weiss, 1990, Franks and Torous, 1989). According to several authors (Aghion et al., 1993, Bradley and Rosenzweig, 1992, Bergman and Callen, 1991), priority violations arise because Chapter 11 rules give equity too much bargaining power. The analysis developed here suggests that reducing equity's bargaining power in Chapter 11 would make private

workouts more likely, reducing the costs of court intervention. Proposals to this effect are discussed by Bebchuk (1988) and Aghion et al. (1993).

The analysis also indicates that, when asymmetric information is present, it is efficient for pre-bankruptcy debt forgiveness agreements to be enforced even if the firm subsequently files for bankruptcy. If this was not the case, non-viable firms could choose to continue as going concerns in equilibrium. A recent ruling by a U.S. judge goes in this direction, but it has been criticized for discouraging private settlements (Wruck, 1990).

The model does not directly address the issue of whether financial distress worsens potential agency problems between equityholders and debtholders or between managers and equityholders when asymmetric information is also present. However, it is shown that, by using strip financing, an efficient workout plan can give rise to an arbitrary financial structure for the reorganized firm. Hence, the firm's capital structure can be chosen to minimize agency problems, and financial distress does not impose any additional constraints.

The paper is organized as follows: in section 2 the benchmark model is presented, and it is shown that the outcome of financial distress is always efficient when workout plans consisting of both cash and equity are feasible. A discussion of the existing literature is also in this section. In section 3 it is shown that inefficiencies may arise if equityholders are not the residual claimants in bankruptcy. In section 4 some empirical implications of the model are briefly discussed. Section 5 contains a discussion of the robustness of the model. Section 6 extends the benchmark model to an arbitrary number of possible types of debtor. Section 7 concludes.

2. The model with three types of debtor

2.1. The basic set-up

A firm has an outstanding debt of D , and no cash in hand. An investment project that yields a present discounted value of $R(t) + I$ can be undertaken by investing I . t is a random variable with support $T = \{t_1, t_2, t_3\}$, that identifies the type of the firm. $p(t_i)$ is the probability that $t = t_i$, for $i = 1, 2, 3$. The firm is run by managers, who maximize the value of equity. Conflicts of interest between managers and shareholders are not considered here². Assuming for simplicity that the risk-free interest rate is zero and that shareholders are risk-neutral, investment in the project is profitable for shareholders if and only if:

$$R(t) - D > 0. \quad (1)$$

² For a model in which managers and equity holders disagree over the liquidation decision see Harris and Raviv (1990).

If this condition is not met, and if no debt forgiveness is obtained from creditors, the firm is insolvent and management must file for bankruptcy protection³. Let $L(t)$ denote the value of the firm in bankruptcy, which may reflect the outcome of a going concern liquidation, of the piecemeal sale of the assets, or of a court-supervised reorganization. It is assumed that equity-holders are treated as the residual claimants in bankruptcy. Deviations from this rule will be discussed in section 3.

From the point of view of productive efficiency, the investment project should be undertaken if its net present discounted value exceeds the bankruptcy value of the firm:

$$R(t) > L(t). \quad (2)$$

When (2) holds but (1) does not, debt forgiveness is necessary for the investment project to be undertaken, since creditors are the main beneficiaries of new investment (Myers, 1977). Note that it is immaterial whether the outstanding debt D is due immediately or in the next period, as long as long-term debt is covered by a strict seniority covenant. Without such a covenant, the firm could finance new investment through a new debt issue senior to the old one, and no need to recontract with long-term creditors would arise. On the other hand, the value of old debt could be diluted if the new project is risky, so strict seniority covenants are a necessary safeguard for creditors.

Assumption 1. $R(t_1) < L(t_1) \leq L(t_2) \leq R(t_2) < L(t_3) < R(t_3) < D$.

Under this assumption, none of the firms is solvent (condition (1) is violated for all t), and only firms 2 and 3 are viable (condition (2) is violated for $t = t_1$)⁴.

2.2. The extensive form game

Prior to the decision on whether to invest or file for bankruptcy, management and creditors bargain over a debt reduction agreement. Creditors are risk-neutral and behave like a coalition, so strategic interaction among creditors is neglected⁵. Private debt renegotiation is modeled as a game of incomplete information. Fig. 1 shows the extensive form of the game. Nature moves first, choosing the type of the firm. The debtor observes the realization

³ To be precise, creditors will start legal action to seize the debtor's assets, and management will find it optimal to seek bankruptcy protection. Notice that, following a default, creditors do not automatically become the new owners of the firm. This is consistent with bankruptcy legislation in most countries (see Mitchell, 1990). See also section 4.5 below.

⁴ Similar results arise if firms of type 3 are assumed to be viable and solvent, i.e. $R(t_3) > D > L(t_3)$.

⁵ On coordination problems among creditors, see Gertner and Scharfstein (1992) and Detragiache and Garella (1994).

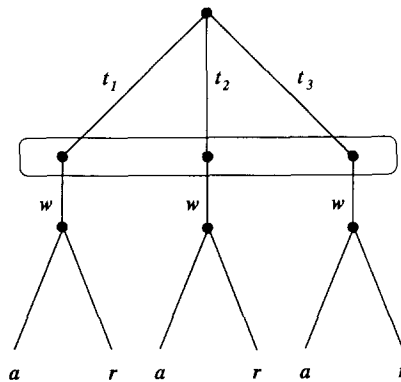


Fig. 1. The extensive form game. Nature moves first, choosing the type of the firm. Then the firm offers a workout plan w , which creditors accept or reject.

of t , but creditors do not. Then, the debtor proposes a workout plan $w = (g, B)$, where B is a cash payment, and $0 \leq g \leq 1$ is an equity participation in the firm. The workout plan also specifies that the cash payment B will be financed through a new equity issue to be entirely subscribed by old stockholders⁶. Hence, if the workout plan is accepted the firm is 100% equity. Alternative financial structures for the reorganized firm are discussed in section 5.4. After the workout is completed, the cash necessary to finance new investment is raised through a loan on the open market. Note that $w = (0, D)$ is an offer to repay according to the original contract.

After they receive the workout proposal, creditors move to either accept or reject the offer. With an acceptance, creditors give up their pre-existing contractual rights⁷. Finally, the debtor decides whether to file for bankruptcy or to invest. It is easy to see that firms of type 1 are strictly better off filing for bankruptcy regardless of the creditors' move: if no debt is written off, investment is not profitable, while if sufficient debt forgiveness is granted, old shareholders are the residual claimants, and their profits are maximized by choosing the socially efficient allocation of the assets, which is bankruptcy⁸. On the other hand, firms of type 2 and 3 invest only if they receive sufficient debt relief, namely if

$$R(t)(1 - g) - B \geq 0. \quad (3)$$

⁶ Equivalent results can be obtained in a model in which B is riskless debt.

⁷ In principle, firms could make an offer and then renege on it by not making the cash payment B . In this case, the creditors' original claims would still be valid, and the firm would be in the same position in which it was before renegotiation. Since the option of renegeing on an accepted offer is strategically irrelevant, here it is ruled out.

⁸ This could be thought of as a "voluntary" liquidation, since it is not caused by creditors' refusal to make concessions.

Extending offers that do not satisfy (3) has no strategic relevance for firms of type 2 and 3. Hence, I will assume that only “serious offers” (offers such that (3) holds) are feasible, so that firms of type 2 and 3 invest whenever their workout offer is accepted. Under this assumption the investment/bankruptcy decision need not be modeled as a separate move in the game. Only equilibria in pure strategies are considered.

2.3. Equilibrium workout plans

If creditors knew the type of the firm, then the equilibrium of the game would be straightforward. If $t = t_1$, the debtor would offer a pair (g, B) such that $gL(t_1) + B = L(t_1)$, and creditors would accept. If $t = t_2$, the offer would satisfy $gR(t_2) + B = L(t_2)$, and similarly for $t = t_3$. With full information, renegotiation ensures that the bankruptcy/continuation decision is efficient (Haugen and Senbet, 1978). Furthermore, firms of type 2 and 3 would capture all of the going concern surplus, since they make take-it-or-leave-it offers. Finally, there is no reason for firms to offer a mix of cash and equity: the same payoffs could be achieved if firms were constrained to offer a cash payment only.

If creditors cannot observe the realization of t , the equilibrium depends on their beliefs about the nature of the debtor. In particular, after receiving a workout offer, creditors revise their prior on the type of firm that they are facing. Let $q(t|w)$ be the probability assigned to the firm being of type t at the information set w . The notion of equilibrium used for this game is that of Bayesian-Nash equilibrium, that requires beliefs to be consistent with Bayes' law along an equilibrium path.

First it will be shown that, if offers are constrained to be only cash, then firms of type 2 may go bankrupt in equilibrium, and there are social costs to financial distress. The intuition is the following: firms of type 2 need debt relief to invest. Specifically, they need their debt to be written down to $B \leq R(t_2)$ at the most. Suppose creditors receive an offer of $B = R(t_2)$. If they accept, then they are better off if the firm is indeed of type 2, but they are worse off if the firm is of type 3, because $L(t_3) > R(t_2)$. If the probability that $t = t_3$ is large enough, creditors will refuse any amount of debt forgiveness that is sufficient to keep firms of type 2 in business.

Lemma 1. When workout offers cannot include an equity participation, if $p(t_2)[R(t_2) - L(t_2)] < p(t_3)[L(t_3) - R(t_2)]$, firms of type 2 file for bankruptcy in all equilibria.

Proof. For firms of type 2 to choose continuation creditors must be willing to accept an offer $B \leq R(t_2)$. Suppose creditors' strategy is to accept any $B \geq R(t_2)$. Given this strategy, it is an equilibrium for firms of type 2 to offer $B = R(t_2)$, but also firms of type 3 will follow the same course of action. Type 1 firms, on the other hand, offer a lower repayment, which is rejected by

creditors. According to Bayes' law, creditors' posterior beliefs after receiving a proposal $B = R(t_2)$ are:

$$q[t_1|R(t_2)] = 0, q[t_i|R(t_2)] = \frac{p(t_i)}{p(t_1) + p(t_3)}, i = 2, 3.$$

Consequently, it is optimal for creditors to accept the offer if and only if:

$$\frac{p(t_2)}{p(t_1) + p(t_3)} [R(t_2) - L(t_2)] \geq \frac{p(t_3)}{p(t_1) + p(t_3)} [L(t_3) - R(t_2)]. \quad (4)$$

This condition may fail under the maintained assumptions on parameter values, so type 2 firms may go bankrupt in equilibrium. Finally, notice that, if condition (4) is violated, it is not a best response for creditors to accept offers below $R(t_2)$. Hence, efficient equilibria cannot arise.||

As usual, adverse selection stands in the way of efficient bargaining. Work by Vincent (1989) shows that altering the extensive form of the game by allowing for repeated offers from both sides does not eliminate inefficiencies in bargaining games with common values, such as the one at hand.

Adverse selection problems can be overcome if workout offers containing an equity participation are feasible. Equity is worth more the higher is the future profitability of the firm, so firms of type 3 are unwilling to give creditors a large equity stake. By offering creditors a large equity stake, firms of type 2 can credibly reveal that they need substantial debt forgiveness to stay in business. The next proposition makes this intuition more specific. The essence of the proof is to show that for all parameter values there is a set of offers, such that (i) creditors are strictly better off accepting than rejecting the offer *for any beliefs* and (ii) shareholders of firms of type 2 and 3 receive a larger payoff than in bankruptcy.

Proposition 1. If workout offers containing an equity participation for creditors are feasible, there is no Bayesian-Nash equilibrium in undominated strategies such that viable firms file for bankruptcy.

Proof. Let W be the set of offers that satisfy the following inequalities:

$$B + gR(t_2) < R(t_2), \quad (5)$$

$$B + gL(t_1) > L(t_1), \quad (6)$$

$$B + gR(t_2) > L(t_2), \quad (7)$$

$$B + gR(t_3) > L(t_3). \quad (8)$$

The set W corresponds to the shaded area in Fig. 2. Inequalities (6)–(8) ensure that creditors are strictly better off accepting the offer than rejecting it irrespective of their beliefs. Hence, to reject an offer $w \in W$ is a strictly dominated strategy for creditors. Condition (5) ensures that an offer in W makes the shareholders of firms of type 2 strictly better off than bankruptcy. Since (5) implies that also $[B + gR(t_3)] < R(t_3)$, also shareholders of type 3

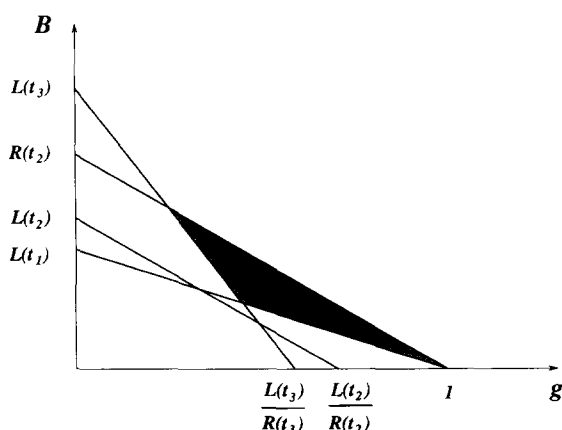


Fig. 2. Workout offers. Each pair (g, B) is a possible workout offer. The shaded area corresponds to the set W defined in Proposition 1.

firms are better off making an offer in W than filing for bankruptcy. Hence, as long as the set W is non-empty, it cannot be an equilibrium for types 2 or 3 to make an offer that creditors reject. To see that W is not empty for any parameter values, consider a restructuring plan $w = (1, 0)$, namely, a plan to give creditors all of the equity. This offer satisfies (7) and (8), but not the other two inequalities, since they are strict. Consider now the offer

$$w'(\epsilon) = \left[1 - \frac{\epsilon}{k}, \epsilon \right],$$

with $\epsilon > 0$ and $R(t_2) > k > L(t_1)$. Choosing ϵ adequately small, $w'(\epsilon)$ satisfies (5)–(8) for all parameter values.||

As with most signalling games, the game studied here has several equilibrium outcomes, that differ according to the ex-post distribution of the surplus between the parties. However, all the equilibria yield the socially efficient choice between continuation and bankruptcy⁹. The restriction to strictly undominated strategies is needed to eliminate potential equilibria in which creditors play strategies that involve rejecting offers in W off the equilibrium path. Such strategies are clearly not credible, since creditors prefer any offer in W to bankruptcy no matter what they believe about the type of the debtor. However, subgame perfection cannot eliminate these equilibria, because the game has no proper subgame.

⁹ This result, although it holds for a large class of equilibria of the renegotiation game, is specific to the extensive form. Whether is possible to sustain inefficient outcomes in more general extensive forms (for instance, in games with two-sided, repeated offers) it is not clear. Unfortunately, bargaining theory has not devoted much attention to games with payments contingent on the value of the object being transacted.

The importance of transferring equity to creditors in times of financial distress has long been recognized in the U.S.: the Glass-Steagall Act, while it prohibits banks from holding stock in non-bank firms, makes a specific two-year exception for claims obtained as part of a debt workout package. Apparently, banks often take advantage of this opportunity. Accounts of successful debt workouts indicate that also non-bank creditors often accept equity in exchange for debt forgiveness (see Gilson, 1990, Weiss, 1990, Brown et al., 1993).

2.4. Relationship with the existing literature

The idea that adverse selection problems are mitigated when information can be verified at a later date was first explored by Grossman (1981). Grossman considers a monopolist selling a good, the quality of which is unobservable to customers. If it is feasible for the seller to offer a warranty (which can be partial or full), then the equilibrium is the same as under full information, and no “lemons problem” arises.

Berkovitch and Narayanan (1990) study the role of cash/equity payments in corporate takeovers, when the value of the synergy between the acquiring firm and the target is private information of the raider. In the separating equilibrium, a large fraction of equity signals low synergisms, which is consistent with empirical evidence. The paper does not address the issue of whether trading inefficiencies may arise because of adverse selection when cash-equity offers are possible.

Asymmetric information in models of financial distress has been studied by Webb (1987) and Giammarino (1989). Neither paper allows for workout offers containing equity claims, hence the result is that adverse selection generates real costs of financial distress as in Lemma 1. The role of equity offers in debt restructuring has been noted by Webb (1991), who studies a model with a viable and a non-viable firm, both of which are insolvent. The institutional context is administrative receivership, the British procedure for court-supervised restructuring. With two types, the ability of offering either equity or debt to creditors insures that private workouts are efficient. The author, however, observes that with many types of debtor complex offers would be needed, so that adverse selection is likely to be a problem in practice. The results of Proposition 1 suggest otherwise.

3. Priority violations in bankruptcy

In the preceding section it was assumed that in bankruptcy equityholders are treated as the residual claimants, as established by pre-bankruptcy contractual rights. When bankruptcy leads to the reorganization of the firm, U.S. evidence suggests that this assumption is often violated. Eberhart et al.

(1990), Weiss (1990), and Franks and Torous (1989) find that in Chapter 11 equity often receives a positive payout even though creditors make substantial concessions. This evidence is not surprising, because the rules of Chapter 11 put management and equity in a very favourable bargaining position. Management typically maintains control of the company (debtor in possession), and it has exclusive right to propose a restructuring plan for the first 120 days. Judges often extend this exclusivity period. Also, while the firm is in court, the judge typically authorizes new loans to finance current operations (debtor in possession financing), and these loans rank senior to existing claims. Hence, delay can be very costly for creditors (Bergman and Callen, 1991). Finally, the restructuring plan must be approved by a 2/3 majority not only of creditors, but also of shareholders, who therefore can veto the plan. Several authors have criticized Chapter 11 for being biased towards equity (Aghion et al., 1993, Bradley and Rosenzweig, 1992, Bebchuck, 1988), but they have not explicitly modeled the efficiency losses that may arise from this bias.

In the context of the model developed in the preceding section, it is possible to show that granting excessive bargaining power to equity in Chapter 11 can be socially inefficient, because it leads to costly court intervention. Specifically, if shareholders of firms of type 2 expect to receive a positive payoff in bankruptcy, then the result of Proposition 1 breaks down: even if cash-equity offers are feasible, for some parameter values the equilibrium is inefficient, because firms of type 2 reorganize in court instead of reaching a private workout agreement. Hence, asymmetric information combined with priority violations in bankruptcy can generate real costs of financial distress. The intuition is quite straightforward: if shareholders of type 2 firms expect to obtain a positive payoff in bankruptcy, then the set of workout offers that they are willing to make in out-of-court bargaining is smaller¹⁰. In fact, it may be that all offers that are in this set yield creditors less than $L(t_3)$ if the debtor turns out to be of type 3. Hence, if creditors assign a large enough probability to $t = t_3$, they reject all offers that are individually rational for firms of type 2, and these firms go to court.

Proposition 2. If equity offers are feasible, but equityholders of viable firms receive a positive payoff in bankruptcy, equilibria in which viable firms go to court are possible.

Proof. Let $f > 0$ be the payoff that shareholders of a viable firm expect to receive in a court-supervised reorganization. Let W' be the set of workout offers such that: (i) firms of type 2 and 3 are better off if the offer is accepted than in bankruptcy; (ii) creditors are strictly better off accepting than reject-

¹⁰ Also non-viable firms can attempt to reorganize in Chapter 11. If they are eventually liquidated, however, equityholders do not extract any surplus, and their bankruptcy payoff is still zero.

ing irrespective of their beliefs. Then the set W' is defined by the following inequalities:

$$B + gR(t_2) < R(t_2) - f, \quad (5')$$

$$B + gL(t_1) > L(t_1), \quad (6')$$

$$B + gR(t_2) > L(t_2) - f, \quad (7')$$

$$B + gR(t_3) > L(t_3) - f. \quad (8')$$

Rearranging (5') and (8'), for W' to be non-empty it must be

$$R(t_2) - B - f > gR(t_2),$$

$$L(t_3) - B - f < gR(t_3).$$

For these inequalities to be satisfied, there must exist a g and a B such that

$$[R(t_2)]^{-1}[R(t_2) - B - f] > g > [R(t_3)]^{-1}[L(t_3) - B - f].$$

Since g must be less than 1,

$$\frac{R(t_2) - B - f}{L(t_3) - B - f} > \frac{R(t_2)}{R(t_3)}.$$

The LHS is decreasing in B and in f . Even if B is set equal to zero, for a sufficiently large f the inequality is violated, and the set W' is empty. Hence, there can be equilibria in which creditors reject all offers that are individually rational for firms of type 2, and these firms go to court.||

If insiders to the firm have both private information and substantial bargaining power in court, private workouts may fail even if offers that include equity claims are possible.

Bebchuk (1988) proposes a scheme for reforming Chapter 11 to ensure that contractual priority is enforced even if the judge ignores the true continuation value of the firm. Aghion et al. (1992) recommend a similar procedure for Eastern European countries. Although an overall evaluation of the desirability of such proposals is outside the scope of this paper, the result in Proposition 2 suggests that they should reduce the costs of financial distress associated with adverse selection.

4. Empirical implications

The main result of the paper is that designing debt reduction agreements that include an equity participation for creditors eliminates the costs of financial distress due to asymmetric information. To find empirical support for this result it is necessary to have data from a country in which debtors are

prohibited from offering equity participation to creditors as part of a debt workout (until recently, Italy had such a prohibition) and show that – other things being equal – private workouts are less common, and firms tend to file for bankruptcy more often than in countries (like the U.S.) where this prohibition does not exist. A possible difficulty is that countries have different bankruptcy regimes (Mitchell, 1990), and controlling for such differences may be quite complex.

An interesting question is whether the model presented here provides sufficient elements for predicting how much equity will be offered to creditors in a restructuring. The answer unfortunately is likely to be negative for two reasons. First, there is the problem of identifying the type of the firm: just like a creditor, the econometrician is unlikely to know the expected future profitability of the debtor, and, unless the equilibrium is completely pooling, the equity participation depends on the type of the firm. One way around this problem may be to gather data on profitability after financial distress is resolved, and consider as highly profitable firms that performed better than expected before financial distress started. The second problem is more serious: like all models with asymmetric information and a reasonably rich strategy space, this model has many equilibria, all of them equally legitimate from a game-theoretic perspective. In each equilibrium a firm of a given type offers a different equity participation. The model can tell us what is that quantity as a function of the underlying parameters, but it cannot tell us which equilibrium is being played. Although the multiplicity of equilibria happens not to be an obstacle for deriving the normative result of Proposition 1, it is a serious problem when one asks the model to make predictions about specific workout plans.

Perhaps more amenable to empirical investigation is the implication that offering equity to debtholders in case of financial distress conveys negative information about future profitability. Although it is well-known that equity-type claims are often used in debt workouts, they may have a different role than the one hypothesized here. For instance, another (not necessarily alternative) explanation would be that creditors want to acquire control rights over the distressed firm, so that they can be more involved in business decisions and monitor management more closely. Some evidence in this direction is presented by Gilson (1990)¹¹. Whether issues of control are sufficient to explain the use of equity claims in debt restructuring, or, instead, asymmetries of information also play a role is ultimately an empirical question. In a recent paper, Brown et al. (1993) study how the equity content

¹¹ It should be noted that, according to Gilson's findings, creditors control managerial decisions not only through the voting rights associated with common stock holding, but also through the imposition of tighter loan covenants.

of workout offers affects the stock market price of firms in financial distress. They distinguish between public creditors (uninformed) and private creditors (informed), and find that offers of equity to uninformed creditors are associated with an abnormal drop in the price of the firm, suggesting that unfavourable information about firm value is revealed¹². This evidence supports the view taken in this paper that equity is used to convey information. However, Brown et al. do not consider the possibility that creditors receive equity to acquire control rights, so they do not control for it in their empirical tests.

Finally, the version of the model examined in section 3, in which equity receives a positive payoff in bankruptcy, suggests another empirical implication of the model: the more favourable to equity is the bankruptcy regime, the higher the incidence of court filings as opposed to private workouts. It is important to note that this prediction does not obtain in models with full information and no obstacles to recontracting (because courts are never used in equilibrium, as in Haugen and Senbet, 1978), nor in models in which courts are used because public debt cannot be renegotiated, such as Gertner and Scharfstein (1992). In the latter type of model, the likelihood of going to court depends on the amount of public debt outstanding, and not on the treatment of equity. In a recent empirical study, Bradley and Rosenzweig (1992) argue that the introduction of Chapter 11 in the U.S., with its generous treatment of equity, has significantly increased the number of bankruptcy filings.

5. Taxation, liquidity constraints, and other issues

In this section, some potential obstacles to efficient restructuring plans under asymmetric information are briefly examined.

5.1. Taxes

In the model of the previous section the tax costs of switching from debt to equity financing are neglected. If these costs are substantial, then the type of restructuring plan described in Proposition 1 may not work. In practice, however, firms that run into financial difficulties are likely to have substantial tax credits from loss carry-forwards, and they do not expect to pay corporate profit taxes for several years into the future. Hence, tax considerations should not be a serious obstacle to the design of efficient workout plans.

¹² The empirical work in this paper is motivated by a theoretical model of debt renegotiation under asymmetric information similar to the model of Webb (1991).

5.2. Liquidity constraints

In section 2, equityholders are assumed to finance the cash part of the plan through a new equity subscription. Shareholders of distressed firms, however, may not have sufficient cash, and they may face binding credit constraints. So it may be that the space of feasible cash payments is smaller than that hypothesized in section 2. Nonetheless, inspection of Fig. 1 shows that the presence of an upper bound on B would not alter the results of Proposition 1: the offer $(1, 0)$ is always on the boundary of the set of offers that creditors must accept in equilibrium. Hence, as long as B is bounded away from zero, the set W is non-empty, and the proof of Proposition 1 holds.

5.3. Treatment of out-of-court debt forgiveness in bankruptcy

The analysis of section 2 assumes that acceptance of a workout offer by creditors voids preexisting contractual rights, even if the firm is subsequently liquidated. This assumption plays an important role, because it ensures that bankruptcy is a strictly dominant strategy for non-viable firms. If old debt contracts were reinstated after a bankruptcy filing, shareholders of a non-viable firm would be better off continuing whenever creditors have accepted a workout offer such that $B + gR(t_1) < R(t_1)$ (this may happen in equilibrium, if creditors assign a large enough probability to the firm being viable). Hence, the outcome may be inefficient because too little liquidation occurs in equilibrium.

In the U.S., a bankruptcy judge recently ruled that bondholders who participate in an exchange offer (accepting claims of lower face value) are not entitled to their old claims if the firm subsequently files for bankruptcy (Wruck, 1990). Wruck criticizes this ruling, on the grounds that it makes out-of-court settlements less attractive for creditors. The analysis in this paper suggests that economic efficiency considerations support the ruling, because it encourages voluntary liquidation of non-viable firms.

5.4. Alternative financial structures for the reorganized firm

In the benchmark model, after a successful workout has been completed the firm is 100% equity. Maintaining some leverage after the reorganization, however, may be desirable; for instance, it may reduce agency problems between management and shareholders (Jensen, 1986, Hart and Moore, 1989). Fortunately, an efficient workout plan is consistent with an arbitrary degree of leverage for the reorganized firm. Suppose that claims to the firm are divided into n identical strips. A strip is a unit of a composite asset, consisting of d units of debt and a share of $\{1/n\}$ in the residual value of the firm (equity). The workout offer assigns creditors a cash payment B and x

strips, while the remaining $n-x$ strips are given to old shareholders. If $nd \leq R(t)$, creditors' expected payoff from accepting, if they think that the firm is of type t , is

$$B + xd + x \left[\frac{R(t) - nd}{n} \right] = B + \left[\frac{x}{n} \right] R(t).$$

Hence, the workout plan yields the same payoff as one in which creditors are given an equity participation of $g = \{x/n\}$. Creditors' expected payoff is independent of d , the amount of debt in each strip, so management can choose the optimal degree of leverage¹³.

This result throws some additional light on the mechanism through which workout plans can overcome adverse selection problems. Offering creditors an equity participation is not really essential. What matters is the ability to offer an upfront payment together with a claim on the future profits of the firm which is of the same nature as the claim that remains in the hands of the informed party. Whether the claim is senior debt, junior debt, equity, or some other type of financial contract is immaterial to the resolution of financial distress.

5.5. Costs of ownership transfer

By transferring some equity to creditors, debt workouts change the ownership structure of the firm. In the benchmark model, this has no cost in terms of the profitability of the business: managers run the firm, and old shareholders have no special skills at monitoring management, or at least no skills that creditors do not have. This picture is probably fairly realistic for public companies, and probably for several closely-held firms that experience financial distress. In fact, as pointed out in section 4, the transfer of some control powers to creditors is likely to be desirable, if financial distress is also the result of an inefficient corporate governance structure (see also Wruck, 1990). Hence, there should be no trade-off between the need to reallocate ownership and the need to convey private information.

This observation raises the question of why debt contracts do not specify that all of the firm's equity be transferred to creditors upon default. Such a provision would eliminate the need for ex post recontracting at no cost. A possible answer is that, because firms usually have many classes of creditors, it is not obvious how shares should be allocated across debtholders in case of default. Debt contracts would have to make explicit an allocation rule ex

¹³ If the firm wants to hold debt as a tax shield, strip financing does not work (at least for U.S. companies), because interest paid on the debt portion of a strip is subject to the corporate profit tax. On taxes, see section 5.1. above.

ante. Since the debt structure of the firm at the time of default is unknown ex ante, a complete allocation rule would have to specify a large number of contingencies, and, therefore, it would be quite complex. Contractual incompleteness – although it leads to ex post renegotiation – may be the best alternative.

A more thorough analysis of this important issue is left to future work.

6. An arbitrary number of possible types

Proposition 1 can be easily generalized to the case in which firms are of an arbitrary (but finite) number of types. Let $T \equiv \{t_1, \dots, t_i, \dots, t_I\}$ be the set of possible types, and suppose that $R'(t_i) > L'(t_i) \geq 0$ for all $t_i \in T$. Define t_n to be the largest value of t_i such that the firm is non-viable ($L(t_i) > R(t_i)$). Then all types $t_i \geq t_{n+1}$ are viable. Following the same steps as in the proof of Proposition 1, define W'' to be the set of workout offers such that

$$R(t_i) - [B + gR(t_i)] > 0 \text{ for all } t_i \geq t_{n+1}, \quad (5'')$$

$$B + gL(t_i) > L(t_i) \text{ for all } t_i \leq t_n, \quad (6'')$$

$$B + gR(t_i) > L(t_i) \text{ for all } t_i \geq t_{n+1}. \quad (7'')$$

Let t_s be the largest type of viable firm such that $L(t_i) > R(t_s)$ for some $t_i \geq t_{n+1}$. Consider a workout offer

$$w(\epsilon) = \left[1 - \frac{\epsilon}{k}, \epsilon \right],$$

with $\epsilon > 0$ and $R(t_s) < k < L(t_n)$. It can be easily verified that for all values of the parameters, there exists an ϵ small enough that $w(\epsilon)$ satisfies (5'')–(7''). This proves that, for all parameter values, there is a workout plan such that creditors strictly prefer to accept the offer than to reject it irrespective of their beliefs. Furthermore, this offer yields a strictly positive payoff to shareholders of all viable firms. Hence, it is not an equilibrium for these firms to go bankrupt.

7. Conclusions

Haugen and Senbet (1978) argued that the costs of financial distress are irrelevant to the theory of the optimal capital structure of the firm, because efficient recontracting ensures that these costs are not paid in equilibrium. Subsequent work by Webb (1987) and by Giammarino (1989) countered that, since creditors are likely to be imperfectly informed as to the true continuation value of the firm, adverse selection leads to bargaining inefficiencies, and, hence, to costs of distress.

This paper has shown that the inefficiencies due to adverse selection can be completely avoided by designing workout plans that include both a cash payment and an equity participation for creditors. Empirical evidence on out-of-court restructurings indicates that creditors often receive equity-type claims in exchange for debt forgiveness (Gilson et al., 1990, Brown et al., 1993). The analysis also shows that, by using strip financing, an efficient workout plan can give rise to an arbitrary financial structure for the reorganized firm. Hence, financial distress need not worsen existing agency problems.

Inefficiencies are possible, however, if equityholders are not treated as the residual claimants in bankruptcy, as it often happens in Chapter 11 corporate reorganizations in the U.S. In this case, equilibria exist in which firms use the costly court-supervised procedure instead of agreeing on a private workout plan, because they can get a more favourable deal in court.

The issue of the treatment of equity in bankruptcy has been at the centre of a lively debate. The results in this paper suggest that to reduce the inefficiencies arising from adverse selection it is appropriate to design rules that do not give equity much bargaining power in court negotiations, as proposed by Bebchuk (1988) and by Aghion et al. (1993). However, a more general model, in which adverse selection is not the only source of potential inefficiencies, may yield different conclusions. For instance, as White (1989), Gertner and Scharfstein (1992), and Daigle and Maloney (1994) have observed, preserving some equity value in bankruptcy may encourage an early filing, preventing management from gambling with the firm's assets¹⁴. This position has been criticized by Aghion et al. (1993), who claim that creditors can use bond covenants and other contractual provisions to effectively limit management ability to dispose of the assets of highly indebted firms. Before reliable indications on bankruptcy reform can be derived from economic principles, more theoretical and empirical work is needed to assess the relevance of various agency problems to financially distressed firms, and to clarify the factors that induce firms to go to court instead of reaching a private settlement with their creditors.

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¹⁴ Daigle and Maloney (1994) also find that, empirically, equityholders retain a larger share of the firm in companies whose assets can be more easily manipulated prior to financial distress.

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