Control Rights, Debt Structure, and the Loss of Private Benefits: The Case of the U.K. Insolvency Code

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We show how the efficiency of reorganization is affected by the distribution of control rights under the U.K. insolvency code. Control rights raise particular problems when creditors have different incentives to keep the firm as a going concern. Such differences may arise from the possession of private benefits by particular creditors which are lost if the debtor firm is liquidated. The incidence of inefficient liquidations is influenced by the size and seniority of creditors' claims. The current U.K. code is widely thought to give rise to inefficient liquidations. We show, however, that inefficiency depends upon the debt structure and whether the controlling creditor in formal bankruptcy has private benefits.

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The issue of control rights is an important element in the design of bankruptcy codes.[1] Chapter 11 in the United States gives control rights to the debtor-in-possession. In contrast, *receivership* in the United Kingdom gives control rights to a predetermined secured creditor. This article, focusing on the U.K. code, shows how the efficiency of reorganization is affected by the distribution of control rights.

Control rights raise particular problems when creditors have different incentives to keep the firm as a going concern. In this article the different incentives arise from the possession of private benefits by particular creditors; such benefits are only preserved when the debtor firm is maintained as a going concern. An example would be a trade creditor who gains rents from doing business with the firm but can make no legal claim for their loss in the event of bankruptcy. When taking private benefits into account, inefficient liquidations can arise even when the firm's liquidation value is larger than its value as a going concern. We show that the probability of inefficient liquidations critically depends not only on the distribution of control rights and private benefits but also on the debt structure measured in terms of the size and seniority of different creditors' claims.

The vesting of control in one creditor and the evidence of a high rate of liquidations in receivership has led some observers to suggest that there is a significant number of inefficient liquidations [see Aghion, Hart, and Moore (1992) and White (1991)]. We show that if the controlling creditor has low or no private benefits, inefficient liquidations will occur. However, if he has large private benefits relative to other creditors, inefficient liquidations are greatly reduced, if not eliminated. This addresses an important question in the current U.K. government review of insolvency law as to whether particular secured creditors should retain their exclusive power to control the firm.

In this article we model how the legal rules affect the negotiations between creditors to keep the firm as a going concern. One result is that deviations from absolute priority accrue in favor of creditors without private benefits. This takes the form of side payments from creditors with large private benefits to induce other creditors not to take actions which could lead to the liquidation of the firm. A second result is that deviations from absolute priority are larger in workouts than in formal bankruptcy, where a workout is defined as an agreement among creditors of a distressed firm that takes place outside, and in place of, the formal bankruptcy process. This result is similar to the empirical findings for the United States [see Franks and Torous (1994)], where equityholders gain substantially larger deviations in workouts

[1] In the U.K., *insolvency* is used for company bankruptcy proceedings and *bankruptcy* is used for individuals.

than in Chapter 11 reorganizations. Deviations from absolute priority in workouts is evidence of one party having a credible threat to take the firm into formal reorganization and waste assets. Smaller deviations in formal bankruptcy reflect that the threat to waste assets has already been carried out.[2]

Webb (1991) likens the U.K. insolvency code to a prisoner's dilemma resulting in inefficient liquidations. He does not permit side payments and does not consider private benefits. Gertner and Scharfstein (1991) examine how the U.S. bankruptcy code can give rise to inefficiencies as a result of conflicts of interest between different security holders. Their model assumes full information and they do not model bargaining explicitly. Our model examines inefficiencies that can arise from the U.K. bankruptcy code, but it does so within a framework of asymmetric information and bargaining between creditors. Thus, side payments are permitted and can reduce but not eliminate inefficiencies. Under complete information side payments would eliminate all inefficiencies. Brown (1989) and Giammarino (1989) also emphasize the importance of the formal rules embodied in the bankruptcy code in determining the structure and outcome of bargaining. Berkovitch and Israel (1994) study a model based on the U.S. code, where managers negotiate with creditors and inefficiencies arise because of asymmetric information.

The rest of this article is organized as follows. Section 1.1 discusses private benefits, and the remainder of Section 1 describes the model and its similarity to the U.K. code. Section 2 discusses the incentives for creditors with different seniorities to workout or force the firm into formal reorganization. An example is used to illustrate the problem of inefficient liquidations and the incentive to give side payments under different structures of the creditors' claims. Sections 3 and 4 formally analyze the model in the context of the liquidation and receivership codes, respectively, and derive propositions that determine the probability of a workout or formal reorganization and the conditions under which the firm may be inefficiently liquidated. Section 5 examines the *administration* code and compares it to receivership. Section 6 concludes. Appendix B provides some numerical examples.

[2] Bergman and Callen (1991) examine how a shareholder-oriented management can threaten to waste assets through underinvestment and thereby renegotiate the debt contract. This has implications for optimal capital structure. Berkovitch et al. (1994) show that ex ante incentives to invest in human capital may be optimized under a bankruptcy code where control rights are placed in the hands of managers. Anderson and Sundaresan (1996) calculate bond values using a strategic model of bankruptcy embedded in a dynamic framework where the value of the firm evolves stochastically over time. Our model of insolvency could potentially be incorporated into the Anderson and Sundaresan framework to give more accurate values of U.K. fixed income securities.

1. The Model and the U.K. Insolvency Code

We consider an insolvent firm and model the bargaining process between two creditors concerning the division of the firm's value. In accordance with the U.K. code, equityholders play no role in the model.[3] The creditors will initially attempt to forge an extrajudicial agreement. Formal bankruptcy is triggered when both creditors go to court for repayment of their claims. We also allow for the possibility that only one creditor goes to court, capturing the idea that a junior creditor can attempt to obtain repayment of his claim before more senior claims have been satisfied. In the U.K. insolvency system, this would be achieved by the creditor attaching a lien on an unsecured or partially secured asset.

1.1 Private benefits

An important assumption in the model is that some creditors have private benefits. These private benefits are noncontractual monetary revenues that accrue from creditor-firm relationships only when the latter is kept as a going concern; they are lost in liquidation. Such relationships could be with banks, trade creditors, and employees and managers.

For example, a supplier may earn quasi-rents from supplying goods at a higher price to a firm than he could obtain elsewhere. The quasi-rents may reflect the investment by the supplier in relationship-specific assets, which are sunk costs. Milgrom and Roberts (1992, pp. 269–270) write: "Whereas rents are defined in terms of decisions to enter a job or an industry, quasi-rents are defined in terms of the decision to exit." The difference between rents and quasi-rents arises from the presence of costs that must be incurred to develop a relationship but that cannot be salvaged if the firm chooses to exit. We argue that when the supplier is faced with default he will, as a trade creditor, include the costs of switching to another customer in any decision to liquidate or maintain the defaulting firm as a going concern. Wilner (1995) looks at the influence of trade creditors' private benefits on the terms of trade credit. He shows the importance of trade credit in firm financing, which in 1990 exceeded $1 trillion in the United States and was 50% larger than short-term bank financing.

Private benefits may also arise from bank lending relationships. Petersen and Rajan (1993) argue that banks help out small firms by

[3] The exception is a workout where creditors seek court approval for the reorganization plan so as to avoid future litigation by particular creditors. In this case court approval requires 75% of those voting, including shareholders. The firm cannot prevent an insolvency liquidation except in a very narrow set of cases. See *A Practitioner's Guide to Corporate Insolvency and Corporate Rescues* (1991) for a legal descriptions of the codes.

charging below-market rates of interest in the early years in the hope that such firms will generate significant future business when they grow. In return for a stake in the firm's future, banks lend when there are few alternative sources of finance. However, the firm cannot explicitly commit to giving the bank a stake because U.S. banks are prohibited from owning equity in other firms (British banks have similar low levels of equity holdings). Thus, banks must rely on promises of future business. In a concentrated market such a promise is more credible. Should the firm be in financial distress, the bank must weigh the loss of these quasi-rents in any decision to liquidate the firm or help maintain it as a going concern.[4] In an empirical article, Petersen and Rajan (1994) examine relationship lending with small firms and find that those small firms that have highly concentrated borrowing pay lower interest rates compared with firms that rely on multiple lenders. These results are consistent with banks charging lower interest rates in return for the expectation of future business.

A second example of private benefits held by banks is of a dominant regional bank which may find that the prospective failure of an important firm will, through higher unemployment, affect the level of customer deposits and other business. As a result, the bank may recognize the prospective cost of lost deposits in any decision to liquidate the distressed firm or maintain it as a going concern. A third example relates to the reputations of banks. If a bank is perceived by prospective customers to be overzealous in liquidating businesses, some borrowers may turn to other banks. When a bank makes a decision to liquidate a company, it must take into account any dimunition in its reputation and the consequent loss of future business.

Employees and managers may also be creditors of the firm through unpaid wages or through future pension entitlements. The default of the firm is likely to impose switching costs on those employees and managers who must seek alternative employment. Such costs may derive from the loss of firm-specific human capital. The costs of switching jobs or the possibility of lower salaries may provide important incentives for employees to help in the restructuring of the firm. Jog, Kotlyar, and Tate (1993) examine stakeholder losses in corporate restructuring for four cases of distressed firms. They find that employees made "significant sacrifices . . . in order to prevent liquidation" (p. 189). Those sacrifices included deferred wages, retiree and medical claims, and other unpaid benefits. Although the authors did not investigate the motivation for the writedown of claims by employees, it seems

[4] Rajan (1992) analyzes this more generally when he looks at relationship banking compared with arms-length banking.

likely that the costs associated with finding new employment would have figured prominently in their decision.[5]

1.2 The Model

We consider a firm, A, whose capital structure consists of common stock and straight debt. The debt is owned by two creditors, creditor 1 (C_1) and creditor 2 (C_2). The debt is currently due, and its total face value F is greater than the value of the firm, $V = \max\{V_L, V_G\}$, where V_L is the liquidation value of the firm and V_G is its going concern value. The total face value of creditor i's loans is F_i, $i = 1, 2$. We assume that $F_i < \min\{V_L, V_G\}$. We define $\Pi_i(V_L)$ as the payoff received by creditor i under absolute priority if the firm is liquidated. Similarly, define $\Pi_i(V_G)$ as creditor i's payoff under absolute priority if the firm is kept as a going concern. For example, suppose the liquidation value of the insolvent firm is 80, the face value of the first creditor's claim is 60, and the other creditor has a claim of 40. If the two creditors are equally senior, $\Pi_1(V_L) = 48$ and $\Pi_2(V_L) = 32$. If the first creditor is senior, $\Pi_1(V_L) = 60$ and $\Pi_2(V_l) = 20$, etc. This formulation allows for multiple classes of seniority. For example creditor 1 can have a senior and junior claim, while creditor 2 has a claim of intermediate seniority.

In this model only creditor 1 possesses private benefits $\tilde{b}$. Private benefits are lost in liquidation and preserved when the firm is kept as a going concern. Only creditor 1 knows the realization b of $\tilde{b}$. Creditor 2 knows only the distribution of $\tilde{b}$, which, in the formal analysis, we assume is uniformly distributed on $[0, B]$.[6] Asymmetric information about creditor 1's private benefits may give rise to creditor conflicts and inefficient liquidations.

An inefficient liquidation occurs if the firm is liquidated when $V_G + b > V_L$.[7]

1.2.1 The creditors' negotiation: workouts and formal bankruptcy.

Creditors negotiate over how to divide the firm with the objective of maximizing their own expected payoffs. The legal statutes structure the nature of these negotiations. The sequence is as follows: (i) initial bargaining (an attempted workout). A breakdown

[5] A firm's customers could also lose private benefits in the event of liquidation, for example, due to the loss of warranties and the increased costs of spare parts and service [Titman (1984)]. However, it may be unusual for customers to be creditors.

[6] In our model there are only two states of the world, represented by *going concern* and *liquidation*. a more general model would have multiple states with nonzero private benefits.

[7] Another form of inefficiency would occur if the firm were maintained as a going concern when $V_G + b < V_L$. We shall show that this occurs in the administration code.

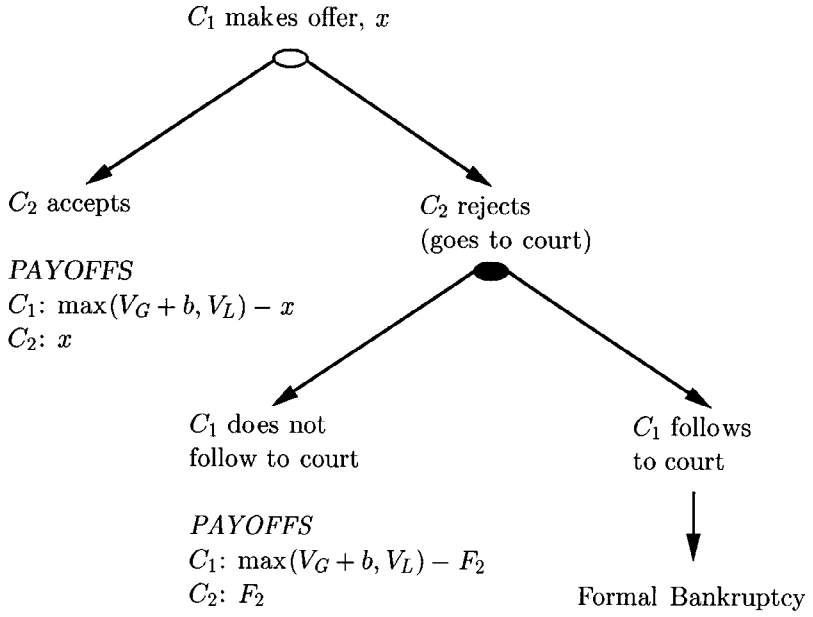

Figure 1
The game with side payments
Solid ovals indicate that creditor 2 moves, open ovals indicate that creditor 1 moves. The game starts with creditor 1 offering a payment s to creditor 2. If creditor 2 accepts, creditor 1 decides whether to liquidate or keep the firm as a going concern, pays x to creditor 2, and keeps the remainder. In the liquidation decision, creditor 1 will take account of his private benefits, and the figure shows the payoffs that will result. If creditor 2 rejects, that is, goes to court, creditor 1 must then decide whether to follow creditor 2 to court. If creditor 1 does not follow to court, creditor 1 subsequently decides whether to liquidate or keep the firm as a going concern, pays creditor 2 the full face value of his claims F_2, and keeps the remainder. Again, the payoffs that will result have been indicated in the figure. If creditor 1 follows to court, formal bankruptcy obtains. We discuss three forms of formal bankruptcy: liquidation, receivership, and administration.

in these negotiations will lead to (ii) application to the court by one or more creditors for repayment of outstanding debt. If only one creditor goes to court, the court orders the firm to repay the first creditor's claim in full without reference to the seniority of that claim. If both creditors go to court, there is a creditors' run and the firm is precipitated into (iii) formal bankruptcy. If formal bankruptcy does not occur, a *workout* results.

Figure 1 outlines the game with side payments, which is what we shall focus on. We show in Section 2 that, without side payments, there would be a high incidence of inefficient liquidations and that creditor 1, who possesses private benefits, would have an incentive to offer side payments to the other creditor. This motivates the game with side payments. In Figure 1, creditor 1 attempts to keep creditor 2 from applying to court by making an initial offer to buy out creditor 2's

claims. Creditor 2's decision is then to accept the offer or to go to court. By letting creditor 1 make the offer rather than creditor 2 making a request to be bought out, we focus on the information transmission that occurs in these creditors' negotiations.[8]

If creditor 2 goes to court and creditor 1 does not follow, we model the repayment of creditor 2's claim as creditor 1 obtaining control of the firm, paying off creditor 2, and subsequently deciding whether to liquidate the firm or keep it as a going concern. The payment can be financed by cash, new borrowings, or by an issuance of securities. Application to the court provides a junior creditor with an opportunity to jump the queue of absolute priority.[9] This can be blocked if the other creditor follows to court. When creditor 1 follows the other creditor to court, formal bankruptcy obtains.

We are primarily interested in modeling the U.K.'s receivership code, but as a benchmark we also include a pure liquidation code where V_L obtains and is shared according to absolute priority. Also, private benefits are lost. (We can view b as the incremental private benefits that would be lost if the firm went into liquidation.) The U.K. liquidation code is designed for a speedy sale. We can see this in the lack of debtor in possession provisions (ability to raise new funds), the lack of automatic stay provisions, and the ability of a creditor to remove a liquidator who delays a sale.[10] As a result, the firm usually will be shut down or its operations severely curtailed. Therefore, there will be a loss of private benefits associated with the liquidation code.

Receivership is modeled as follows. The creditor who appoints the receiver, the *appointor*, either offers to purchase the other creditor's claims or proposes that the other creditor purchase the claims of the appointor. The other creditor can reply in three different ways: (i) Accept the plan. If the plan is accepted, the creditor who is not bought out pays off the other creditor, obtains control of the firm, and subsequently decides whether to liquidate the firm or keep it as a going concern. (ii) Reject the plan and appoint a liquidator; absolute priority prevails. (iii) Wait. If the other creditor waits, the appointor (acting through the receiver) chooses whether to keep the firm as a going concern or to liquidate it; in both cases, absolute priority prevails.

[8] A problem with modeling the initial bargaining is that there is a first mover advantage. The game in Figure 1, where creditor 1 moves first and makes "a take it or leave it" offer is stylized, but it captures that it is creditor 1 who has the incentive to make a side payment.

[9] The only constraint on jumping the queue of priority is if a petition for insolvency is presented by another creditor. See, for example, the case of Rainbow and Moorgate Properties, 1975. We are informed by both British and American lawyers that jumping the queue in this fashion is not unusual.

[10] In *liquidation* in the U.K., there is a de jure stay of creditors' claims only while the assets are being sold.

1.2.2 Description of the U.K. code. Our model is based upon *administrative receivership*. The administrative receiver is appointed by a creditor with a *floating charge*, where the claim is secured on the firm's movable assets, for example, inventories, plant, and machinery. The creditor with a floating charge has control rights in bankruptcy.

The administrative receiver can keep the firm as a going concern (he is often referred to as the receiver-manager) or liquidate it.[11] His actions may be hampered by a creditor whose claims are secured on a specific asset, that is, a fixed charge. For example, in the case of the building contractor, G. Dew, the creditor with a fixed charge over plant and machinery placed a fence around the assets so that they could not be used by the administrative receiver. The firm may be precipitated into liquidation if such assets are material to keeping the firm as a going concern.

Absolute priority is observed in receivership unless the creditors agree otherwise. For example, if a creditor has a fixed charge on an important asset he may be bought out by the receiver. Such purchases may involve deviations from absolute priority.

Our model is based upon the case where one creditor has a floating charge and the other has a fixed charge on an asset that is material to the firm as a going concern.

The administrative receiver has a low duty of care to creditors who are junior to the appointor's claim. As a result, the administrative receiver's actions may favor his appointor at the expense of other creditors. The unsecured creditors can appoint a voluntary liquidator to sell the assets, but only after the administrative receivership has ended. In addition, the unsecured creditors can monitor the actions of the administrative receiver so as to ensure that he does not act negligently by, for example, not properly advertising the assets for sale and thereby depriving the unsecured creditors of repayment.[12]

Workouts are also an important part of the U.K. insolvency scene. They can include large company defaults such as Brent Walker and Heron, both with assets exceeding £1 billion sterling. In addition, the plans of reorganization may involve some creditors accepting large deviations from absolute priority. For example, the bank creditors of International Business Communications accepted large writedowns to their debt while equity holders retained an interest in the reorganized company.

[11] If he maintains the firm as a going concern, costs can be reduced by breaking and renegotiating contracts. Although the firm may be liable for damages from breaking contracts such claims are automatically ranked as junior and unsecured.

[12] The administrative receiver has a strong duty of care to preferential creditors who include the IRS, employees owed wages, and creditors with a more senior floating charge.

In 1986 a new insolvency procedure called *administration* was introduced. It differs from receivership in that the administrator is appointed by the court to represent all creditors. However, it is infrequently employed, in large part because an administration order can always be blocked by a creditor with a floating charge who wishes to appoint an administrative receiver. We discuss the efficiency of administration and compare it to receivership below.

2. An Illustration of Inefficient Liquidations

Without initial bargaining, the pure liquidation code gives rise to inefficient liquidations.[13] When $V_L < V_G + b$, inefficient liquidations can occur in two different ways when there is no initial bargaining: (i) if neither creditor goes to court and $V_L > V_G$ (assuming liquidation, since this would maximize the value of the firm, not taking private benefits into account), and (ii) if both creditors go to court. Creditor 2 has an incentive to go to court since creditor 1 obtains the value of the private benefits if the firm is kept as a going concern.

Consider the following example: The face value of creditor 1's claim is 60 and the face value of creditor 2's claim is 40; $V_L = 80$, $V_G = 70$, $b = 13$, but is known only by creditor 1; creditor 2 only knows the distribution from which b is drawn. These values are chosen so that $V_G + b > V_L$; that is, liquidations are inefficient.

Creditor 1 will not go to court because creditor 2 will always follow, leading to the liquidation of the firm. However, if creditor 2 goes to court, creditor 1 does not necessarily follow if the private benefits are sufficiently large. That is, creditor 1 does not follow creditor 2 to court if $V_G + b - F_2 \geq \Pi_1(V_L)$. Therefore, creditor 2 will go to court unless creditor 1's private benefits are known to be so small that creditor 1 will always follow. Table 1 lists the payoffs to both creditors, first when creditor 1 does not follow creditor 2 to court, and second when creditor 1 follows.

Here is an illustration of one cell of the table: Creditor 1 is senior and does not follow. Creditor 2 receives the face value of his claim, 40, and creditor 1 receives the remaining 30 of the going concern

[13] A game without side payments, that is, without bargaining, could be modeled as follows: (i) the creditors simultaneously decide whether to go to court; (ii) if only one creditor goes to court, the game would proceed as in Figure 1. If both creditors go to court, the firm would be precipitated into liquidation. In the event that neither creditor goes to court, a rule would be required to determine whether the firm is liquidated or maintained as a going concern. A "natural" rule would be that the firm is (voluntarily) liquidated if and only if $V_L > V_G$. The value of the firm is shared according to absolute priority because not going to court is assumed to imply adherence to the terms of the loan agreements. (A more general rule would be that the firm is liquidated when $V_L > V_G + \alpha B$. The size of α can be assumed to be between 0 and 1 and may depend upon the nature of the loan agreements and relationships between creditors.)

Table 1
Structure of claims and inefficient liquidations

C_1's move after C_2 goes to court	C_2 is senior, payoff to		C_1 is senior, payoff to		Equal seniority, payoff to	
	C_1	C_2	C_1	C_2	C_1	C_2
C_1 does not follow	$30 + 13 = 43$	40	$30 + 13 = 43$	40	$30 + 13 = 43$	40
C_1 follows	40	40	60	20	48	32
Outcome	Efficient		Inefficient		Inefficient	

$V_L = 80$; $V_G = 70$; $b = 13$; $F_1 = 60$; $F_2 = 40$.

value plus his private benefits of 13.[14] Consider next the case where creditor 1 follows creditor 2 to court. In this case, the firm is liquidated and each creditor receives a payment according to absolute priority. Creditor 1 receives 60 because he is senior and creditor 2 receives the remaining 20. Thus, when creditor 1 is senior, his best response to creditor 2's going to court is to follow. The result is an inefficient liquidation.

In our example with $b = 13$, when creditor 2 is senior, there are no inefficient liquidations. However, in the other two cases, creditor 1 will follow creditor 2 to court because his payoff in formal bankruptcy is 60 (if C_1 is senior) or 48 (if equal seniority) compared with 43 if he does not follow; inefficient liquidations result.

This example illustrates how the structure of claims influences the incidence of inefficient liquidations and provides an incentive for the creditor with private benefits to offer side payments to keep the other creditor from going to court. When creditor 1's private benefits are uncertain, the expected payoff to creditor 2 from going to court in the case that creditor 1 is senior (in Table 1) is not 20 or 40, but somewhere in between. Since creditor 2 does not know the value of the private benefits, he cannot know whether creditor 1 will follow to court. It is, therefore, not clear what the necessary side payment would be to induce creditor 2 not to go to court, particularly since creditor 2 will condition his expected payoff from going to court on the side payment that is offered. We investigate this in a more general setting in the next section. A numerical example of how side payments can reduce but not necessarily eliminate inefficient liquidations is provided in Appendix B.

[14] Although liquidation would give creditor 1 the remaining 40 of the liquidation value, he will not liquidate because his private benefits would be lost.

3. Analysis of the Pure Liquidation Code

In this section we show that there is a unique sequential equilibrium outcome, using the Grossman and Perry refinement, in the model with side payments (Figure 1). We also derive implications of this equilibrium outcome.[15] *We define a side payment from creditor 1 to creditor 2 as any amount in excess of creditor 2's liquidation payoff*, Π_2 (throughout Section 3 we will write Π_i instead of $\Pi_i(V_L)$ to economize on notation). The objective of the analysis will be first to find the equilibrium side payment and then examine the implications for the incidence of inefficient liquidations.

In the game sketched in Figure 1, creditor 1 attempts to keep creditor 2 from going to court by offering a side payment. Creditor 1 may be willing to offer such a side payment because of the threat of an inefficient liquidation should creditor 2 go to court. It is important to note that the firm is not precipitated into formal bankruptcy immediately when creditor 2 goes to court. For bankruptcy to happen, creditor 1 must follow. If creditor 1 does not follow, creditor 2 receives the full face value of his claim, F_2, irrespective of seniority. If creditor 1 follows, creditor 2 receives Π_2. Thus, by not following, creditor 1 effectively pays a side payment of:

$$y^* \equiv F_2 - \Pi_2.$$

This is also an upper bound on the side payment creditor 1 needs to offer creditor 2 to keep him from going to court, since, as just observed, the most creditor 2 can get by rejecting an offer from creditor 1 and going to court is the face value of his claim, F_2.

When creditor 1 has to make the decision whether to follow creditor 2 to court, inefficient or efficient decisions may arise. By going to court, creditor 2 makes creditor 1 the pivotal player whose decision ultimately seals the fate of the firm. The threat of creditor 2 is to place creditor 1 in a position where creditor 1 must decide whether to liquidate the firm by following to court or to keep the firm as a going concern by not following. In making this decision, creditor 1 trades

[15] Except for a special case (see the proof of Lemma 1), there is a unique sequential equilibrium [Kreps and Wilson (1982)] outcome so that, in general, we do not need the Grossman and Perry criterion. This is the criterion that motivated their (1986a) definition of perfect sequential equilibria and appeared without the language of this equilibrium concept in a working paper version of their (1986b) article. The criterion can be described as follows: Consider a two-person game with asymmetric information. Let m be an out-of-equilibrium move by one player, call him player 1, and call the other player player 2. The restriction says that out-of-equilibrium beliefs are unreasonable if there is a nonempty set $K(m)$ of types of player 1 with the following property: if player 2 believes that player 1's type is in $K(m)$, then player 1 does better with m than his prescribed equilibrium move if and only if he has a type in $K(m)$.

off the loss of private benefits if he follows against the side payment of y^* he makes by not following.

If, when creditor 2 makes his decision to go to court, creditor 2 would know creditor 1's decision to follow, creditor 1 could make an initial offer that would assure efficient outcomes. The problem is that creditor 2 does not know creditor 1's private benefits. Hence inefficiencies may arise. The extent to which this will occur depends on the equilibrium minimum acceptable side payment, a, required to keep creditor 2 from going to court. We will show that this minimum acceptable side payment will under certain conditions coincide with the maximum side payment y^*. We also derive conditions under which the minimum side payment is smaller than y^*.

The maximum side payment y^* is determined by the seniority and size of creditor 2's claims relative to creditor 1's claims. For example, if creditor 2's entire claim is senior, $y^* = 0$ because creditor 2 would be repaid the full face value of his claims before creditor 1 would receive any payment, irrespective of whether creditor 1 followed to court. Similarly, if creditor 1's entire claim is senior, $y^* = F_2 - (V_L - F_1)$. As the face value of creditor 1's claims approaches the liquidation value of the firm, y^* would approach F_2. This illustrates that y^* is a measure of the seniority (and size) of creditor 2's claim. When y^* is small, creditor 2 is more senior (or smaller) than when y^* is large. For example, in Table 1, when creditor 1 is senior $y^* = 20$; when the creditors are of equal seniority $y^* = 8$; and when creditor 1 is junior $y^* =$ zero.

3.1 Equilibrium

Creditor 1's strategy is a probability distribution of offers to creditor 2 and a probability distribution of whether to go to court in the case that creditor 2 does not accept the offer. We use the notation $\mathcal{A}$ to denote a decision by creditor 2 to "accept creditor 1's offer" and $\mathcal{R}$ to denote a decision to "reject the offer and go to court." If creditor 2 accepts creditor 1's offer, creditor 1 obtains control of the firm.

We will solve for equilibrium by working backwards, first looking at creditor 1's decision when creditor 2 has gone to court. Creditor 1 could obtain control of the firm by not following. Creditor 1 would then choose to liquidate or keep the firm going. His payoff would be:

$$\max\{V_G + b - F_2,\ V_L - F_2\}. \tag{1}$$

This provides creditor 1 with the possibility of retaining his private benefits. On the other hand, if creditor 1 were to follow to court, liquidation would automatically result and his payoff would be:

$$\Pi_1 = V_L - \Pi_2 \tag{2}$$

Since $F_2 > \Pi_2$, it can be seen from Equations (1) and (2) that it is never optimal not to follow to court and liquidate. Creditor 1's choice is therefore between following to court (leading to liquidation) or not following to court (and keeping the firm as a going concern). Creditor 1's best reply to creditor 2's going to court is:

$$S_2(\mathcal{R}) = \begin{cases} \text{go to court} & \text{if } b + \Delta < y^* \\ \text{not to court} & \text{if } b + \Delta \geq y^* \end{cases} \tag{3}$$

where $\Delta \equiv V_G - V_L$ is the difference between the value of the firm as a going concern and its liquidation value. Equation (3) illustrates the trade-off faced by creditor 1 in making the decision whether to follow creditor 2 to court. This decision is essentially one of keeping the firm as a going concern or liquidating it. Keeping the firm as a going concern requires not following to court, but this involves an implicit side payment to creditor 2 of y^*. The benefit is the preservation of the private benefits b, plus the difference between the going concern and liquidation values Δ.

The optimal liquidation policy is to liquidate if and only if $b+\Delta < 0$. Thus, Equation (3) implies that when creditor 2 goes to court, the firm would be inefficiently liquidated whenever $y^* > b + \Delta \geq 0$, as in two of the cases in Table 1. We now consider how side payments may reduce this inefficiency.

Given an offer x by creditor 1, a strategy for creditor 2 specifies a probability distribution over the set $\{\mathcal{A}, \mathcal{R}\}$. We make the tie-breaking assumption that creditor 2 does not go to court if he is indifferent between accepting creditor 1's offer and going to court; that is, creditor 2 accepts an offer x if and only if the expected value from not accepting is less than or equal to x.[16] We can thus view creditor 2's strategy as a function $R(x)$ taking on values in $\{\mathcal{A}, \mathcal{R}\}$.

Let $S_1(x|b)$ be creditor 1's equilibrium strategy of offers to creditor 2, and let $\pi_2(x, \mathcal{R})$ be the payoff to creditor 2 if he rejects the offer x and goes to court. If creditor 2 rejects, by Equation (3), creditor 1 follows to court with probability $\Pr\{\tilde{b} + \Delta < y^* | x, S_1\}$ and does not follow with probability $\Pr\{\tilde{b} + \Delta \geq y^* | x, S_1\}$. Hence, in equilibrium, the expected payoff to creditor 2 from rejecting the offer x is given by

$$E\pi_2(x, \mathcal{R}) = \Pr\{\tilde{b} + \Delta < y^* | x, S_1\}\Pi_2 + \Pr\{\tilde{b} + \Delta \geq y^* | x, S_1\}F_2. \tag{4}$$

The first term reflects the payoff to creditor 2 if creditor 1 follows him

[16] This assumption can be motivated by assuming that going to court involves a cost; here, of course, this cost is infinitesimal. This allows us to focus on pure strategies.

to court, and the second term reflects his payoff if creditor 1 does not follow. Creditor 2's equilibrium strategy is thus given by

$$R(x) = \begin{cases} \mathcal{A} & \text{if } x \geq E\pi_2(x, \mathcal{R}) \\ \mathcal{R} & \text{if } x < E\pi_2(x, \mathcal{R}) \end{cases} \tag{5}$$

If creditor 2 knows b, the payoffs in Equation (5) are certain. In this full-information case there are no inefficient liquidations. There are two special cases in which creditor 2 knows whether creditor 1 will follow him to court:

3.1.1 Case 1: Creditor 1 never follows to court, $V_G - V_L \geq y^*$. Creditor 2 knows that if he goes to court, creditor 1 will not follow regardless of the value of his private benefits because they are bounded below by 0. Therefore, creditor 2 will not accept x unless $x \geq F_2$, a workout is achieved, the firm is kept as a going concern, creditor 2 receives F_2, and creditor 1 receives $V_G + b - F_2$.

3.1.2 Case 2: Creditor 1 always follows to court, $V_G - V_L + B < y^*$. In this case, creditor 2's threat of going to court is neutralized; creditor 2 will accept anything greater than or equal to Π_2. Hence, a workout is achieved and creditor 2 receives Π_2. The liquidation decision is efficient; the firm is kept as a going concern if and only if $V_G + b \geq V_L$; creditor 1 collects $V_G + b - \Pi_2$ if the firm is kept as a going concern and Π_1 otherwise.

In the remainder of the analysis we will focus on the case where it is uncertain whether creditor 1 follows creditor 2 to court.

3.1.3 Case 3: Uncertain whether creditor 1 follows to court, $V_G - V_L < y^* \leq B + V_G - V_L$. Our immediate objective is to characterize the minimum acceptable payment that would keep creditor 2 from going to court. This can be written as $\Pi_2 + a$, where a is interpreted as the minimum acceptable side payment. If creditor 2 goes to court, his payoff is at least Π_2 and at most F_2. Therefore, $0 \leq a \leq y^*$.

The side payment, a, can be interpreted as a deviation from absolute priority based on the liquidation value of the firm. In contrast, the deviations from absolute priority as measured by Weiss (1990) and others are based upon the firm's going concern value. Reported deviations from absolute priority are overstated when $V_L > V_G$ and the firm is kept as a going concern.[17]

[17] Our side payments are not always identical with deviations from absolute priority. Where $V_G > V_L$, the benchmark for calculating deviations is the going concern value, while the benchmark for calculating side payments is the liquidation value. In this case, side payments will overstate the deviations from absolute priority.

It is clear that creditor 1 never offers more than $\Pi_2 + a$. The rationale behind offering this amount would be to keep the firm as a going concern and preserve private benefits. If creditor 1 offered less than $\Pi_2 + a$, the other creditor would go to court. In this case, creditor 1 would have to give up $\Pi_2 + y^*$ to maintain the firm as a going concern. Since $a \leq y^*$, it is therefore cheaper to pay off creditor 2 immediately rather than through the indirect route of letting him go to court and not following. As a result, in equilibrium, we would see either a workout where creditor 1 pays off the other creditor or a creditor's run where both creditors go to court, resulting in the liquidation of the firm. Analogous to the situation when creditor 2 had applied to court, creditor 1's benefit to paying off creditor 2 is captured by the sum of b and Δ. His cost is the side payment a. Hence, creditor 1's equilibrium strategy of initial offers can be written[18]

$$x(b) = \begin{cases} \Pi_2 + a & \text{if } b + \Delta \geq a \\ z(< \Pi_2) & \text{if } b + \Delta < a \end{cases} \tag{6}$$

We can interpret $z < \Pi_2$ as creditor 1 walking away from the bargain, leaving creditor 2 to go to court. That is, if the private benefits are very low, the creditor who holds them cannot offer the other creditor a sufficiently large amount to keep the latter from going to court; hence, the creditor with private benefits does not even attempt a workout. The reason that $z < \Pi_2$ is that if it were not, creditor 2 would accept the offer, contradicting the definition of a as the smallest acceptable side payment. An equilibrium of the game is thus characterized by Equations (3) and (6), and[19]

$$R(x) = \begin{cases} \mathcal{A} & \text{if } x \geq \Pi_2 + a \\ \mathcal{R} & \text{if } x < \Pi_2 + a \end{cases} \tag{7}$$

We can now address the question, what is the smallest side payment a that keeps creditor 2 from going to court?

[18] To be precise, creditor 1's strategy is a degenerate probability distribution where all weight is put on $x(b)$, where $x(b)$ is given by Equation (6). Notice that in this equation, the "walking away offer," z could be written as a function of b. The important thing is that it is less than Π_2.

[19] Out-of-equilibrium beliefs supporting such strategies can, for example, be, if $x \in [\pi_2, \Pi_2 + a)$, then creditor 2 believes that $b + \Delta \geq y^*$. This is to say that creditor 2 believes that any out-of-equilibrium offer between Π_2 and the minimum acceptable offer $\Pi_2 + a$ would come from creditor 1 with private benefits so large that creditor 1 would not follow creditor 2 to court. This is obviously more restrictive than necessary.

Lemma 1.[20] *Suppose* $\Delta < y^* < B + \Delta$ *so that it is uncertain whether creditor 1 will follow creditor 2 to court. If* $y^* \leq (B+\Delta)/2$ *then* $a = y^*$. *If* $y^* > (B + \Delta)/2$ *then*

$$a = \begin{cases} \frac{B-(y^*-\Delta)}{B} y^* & \text{if } y^* \geq B \\ B + \Delta - y^* & \text{if } y^* < B. \end{cases}$$

This lemma shows that the minimum acceptable side payment a is a function of the structure of creditors' claims and the prior distribution of private benefits. In particular, initially a is increasing in y^*, but eventually becomes decreasing in y^*. The intuition derives from the changing credibility of creditor 2's threat to go to court, an action which may lead to liquidation and the loss of creditor 1's private benefits. Recall from Equation (3) that y^* can be viewed as creditor 1's cost of not following creditor 2 to court. Thus, when y^* is large, the likelihood that creditor 1 will follow is large as compared with when y^* is small. This tends to make creditor 2's threat of going to court less credible for large y^*. As a result, for large y^*, the minimum acceptable side payment required to keep creditor 2 from going to court is decreasing in y^*. As we observed earlier, in the extreme case that $y^* \geq B+\Delta$, the minimum acceptable side payment is 0. When y^* is small, creditor 1's cost of not following creditor 2 to court is small; thus, it is likely that creditor 1 will not follow. This lends credibility to creditor 2's threat of going to court and puts upward pressure on the minimum acceptable side payment. However, this payment is bounded above by y^* [since creditor 2 cannot do better than $\Pi_2+y^*(\equiv F_2)$ by going to court]. For small y^*, therefore, the minimum acceptable side payment is identical to y^* and is, therefore, also increasing in y^*.

The following result summarizes the discussion thus far.

Theorem 1. *There is a unique equilibrium outcome (that satisfies the Grossman and Perry refinement), and this outcome is determined by the strategies described by Lemma 1 and Equations (3), (6), and (7).*[21] *In particular, when* $\Delta < y^* \leq B + \Delta$, *the firm is liquidated if and only if* $b + \Delta < a$, *where* a *is as in Lemma 1. If the firm is liquidated, the firm is divided according to absolute priority. If the firm is kept*

[20] The proof of Lemma 1 (in Appendix A) uses the Grossman and Perry refinement only in the case that $y^* > (B+\Delta)/2$. In this case, there is a continuum of sequential equilibria, but a unique one satisfying the refinement.

[21] One set of out-of-equilibrium beliefs that support the equilibrium described by the strategies in Theorem 1 is, if $x \in [\Pi_2, \Pi_2 + a)$, creditor 2 believes that b is distributed uniformly on $[x, B]$, and if $x < \Pi_2$, creditor 2 believes that b is distributed uniformly on $[0, a - \Delta)$.

as a going concern,creditor 2 obtains $\Pi_2 + a$ *and creditor 1 obtains* $V_G + b - (\Pi_2 + a)$.

This theorem comments on the effectiveness of side payments in reducing inefficient liquidations. Notice from Lemma 1 that if $y^* < (B + \Delta)/2$ then $a = y^*$. That is, the minimum side payment that Creditor 2 accepts in equilibrium is equal to y^*. But this is the same as what creditor 1 must give up to creditor 2 in the game without side payments to avoid formal bankruptcy. Hence side payments do not reduce the incidence of inefficient liquidations when y^* is "small." But when y^* is larger than $(B + \Delta)/2$, the minimum acceptable side payment is smaller that y^*, implying that side payments are reducing the incidence of inefficient liquidations.

3.2 Debt structure and probability of inefficient liquidations

By implication, Theorem 1 also relates the structure of creditors' claims to the probability of workouts and inefficient liquidations. As y^* increases from 0 toward $(B + \Delta)/2$, creditor 2's minimum acceptable side payment a becomes larger. As a consequence, creditor 1's private benefits must increase in order for him to be able to offer the required amount to keep creditor 2 from going to court. Thus the probability of a workout is smaller the more junior/large are creditor 2's claims.

However, when $y^* \geq (B + \Delta)/2$, the minimum acceptable side payment is $B + \Delta - y^*$; it is decreasing in y^*.[22] The probability of workouts is thus larger the more junior/large are creditor 2's claims. We have:

Lemma 2. *The probability of a workout is decreasing in* y^* *on* $[0, \frac{(B+\Delta)}{2}]$ *and increasing in* y^* *on* $[\frac{(B+\Delta)}{2}, B + \Delta]$.

If V_G is greater than V_L, a liquidation would be inefficient. However, when $V_L > V_G$, not all liquidations are inefficient. The expression for a in Lemma 1 yields the following condition on $\tilde{b}$ for an inefficient liquidation:

$$\text{Inefficient liquidation if } \begin{cases} -\Delta < \tilde{b} < y^* - \Delta & \text{if } y^* \leq (B + \Delta)/2 \\ -\Delta < \tilde{b} < B - y^* & \text{if } y^* \geq (B + \Delta)/2 \\ & \text{and } \ y^* \leq B. \end{cases}$$

We see that the probability of an inefficient liquidation is initially increasing and then decreasing in y^*.

[22] Lemma 1 describes another, largely technical case that we will not dwell on here.

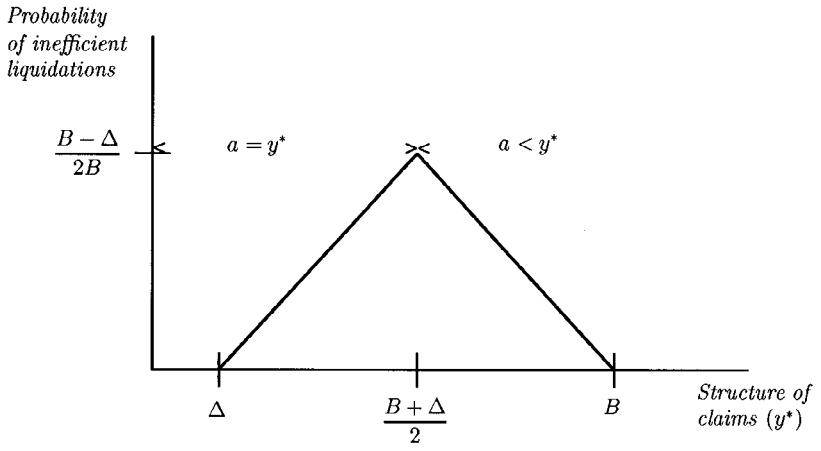

Figure 2
Probability of inefficient liquidation as a function of debt structure, $V_G > V_L$
This figure depicts the case when $0 < \Delta < B$. For $\Delta > B$, the probability of an inefficient liquidation is 0.
a = minimum (in equilibrium) acceptable side payment
Δ = going concern less liquidation value ($V_G - V_L$)
B = maximum private benefits
y^* = maximum side payment; is a function of debt structure ($y^* = F_2 - \Pi_2(V_L)$)

Proposition 1. *The probability of an inefficient liquidation is increasing in* y^* *on* $[0, \frac{(B+\Delta)}{2}]$ *and decreasing in* y^* *on* $[\frac{(B+\Delta)}{2}, B + \Delta]$.

This is just the converse of Lemma 2. The proposition is illustrated in Figures 2 and 3.[23] Figure 2 relates the probability of an inefficient liquidation to the structure of the creditors' claims y^*, and by implication to the equilibrium minimum acceptable side payment a.

The pyramid shape of the curve representing the probability of an inefficient liquidation derives from the size of the equilibrium minimum acceptable side payment a. When a is small, there is a high probability that creditor 1's private benefits are sufficiently large to afford the side payment. The intuition behind the shape of the curve thus derives from the changing credibility of creditor 2's threat to go to court — as we discussed in the text immediately after Lemma 1. The probability of an inefficient liquidation is at its highest when creditor 2's claims are of similar seniority and size as creditor 1's claims [y^* around $(B+\Delta)/2$]. To the left of the minimum, the smallest acceptable

[23] Notice that in Figure 2, where $V_G > V_L$, the probability of an inefficient liquidation is 0 when $y^* > B$. This can be seen as follows: From Lemma 1, if $y^* = B$, $a = \Delta$. Thus, creditor 1 offers $\Pi_2 + a$ to creditor 2 and keeps the firm as a going concern if and only if $\Pi_1 \leq V_G - (\Pi_2 + V_G - V_L) + b = \Pi_1 + b$, which is true for all b. For $y^* > B$, a similar argument applies.

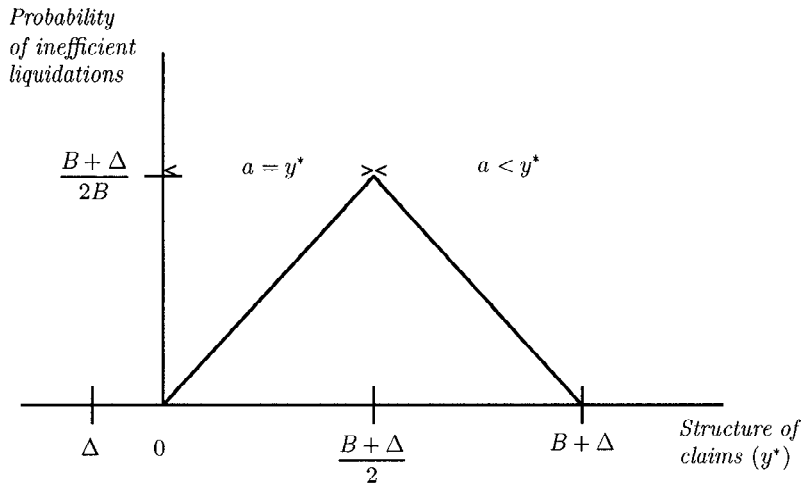

Figure 3
Probability of inefficient liquidation as a function of debt structure, $V_L > V_G$
This figure depicts the case when $\Delta < 0$ and $\Delta + B > 0$. For $\Delta + B < 0$, the probability of an inefficient liquidation is 0.

offer is F_2; to the right of the minimum, the smallest acceptable offer is decreasing in y^*.

Table 2 summarizes the unique equilibrium outcome for all values of the key parameters. From the Table we see that a workout is, with only one exception, synonymous with keeping the firm as a going concern.

4. Analysis of the Receivership Code

This section continues the analysis of the previous section, but with formal bankruptcy being receivership instead of pure liquidation. The focus is on characterizing the extent to which there will be inefficient outcomes as a function of debt structure and which creditor has the right to appoint the receiver. Initially we assume that the creditor with the private benefits, creditor 1, appoints the receiver. Subsequently, we consider the case where creditor 2 appoints the receiver. We assume that the receiver acts solely in the interest of his appointer. The receiver's considerable control rights thus lie with the creditor who appoints him. Unlike the pure liquidation code, receivership allows for further negotiations between the creditors. For example, in the recent case of Swan Hunter shipyard, the Ministry of Defense was an unsecured creditor with large private benefits arising from the costs of switching uncompleted ships to other shipyards. The appointer of

Table 2
Description of the unique equilibrium outcome under the pure liquidation code

y^* is in	$b+\Delta$ is in	Payoff to Creditor 1	Payoff to Creditor 2	Workout	Going concern
$(-\infty, \Delta]$	$[0, B]$	$V_G + b - F_2$	F_2	Yes	Yes
$(\Delta, (B+\Delta)/2]$[a]	$[\Delta, y^*)$	Π_1	Π_2	No	No
	$[y^*, B+\Delta]$	$V_G + b - F_2$	F_2	Yes	Yes
$((B+\Delta)/2, B+\Delta)$[b]	$[\Delta, a)$	Π_1	Π_2	No	No
	$[a, B+\Delta]$	$V_G + b - (\Pi_2 + a)$	$\Pi_2 + a$	Yes	Yes
$[B+\Delta, \infty)$	$[0, B]$	$\max\{V_G + b - \Pi_2, \Pi_1\}$	Π_2	Yes	Yes iff $V_L \leq V_G + b$

Payoff to equity is always 0.

[a]This case obviously cannot occur if $\Delta \geq B$. If so, the other three cases tell us that a workout is always achieved.
[b]In the case that $y^* \in ((B+\Delta)/2, \infty)$,

$$a \equiv \begin{cases} \frac{B-(y^*-\Delta)}{B} y^* & \text{if } B < y^* \\ B + \Delta - y^* & \text{if } B \geq y^*. \end{cases}$$

In the subcase $B < y^*$, $b + \Delta \geq a$ for all b, implying that a workout is always achieved.

the receiver had little or no private benefits and was able to extract large side payments to avoid liquidation and complete the ships.

The bargaining game in receivership is sketched in Figure 4. Notice that this game is a subgame of that sketched in Figure 1. The portion of the bargaining that takes place prior to receivership (i.e., the top portion of Figure 1) will be referred to below as the "workout stage."

Under the pure liquidation code, we saw that inefficient liquidations resulted from creditor 2's threat to make creditor 1 pivotal. In receivership creditor 2's threat is different. When creditor 1 is the appointor, we can see from Figure 4 that creditor 2's threat is to liquidate the firm. This threat is not powerful because it is common knowledge that creditor 2's payoff would be $\Pi_2(V_L)$ for carrying it out. Creditor 1 can pay this amount irrespective of the size of the private benefits. In contrast, when creditor 2 is the appointor, we show below that information asymmetries persist and inefficiencies result. A numerical example is present in Appendix B.

In practice, it may be necessary to raise financing in receivership when the firm is sold as a going concern in order to meet cash flow requirements prior to sale. In the absence of an agreement among creditors, any financing must be provided by the receiver and will

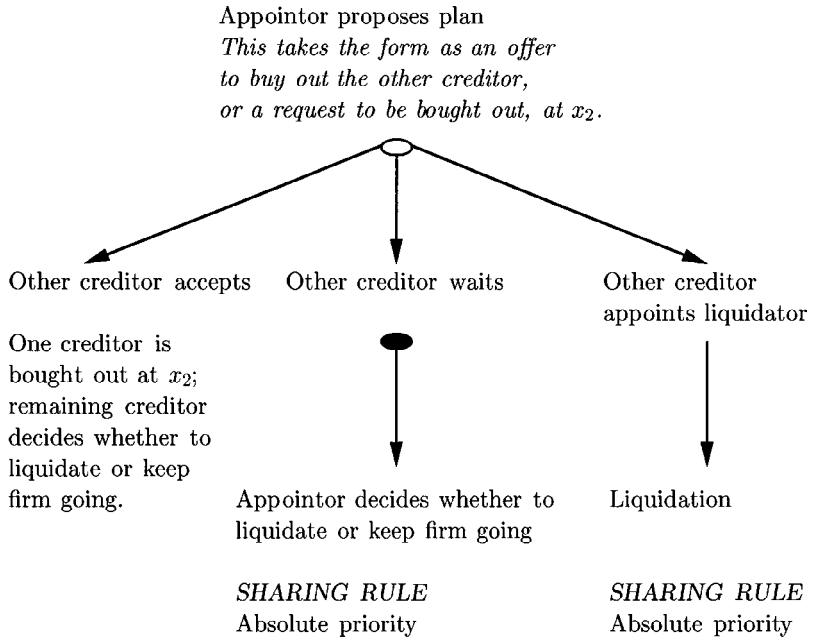

Figure 4
Formal bankruptcy is receivership
Solid ovals indicate that the appointor moves, open ovals indicate that the other creditor moves. The depicted game is a continuation of the game shown in Figure 1 when formal bankruptcy is receivership. Initially, the appointor offers to buy out the other creditor, or makes a request to be bought out by the other creditor at x_2. There are three possible responses: (i) If the other creditor *accepts*, the creditor who is not bought out pays off the bought-out creditor, obtains control and ownership of the firm, and decides whether to liquidate the firm or keep it going. (ii) If the other creditor *waits*, the appointor decides whether to liquidate the firm or keep it going, and absolute priority prevails. (iii) If the other creditor *rejects* the offer and applies his rights as a fixed-charge holder to take possession of an asset vital to keeping the firm as a going concern (which we refer to as appointing a liquidator), the firm is liquidated, and absolute priority prevails.

rank as junior to all existing claims. The reason is that receivership is not court administered and therefore there is no facility to dilute existing claims.[24] We discuss in Section 4.3 how our results may be modified under the risk of new financing in receivership.

[24] In the case of expenditure made by the receiver on behalf of the appointor, it is important to distinguish between expenditure necessary to sell the business and expenditure which is to allow the firm to trade out of trouble. In the first case, such expenditure would have precedence in any proceeds arising from liquidation or sale. However, in the second case the new funds would not have priority. For example, the expense required to rebuild the roof of a hotel was not allowed preferential rights since it was regarded as unnecessary for the sale of the business [see Franks and Torous (1992)].

4.1 Creditor 1 appoints the receiver

In receivership, creditor 1 makes an offer to buy out creditor 2's debt at a price of x_2.[25] If creditor 2 accepts the offer, creditor 1 becomes the owner of the firm. Creditor 2's other options are to reject the offer and appoint a liquidator or to wait. If a liquidator is appointed, the value of the firm V_L is shared according to the rules of absolute priority; in particular, creditor 2 receives $\Pi_2(V_L)$. If creditor 2 waits creditor 1 chooses to liquidate or keep the firm as a going concern, and absolute priority prevails.

The above implies that if $V_G \geq V_L$, there is a unique equilibrium outcome in which creditor 2 receives $\Pi_2(V_G)$ and creditor 1 receives $\Pi_1(V_G) + b$. There are a number of equilibria which lead to this outcome, the most straightforward being that creditor 1 offers $x_2 = \Pi_2(V_L)$, creditor 2 accepts, and creditor 1 keeps the firm going.[26]

If $V_L > V_G + b$, there is a unique equilibrium outcome in which creditor 2 receives $\Pi_2(V_L)$ and creditor 1 receives $\Pi_1(V_L)$. This is achieved, for example, by creditor 1 offering $\Pi_2(V_L)$, creditor 2 accepting, and creditor 1 liquidating the firm.[27] Creditor 2 must receive at least $\Pi_2(V_L)$ because of his right to appoint a liquidator.

If $V_G < V_L < V_G + b$, there is a unique equilibrium in which creditor 1 offers $x_2 = \Pi_2(V_L)$, creditor 2 accepts, and creditor 1 keeps the firm as a going concern.[28] In this equilibrium, creditor 2 gets $\Pi_2(V_L)$ and creditor 1 gets $V_G + b - \Pi_2(V_L)$. The uniqueness obtains because if creditor 1 were to offer less, creditor 2 would liquidate. Creditor 2 will not wait because that would give him $\Pi_2(V_G)$, which is less than $\Pi_2(V_L)$.

We have thus established that in receivership creditor 2 obtains:

$$x_2 = \max\{\Pi_2(V_G), \Pi_2(V_L)\}.$$

It follows by backward induction that at the workout stage, creditor 1

[25] Alternatively, creditor 1 could make a request to be bought out. But because creditor 1 is the creditor with private benefits, it is a (weakly) dominating strategy for him to make an offer to buy out creditor 2 rather than make a request to be bought out. Conversely, if creditor 2 is the appointor, it is a (weakly) dominating strategy for him to make a request to be bought out rather than offer to buy out creditor 1. This is discussed further in the next few footnotes.

[26] Note that creditor 1's offer equally could be viewed as a request to be bought out at a price of $\Pi_1(V_G)$ or as an offer to buy out creditor 2 at a price of $\Pi_2(V_G)$. This is because $V_G > V_L$, implying that if creditor 1 is bought out, creditor 2 will keep the firm as a going concern, thus maintaining creditor 1's private benefits.

[27] Note that this is equivalent to creditor 1 being bought out at a price of $\Pi_1(V_L)$.

[28] However, such an offer is not equivalent to a request to be bought out at a price of $\Pi_1(V_L)$. In this case, if creditor 1 is bought out, creditor 2 will take control of the firm and will liquidate it since $V_L > V_G$. As a result, creditor 1 loses the private benefits that would accrue if the firm were kept as a going concern.

always offers $x = \max\{\Pi_2(V_G), \Pi_2(V_L)\}$, with creditor 2 accepting.[29] Hence, the threat possessed by creditor 2 in the pure liquidation code is neutralized in the receivership system; creditor 2 can no longer "jump the queue" by going to court because creditor 1 will always follow and appoint a receiver. The incidence of premature liquidations, therefore, is eliminated. Since it is common knowledge what creditor 2 receives in receivership, the workout stage has played no role in the allocation of firm value between creditors. The following theorem summarizes the above results:

Theorem 2. *If creditor 1 has the right to appoint a receiver, there is a unique equilibrium outcome in which (i) a workout always occurs, (ii) the firm is liquidated if and only if* $V_L > V_G + b$, *(iii) creditor 2 receives* $\max\{\Pi_2(V_L), \Pi_2(V_G)\}$, *and (iv) creditor 1 collects* $\max\{V_G + b, V_L\} - \max\{\Pi_2(V_L), \Pi_2(V_G)\}$.

4.2 Creditor 2 appoints the receiver

The game is the same as when the creditor with the private benefits was the appointor, but with the roles of the two creditors reversed. The first move belongs to creditor 2, who makes a request to be bought out by creditor 1 at a price of x_2.[30]

4.2.1 Equilibrium when $V_L \leq V_G$. In this case, there will be no inefficiencies because creditor 1 can be assured of the firm being kept as a going concern without bargaining by choosing "to wait." There is a unique equilibrium outcome in which creditor 2 receives $\Pi_2(V_G)$ and creditor 1 receives $\Pi_1(V_G) + b$. This can be achieved by, for example, creditor 2 making a request for $\Pi_2(V_G)$, with creditor 1 accepting. If creditor 2 requests more, creditor 1 will reject the request and wait for creditor 2 to keep the firm as a going concern since $V_G \geq V_L$. Thus, going back to the workout stage, creditor 2 has no credible threat — just as in the case when creditor 1 was the appointor. It follows that creditor 1 offers $\Pi_2(V_G)$ at the workout stage, with creditor 2 accepting. As in the case where creditor 1 is the receiver, the workout stage has not affected equilibrium allocations.

4.2.2 Equilibrium when $V_L > V_G$. In the above cases, receivership eliminated inefficient liquidations. However, we will now show that when $V_L > V_G$, inefficient liquidations can occur; moreover their

[29] In the cases where the creditors are indifferent between going to court or not, we assume they will not go to court.

[30] As we pointed out in footnote 25, whereas it is a (weakly) dominating strategy for creditor 1 when he is the appointor to make an offer to buy out creditor 2, it is a (weakly) dominating strategy for creditor 2 when he is the appointor to make a request to be bought out.

incidence is higher than under the pure liquidation code. Creditor 2's equilibrium request in receivership x_2 can be written as $\Pi_2(V_L) + s$, where s can be viewed as the required side payment to keep creditor 2 from liquidating the firm.

We shall first consider receivership without the possibility of a workout stage. We shall assume that $\Delta + B > 0$ (see footnote 32).

Lemma 3. *Suppose creditor 2 is the appointor in receivership. In the absence of a workout stage, creditor 2's optimal request for a side payment is* $s = (B + \Delta)/2$.

Without a workout stage, creditor 2 bases his request on the unconditional distribution of b, since he is the uninformed party. This results in a high incidence of inefficient liquidations. It is possible here that creditor 2 would ask for more than F_2. Restricting creditor 2 to request F_2 would reduce but not eliminate inefficiencies. We next show that this is the effect of adding the workout stage. Instrumental in obtaining this result is the observation that in equilibrium it must cost creditor 1 the same amount to buy out creditor 2 at the workout stage as in receivership. This is essentially just the law of one price.

Lemma 4. *In equilibrium, creditor 2 requests the same in receivership as the minimum acceptable offer at the workout stage* $[x_2 = \Pi_2(V_L)+a]$. *In particular, creditor 2 does not request more than the face value of his claims* $(x_2 \leq F_2)$.

The lemma implies that the equilibrium strategy followed by creditor 1 must be such that, when he can afford it, he only offers the minimum acceptable side payment at the workout stage, a, in some cases. In the remaining cases, creditor 1 "walks away," that is, makes an offer of a negative side payment. If a were always offered when $b+\Delta > a$, then a failure to offer a would convey to creditor 2 that $b+\Delta < a$. It would then be optimal for creditor 2 to request less than a in receivership. This would violate "the law of one price" established by Lemma 4.

Focusing on pure strategies, we define the set Φ as the set of b's for which creditor 1 offers a.[31] For creditor 2 to accept $\Pi_2(V_L) + a$ (as he should in equilibrium), a must be greater than or equal to what creditor 2 would receive if he rejected the offer and went to court. If Φ is empty and creditor 1 always follows creditor 2 to court, Lemma 3 states that $s(= a)$ is equal to $(B+\Delta)/2$. If Φ is nonempty, $a(= s) = y^*$ because creditor 2 learns from an offer of a that $b \geq a - \Delta$. Hence, if $a < y^*$ is offered, creditor 2 infers that he can extract more than that from creditor 1 by going to court.

[31] It could also be possible that creditor 1 plays a mixed strategy for all b satisfying $b + \Delta \geq a$.

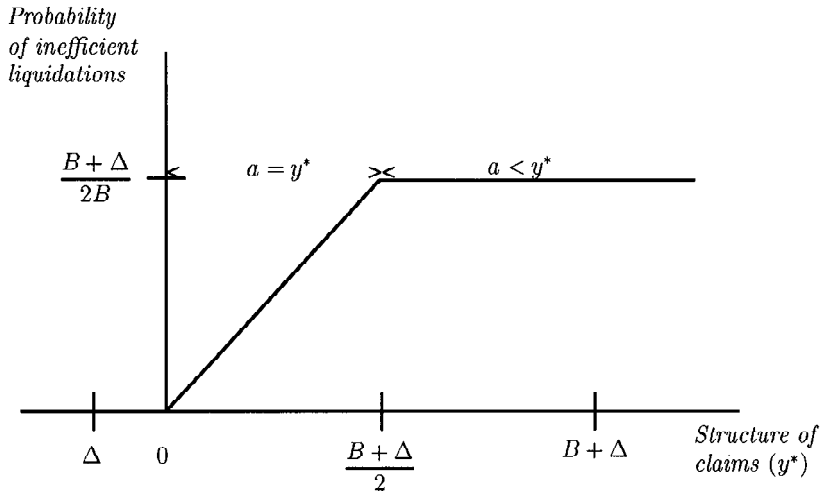

Figure 5
Probability of inefficient liquidation as a function of debt structure under receivership when the creditor without private benefits appoints the receiver
This figure depicts the case when $\Delta < 0$ and $\Delta + B > 0$. It is shown in the text that if $\Delta > 0$, there would be no inefficient liquidations.
a = minimum (in equilibrium) acceptable side payment
Δ = going concern less liquidation value ($V_G - V_L$)
B = maximum private benefits
y^* = maximum side payment; is a function of debt structure ($y^* = F_2 - \Pi_2(V_L)$)

This leads us to the following result (the proof is in the appendix).

Lemma 5. *(i) If* $y^* < (B + \Delta)/2$ *then* $a(= s) = y^*$, *and (ii) if* $y^* \geq (B + \Delta)/2$ *then* $a(= s) = (B + \Delta)/2$.

If creditor 1's private benefits are not sufficiently large for him to afford the required side payment, a liquidation occurs. This would be inefficient if the going concern value including the private benefits is larger than the liquidation value. We have the following condition for an inefficient liquidation:

$$\text{Inefficient liquidation if } \begin{cases} -\Delta < \tilde{b} < y^* - \Delta & \text{if } y^* \leq (B+\Delta)/2 \\ -\Delta < \tilde{b} < (B-\Delta)/2 & \text{if } y^* \geq (B+\Delta)/2. \end{cases}$$

Thus we have the following result:

Proposition 2. *When creditor 2 is the appointor and* $V_L > V_G$, *the probability of an inefficient liquidation is increasing in* y^* *on* $[0, (B+\Delta)/2]$ *and constant for* $y^* > (B + \Delta)/2$.

This proposition is illustrated in Figure 5. Comparing this figure with Figure 3 shows a higher incidence of inefficient liquidations under

receivership than under the pure liquidation code. This is because receivership, when creditor 2 is the appointor, impedes the passage of information about the value of the private benefits. The intuition is that there are no incentives for creditor 1 to reveal information at the workout stage because creditor 2 can take the firm into receivership and use his control rights to profit from the information. The basis of this intuitions is "the law of one price," that it is equally costly to buy out creditor 2 at the workout stage as in receivership. This contrasts with the pure liquidation code where there is some incentive to reveal information in order to avoid liquidation and the loss of private benefits.

The following theorem summarizes the main results of this subsection.

Theorem 3. *I. If $V_G \geq V_L$ and creditor 2 has the right to appoint a receiver, there is a unique equilibrium outcome in which (i) a workout always occurs, (ii) the firm is kept as a going concern, (iii) creditor 2 receives $\Pi_2(V_G)$, and (iv) creditor 1 collects $V_G + b - \Pi_2(V_G)$.*

II. If $V_G < V_L$ and creditor 2 has the right to appoint a receiver then (i) if $y^* < (B + \Delta)/2$, there is a unique equilibrium outcome in which both creditors receive the same payoffs as when the formal bankruptcy code prescribes liquidation. In receivership, the firm may be kept as a going concern or liquidated. (It is liquidated if and only if $b + \Delta < y^*$); (ii) if $y^* \geq (B + \Delta)/2$, there is a unique equilibrium outcome in which workouts never occur and receiverships result in both liquidations and going concerns (but with a larger proportion of liquidations than going concerns).[32]

Theorem 3 allows a comparison of the efficiency of receivership when the appointor is the creditor with and without private benefits, respectively. We have already noted that Figure 5 shows a high level of inefficient liquidations in receivership when the creditor without private benefits is the appointor. Such inefficiencies do not arise when creditor 1 is the appointor or when creditor 2 is the appointor and $V_G > V_L$. In assessing the efficiency of the receivership code, it is thus critical to determine which type of creditor typically is the appointor, the creditor with high or low private benefits? Unless the creditor without private benefits is the appointor and $V_L > V_G$, receivership is efficient and greatly reduces the incidence of inefficient liquidations relative to a pure liquidation code.

[32] There is another, trivial case: if $B + \Delta \leq 0$, $a = s = 0$, there is a workout and a liquidation.

The conclusion that inefficiencies can obtain when creditor 2 is the appointor rests on the assumption that when $V_L > V_G$ and negotiations fail, creditor 2 will sell the firm in a liquidated state. However, if the firm is auctioned without first liquidating it, creditor 1 could buy the firm at a price of V_L and keep it as a going concern, thereby preserving his private benefits. In this case, creditor 2 would have no threat from which to extract side payments. There would then be no inefficient liquidations.

However, in practice there are strong incentives for the receiver to shut the firm down prior to auctioning it for sale. This relates to the fact that the sale of a company as a going concern typically is a time-consuming process. There is, therefore, the risk that the receiver must provide financing to meet any negative cash flows. As explained above, such financing will be junior to all existing claims. As a result, the cost of new borrowing will be borne by the appointor, although the benefits are shared with the other creditor. In contrast, no new financing is required to liquidate the firm. Therefore, when $V_L > V_G$, the appointor would choose to liquidate the firm prior to auction to avoid the risk of having to provide new financing. But by the same token, there may be an incentive to liquidate even when $V_G > V_L$. As a result, there may be more inefficient liquidations than suggested by the analysis above. This is endogenized in the model in the next section.

The effect just described is similar to Myers' (1977) well-known problem of debt overhang where a junior claim holder, especially equity, of a financially distressed firm will not contribute capital to a positive NPV project since senior claim holders reap all the rewards. While we could model the case that financing must be provided with certainty to keep the firm going, we focus on the more general case where the need for financing is uncertain.

There are other reasons why the firm will be liquidated when $V_L > V_G$ and creditor 1 *waits*. Even if creditor 2 is indifferent between shutting the firm down or not before auctioning it, if it is common knowledge that he will not shut it down, creditor 2 will receive no side payment. For reputational reasons, therefore, creditor 2 will choose to liquidate since he may be engaged in similar negotiations in the future. Additionally, there may be reasons why creditor 1 may not be able to purchase the firm in an auction because of statutory restrictions on creditors' purchase of assets with consideration other than cash. Thus, if there are capital market imperfections and the creditor with private benefits is cash constrained, a purchase may be expensive or impossible [see Aghion, Hart and Moore (1992)]. This may be especially important where the creditor is much smaller than the debtor firm.

4.3 New financing in receivership

In this section we examine the appointor's decision to liquidate or keep the firm as a going concern when the other creditor has responded *wait*. This is important where there is a risk that new financing will be required. We derive the implications for the incidence of inefficient liquidations when creditor 2 is the appointor. In Appendix C, we analyze the case when creditor 1 is the appointor.

Initially we will assume that $V_G > V_L$. To capture the idea that selling the firm as a going concern takes time, during which there is a risk of a negative cash flow that will have to be financed by the appointor, we construct a three-date model describing what happens when creditor 1 responds *wait*.

At date 0, creditor 2 decides whether to liquidate the firm or keep it as a going concern. If the firm is kept as a going concern, at date 1 there is an equal probability of a positive cash flow of $k_1 = k$ or a negative cash flow of $k_1 = -k$. A negative cash flow must be financed by creditor 2 (the appointor) through a claim which is subordinated to all existing claims.[33] To emphasize the risk that this claim will not be repaid in full, we will assume that $V_G + k < F$, implying that the repayment of the claim is zero. At date 2, the firm is sold for V_G. All positive cash flows are shared according to absolute priority.

The riskfree rate is normalized to zero. Thus, since all players are risk neutral, the value of the firm as a going concern at date 0 is V_G. If the firm is liquidated, there is no cash flow at date 1 and the firm is sold for V_L.

Creditor 2 will keep the firm as a going concern, provided his expected payoff is larger than if he liquidates the firm. If $k_1 > 0$, creditor 2 receives $\Pi_2(V_G+k)$. If $k_1 < 0$, creditor 2 receives $\Pi_2(V_G)-k$. Thus creditor 2's expected payoff from keeping the firm as a going concern is

$$.5\Pi_2(V_G + k) + .5(\Pi_2(V_G) - k).$$

Creditor 1's expected payoff if the firm is kept as a going concern is

$$.5\Pi_1(V_G + k) + .5\Pi_1(V_G).$$

The combined payoff to the two creditors adds up to V_G. However, since creditor 2 bears the whole cost of the new financing if $k_1 < 0$, but shares the cash flow if $k_1 > 0$, there is a wealth transfer T from creditor 2 to creditor 1 with expected value

$$T = .5(\Pi_1(V_G + k) - \Pi_1(V_G)). \tag{8}$$

[33] The idea is that by keeping the firm going, the appointor contracts with suppliers, employees, etc., and promises to pay them out of his own pocket if necessary.

Creditor 2 may therefore liquidate the firm even though $V_G > V_L$. Creditor 2 liquidates if and only if

$$\Pi_2(V_G) - T < \Pi_2(V_L). \tag{9}$$

The left-hand side of Equation (9) is decreasing in the wealth transfer from creditor 2 to creditor 1. This depends on the size of k and the debt structure. We discuss these two factors in turn.

From Equation (8) it is straightforward that the wealth transfer is increasing in k. This has an intuitive interpretation: when the risk of financing within receivership is large, the incentive to liquidate is large. If $k = 0$, no financing will be required, implying that there is no wealth transfer. Therefore, creditor 2 will keep the firm going when $V_G > V_L$ and $k = 0$. However, for a given V_L, as k increases, V_G must become increasingly large in order for creditor 2 to keep the firm as a going concern.

The size and seniority of the claims is also important. In the limiting case where creditor 2 is the sole creditor, the wealth transfer is zero, implying that creditor 2 will keep the firm going as long as $V_G > V_L$. For a given k, as creditor 1 becomes increasingly senior/large, the wealth transfer increases. As a result, V_G must become increasingly large given V_L in order for creditor 2 to keep the firm as a going concern.

Equation (9) shows that creditor 2's decision to liquidate is independent of creditor 1's private benefits. Thus when the creditors negotiate within receivership, it is common knowledge whether the firm will be liquidated or kept as a going concern if negotiations fail. As a result, the game when there is a risk of financing within receivership can be analyzed as in Section 4.2. Thus, if

$$\Pi_2(V_G) - T \geq \Pi_2(V_L)$$

there are no inefficient liquidations. If the inequality is reversed, however, so that a breakdown in negotiations leads to the liquidation of the firm, inefficient liquidations will result, as shown in Section 4.3 (Figure 5 applies). However, when there is a risk of new financing, there will be more inefficient liquidations than before since we may see liquidations even when $V_G > V_L$.

When $V_L > V_G$ and $k > 0$, there is no incentive to maintain the firm as a going concern. Even if the firm were sold for V_L at date 2, creditor 2 would have an expected loss of $.5(\Pi_1(V_L + k) - \Pi_1(V_L))$ compared with immediate liquidation. Figure 5 therefore applies as before.

Conversations with receivers confirm the view that the risk of having to provide additional financing to keep the firm alive within re-

ceivership often leads to the liquidation of the firm. In our model, the risk of borrowing increases the incidence of inefficient liquidations because bargaining may break down due to asymmetric information about private benefits. This problem may be particularly acute when the appointor, creditor 2, is small or junior.

In Appendix C we show that when creditor 1 is the appointor and there is a risk of new financing, there are cases where the incidence of inefficient liquidations is larger under receivership than under a pure liquidation code. However, the overall picture of receivership that emerges supports our conclusion from Section 4.1 that the incidence of inefficient liquidations are greatly reduced relative to a pure liquidation code.

In this section we have shown that the absence of suprapriority financing results in a wealth transfer from the appointor to other creditors if there is a probability of new financing. The result is inefficient liquidations. The policy implication of this analysis is that inefficient liquidations would be reduced if suprapriority financing were available to the receiver.

5. Administration

This section examines the effect of the new *administration* code introduced in the U.K. in 1986. According to this code, the administrator is appointed by the court to serve the interests of all creditors. The court will grant an administration order on two conditions: (i) if there is a chance that the firm can be maintained as a going concern, and (ii) the creditor with the floating charge does not object. One motivation for the introduction of administration was to increase the incidence of going concerns.

The administrator has 3 months in which to examine the business and put forward a reorganization plan to creditors. This plan can propose liquidation or the sale of the business as a going concern. The approval of the administrator's plan requires a majority by face value [Rule 2.28(1) of the 1986 Insolvency Act]. Failing such a majority, liquidation follows.

We model the administrator as proposing a plan to keep the firm going. If the plan is rejected, the firm is liquidated.[34] Whether the firm is kept as a going concern or liquidated, payments to creditors follow strict absolute priority. When $V_G > V_L$, both creditors will vote in favor of keeping the firm as a going concern. No inefficiencies would

[34] We could equally model the administrator as proposing to liquidate the firm. If this were rejected, the firm would be kept as a going concern. The outcome would be the same.

arise. When $V_L > V_G$, there are two cases to consider, depending on which creditor has the majority vote.

5.1 Creditor 1 has majority

When $V_L > V_G$, creditor 1 will vote to keep the firm as a going concern if his share of the going concern plus his private benefits exceeds his share of the liquidation value. Thus the following equation determining whether the firm is kept as a going concern obtains:

$$\begin{cases} \text{going concern if} & \Pi_1(V_G) + b > \Pi_1(V_L) \\ \text{liquidation} & \text{otherwise.} \end{cases} \tag{10}$$

This equation illustrates that inefficient going concerns can occur. For example, consider the following parameter values:

$$V_L = 80;\ V_G = 70;\ b = 9;\ F_1 = 50 + \varepsilon(\varepsilon > 0);\ F_2 = 50.$$

Under equal seniority, for sufficiently small ε, we then have

$$\Pi_1(V_G) = \Pi_2(V_G) = 35 \text{ and } \Pi_1(V_L) = \Pi_2(V_L) = 40.$$

Creditor 1 will vote for a going concern since in liquidation he receives 40 as compared with a going concern where he receives $35+9$. However, this is inefficient since the total value generated by keeping the firm as a going concern is less than the firm's liquidation value.[35] This could be avoided if administration had a *minority protection clause* whereby minority creditors are guaranteed at least their liquidation payoff.[36]

This result can be compared to the receivership code where creditor 1 appoints the receiver, and as a result has control. It was shown above that in this case, neither inefficient going concerns or liquidations took place. Using the same numbers, in receivership, creditor 2 receives his liquidation payoff, 40. Creditor 1 will then choose to liquidate the firm, and as a result also receives 40 (rather than the 39 he would

[35] Evidence that the courts will allow a firm to be maintained as a going concern in administration is given in the case of Barings. Law Debenture, who were trustees for the bondholders of Barings Bank, petitioned the court they were opposed to the sale of the company to ING as a going concern because they had reason to believe that the bondholders would receive greater proceeds from a liquidation. Their petition was turned down by Vice Chancellor Sir Richard Scott, the High Court judge, who said that although he sympathized with them and they might be less well covered by the rescue than a liquidation, this was "not sufficient to deflect me from approving."

[36] The German reform bankruptcy code that is to come into effect January 1, 1999, has such a minority protection clause.

receive if he kept the firm going). Therefore, creditor 1 would pass up receivership and let the firm go into administration.

5.2 Creditor 2 has majority

When $V_L > V_G$, creditor 2 will vote to liquidate the firm. Hence we are in an identical position as under the pure liquidation code. As a result, inefficient liquidations can occur. As shown above, receivership where creditor 2 is the appointor also leads to inefficient liquidations. However, administration leads to a lower incidence of inefficient liquidations since, in this case, administration is analogous to the pure liquidation code. But since these gains would be captured by creditor 1, creditor 2 would not pass up his right to appoint the receiver; neither would creditor 1 if he had that right.

5.3 Implications

The above analysis illustrates three important implications of administration. (i) There can be inefficient going concerns as well as inefficient liquidations. (ii) It is possible that administration can lead to greater inefficiencies than receivership. For example, when creditor 1 is the appointor, no inefficiencies arise; whereas in administration, inefficient going concerns can arise since there is no minority protection clause. However, if banks, who typically would be the appointors, do not have private benefits, then administration may improve efficiency relative to receivership. (iii) Creditors will on occasion pass up the opportunity to appoint the receiver and thereby let the firm enter administration.[37] As illustrated above, creditor 1 may do so if $V_L > V_G$ (but not otherwise). Creditor 2 would be indifferent between administration or being the appointor in receivership when $V_G > V_L$ since he would receive a payoff of $\Pi_2(V_G)$ in either case. However, if $V_L > V_G$, creditor 2 would not pass up the right to appoint the receiver since in administration creditor 2 receives no side payment, while in receivership, when he is the appointor, creditor 2 may obtain a side payment.

6. Conclusion

This article has stressed the importance of the formal bankruptcy rules in determining the incidence of workouts and inefficient outcomes. Our analysis relies on the assumptions that some creditors retain private benefits from restructuring the insolvent firm and keeping it as a

[37] This happened in the recent case of Olympia and York.

going concern, and that other creditors are imperfectly informed about the size of these private benefits. We have shown that a bankruptcy law that automatically leads to the liquidation of the insolvent firm may under certain circumstances be more efficient than the U.K. administrative receivership code that allows for keeping the firm as a going concern. This conclusion is critically dependent on a party with relatively small private benefits having control rights in bankruptcy. Conversely, if a creditor with relatively large private benefits has control rights in bankruptcy, inefficient liquidations are greatly reduced under a receivership code as compared to a pure liquidation code. In general, the likelihood of an inefficient liquidation is affected by the distressed firm's debt structure. For example, under a pure liquidation code, the probability of an efficient workout increases when debt structures are asymmetric (e.g., one senior and one junior creditor as opposed to two equal creditors).

Our analysis also shows that the lack of suprapriority financing to the receiver can contribute to a high level of inefficient liquidations. This suggests that the receivership code can be improved by allowing for such financing.

Anecdotal evidence suggests that commercial banks typically are the appointor under the receivership code and choose to liquidate a high proportion of firms (more than 80%).[38] If they possess lower private benefits compared with other creditors, such as suppliers, employees, and customers, our analysis would suggest that a large fraction of the observed liquidations would be inefficient. Our analysis further shows that this could be improved upon by a pure liquidation code, or by administration. It may be unfortunate that administration can be blocked by creditors with floating charges who have the right to appoint receivers.

We have shown that the new administration procedure reduces the incidence of inefficient liquidations at the cost of introducing inefficient going concerns. This illustrates that under a creditor-oriented code, both types of inefficiencies can occur, depending on the allocation of control rights. This contrasts with the typical view that creditor-oriented codes are associated with inefficient liquidations, while debtor oriented codes are associated with inefficient going concerns. Our discussion of administration shows that a trade-off between these two types of inefficiencies can be struck within a creditor-oriented code. However, our analysis also shows that inefficient continuations can be greatly reduced by a minority protection clause.

[38] The statistic was given by Mark Homan, President of the Association of Insolvency Practitioners, during a lecture at the London Business School, June 1993.

Appendix A

Proof of Lemma 1. Recall that $\Pi_2 + y^*$ is always accepted since this is the most C_2 can get if he rejects C_1's offer and goes to court. Therefore, we can make the restriction $a \leq y^*$.

By Equations (4), (5), and (6), C_2 accepts $\Pi_2 + a$ if and only if

$$\Pr\{\tilde{b}+\Delta < y^* \mid \tilde{b}+\Delta \geq a\}\Pi_2 + \Pr\{\tilde{b}+\Delta \geq y^* \mid \tilde{b}+\Delta \geq a\}F_2 \leq \Pi_2 + a,$$

which is true if and only if

$$\frac{y^* - a}{B + \Delta - a}\Pi_2 + \frac{B + \Delta - y^*}{B + \Delta - a}F_2 \leq \Pi_2 + a,$$

which after some algebraic manipulation becomes

$$a^2 - (B + \Delta)a - [y^{*2} - (B + \Delta)y^*] \leq 0, \tag{11}$$

which is not true for $y^* \leq (B + \Delta)/2$ and $a < y^*$. Hence, if $y^* \leq (B + \Delta)/2$, we must have $a = y^*$.

We now consider the case that $y^* > (B + \Delta)/2$. Using the calculations above, it is straightforward that if $a < B + \Delta - y^*$, the expected value of rejecting the offer $x = \Pi_2 + a$ is larger than $\Pi_2 + a$. However, if $a \in [B + \Delta - y^*, y^*]$, the expected payoff to C_2 from rejecting the offer $x = \Pi_2 + a$ is less than or equal to $\Pi_2 + a$. Hence, the strategies given by Equations (3), (6), and (7) constitute a sequential equilibrium (with the appropriate beliefs) if and only if $a \in [B + \Delta - y^*, y^*]$. An example of an out-of-equilibrium belief that supports these equilibria is if x is less than $\Pi_2 + a$, then C_2 believes that $b + \Delta \geq y^*$ with a probability of 1.

We will now show that among the continuum of sequential equilibrium strategies, there is a unique set of strategies for which there exist beliefs that satisfy the Grossman and Perry criterion. Let

$$\pi_1(b, a) = \begin{cases} V_G - (\Pi_2 + a) & \text{if } b + \Delta \geq a \\ \Pi_1 & \text{if } b + \Delta < a. \end{cases}$$

This is creditor 1's equilibrium payoff. The Grossman and Perry criterion imposes a restriction on out-of-equilibrium beliefs as follows: Consider an out-of-equilibrium offer $x < \Pi_2 + a$. The equilibrium breaks if there exists a nonempty set $K(x)$ of values of b with the following properties:

1. $E[\pi_2(x, \mathcal{R}) \mid \tilde{b} \in K(x)] < x$, and
2. $\pi_1(b, x) > \pi_1(b, \Pi_2 + a)$, for all $b \in K(x)$.

If a is such that $E\pi_2(\Pi_2+a, R) < \Pi_2+a$ it is easy to see from Equation (11) that there is some $x < \Pi_2 + a$ such that $K(x)$ is nonempty. Hence, when imposing the Grossman and Perry criterion, we must have

$$E\pi_2(\Pi_2 + a, \mathcal{R}) = \Pi_2 + a.$$

That is, we must have

$$\begin{aligned}\Pi_2 + a &= \Pr\{\tilde{b} + \Delta < y^* \mid \tilde{b} + \Delta \geq a\}\Pi_2 \\ &\quad + \Pr\{\tilde{b} + \Delta \geq y^* \mid \tilde{b} + \Delta \geq a\}F_2 \\ &= \begin{cases} \frac{y^*-a}{B+\Delta-a}\Pi_2 + \frac{B+\Delta-y^*}{B+\Delta-a}F_2 & \text{if } \Delta < a \\ \frac{y^*-\Delta}{B}\Pi_2 + \frac{B+\Delta-y^*}{B}F_2 & \text{if } \Delta \geq a. \end{cases}\end{aligned}$$

Thus if $\Delta \geq a$, we have

$$a = \frac{B - (y^* - \Delta)}{B} y^*,$$

which in turn implies that $B < y^*$.

If $\Delta < a$, we have, after some algebra,

$$a = B + \Delta - y^*,$$

which in turn implies that $B \geq y^*$. And we are done. ■

Proof of Lemma 3. Creditor 1 accepts a request $\Pi_2(V_L)+s$ if and only if $b + \Delta \geq s$. Thus, creditor 2's optimal side payment request solves

$$\max_s \Pr\{\tilde{b} + \Delta \geq s\}(\Pi_2(V_L) + s) + \Pr\{\tilde{b} + \Delta < s\}\Pi_2(V_L),$$

that is, it solves

$$\max_s \frac{B + \Delta - s}{B} s,$$

implying that $s = (B + \Delta)/2$. ■

Remark. This lemma implies that if receivership occurs regardless of the value of creditor 1's private benefits and the events of the workout stage do not contain information regarding these private benefits, creditor 2's optimal request in receivership is $\Pi_2(V_L) + (B + \Delta)/2$.

Proof of Lemma 4. It is straightforward that $\Pi_2 + a \leq x_2$: if C_2 can get at most x_2 in receivership, he accepts anything greater than x_2 out of receivership. Suppose now that $\Pi_2(V_L) + a < x_2$. This is equivalent

to a being strictly smaller than s. At the workout stage, C_1 thus offers

$$x(b) = \begin{cases} \Pi_2(V_L) + a & \text{if } b + \Delta \geq a \\ z(< \Pi_2(V_L)) & \text{otherwise.} \end{cases} \tag{12}$$

Accordingly, C_2 receives $\Pi_2(V_L)$ with certainty in receivership. But he can improve on this by setting a request s to solve

$$\max_s \Pr\{\tilde{b} + \Delta \geq s \mid \tilde{b} + \Delta < a\}(\Pi_2(V_L) + s) + \Pr\{\tilde{b} + \Delta < s \mid \tilde{b} + \Delta < a\}\Pi_2(V_L),$$

that is, to solve

$$\max_s \frac{a - s}{a - \Delta} s,$$

implying that $s = a/2$. But this contradicts the hypothesis that $a < s$. Thus we must have $a = s$.

Since $a \leq F_2$ (F_2 is the most creditor 2 can get by going to court), it follows that creditor 2 does not request more than the face value of his claims.[39]

Proof of Lemma 5. We begin by proving two lemmas. These address the question of what is the equilibrium in the subgame starting after creditor 2 has gone to court, conditional on creditor 1 never offering the required minimum acceptable offer at the workout stage. We have to consider both the case that $y^* < (B + \Delta)/2$ and the case that $y^* > (B + \Delta)/2$.

Lemma 6. *Suppose $y^* > (B + \Delta)/2$. If creditor 1 follows a strategy of never offering $\Pi_2(V_L) + a$, creditor 2 requests $\Pi_2(V_L) + (B + \Delta)/2$ in receivership.*

Proof of Lemma 6. By hypothesis, the relevant game to consider is the subgame starting with creditor 2 having gone to court. First we will show that $s \leq y^*$. Suppose, to the contrary, that $s > y^*$. Then creditor 1 follows to court if $b + \Delta < y^*$. But then it is no longer optimal for Creditor 2 to make a side payment request of $s > y^*$ in receivership. This is a contradiction. Next we will show that $s < y^*$. Suppose that $s = y^*$. If creditor 1 follows to court for a positive measure of $\tilde{b}$,

[39] That $F_2 \geq x_2$ can also be proven more directly as follows: Suppose $x_2 > F_2$, that is, $s > y^*$. It is clear that if creditor 2 goes to court, creditor 1 follows if and only if $b + \Delta < y^*$. Hence if the two creditors find themselves in receivership, it is common knowledge that $b + \Delta < y^*$. But then it is not sequentially rational for creditor 2 to request more than F_2. This contradicts the hypothesis and establishes that $x_2 \leq F_2$.

creditor 2 optimally requests $s < y^*$, which is a contradiction. Hence the set of b's for which creditor 1 follows to court must have measure 0. But then by Lemma 3, $s = (B+\Delta)/2$. By hypothesis, this is smaller than y^*. This contradicts that $s = y^*$. If $s < y^*$, creditor 1 follows to court for all b, and creditor 2's optimal side payment request is $(B + \Delta)/2$. ■

Lemma 7. *Suppose $y^* < (B + \Delta)/2$. If creditor 1 follows a strategy of never offering $\Pi_2(V_L) + a$, creditor 2 requests y^* in receivership.*

Proof of Lemma 7. By hypothesis, the relevant game to consider is the subgame starting with creditor 2 having gone to court. Similar to the proof of Lemma 6, $s > y^*$ leads to a contradiction. Suppose that $s < y^*$. Then creditor 1 follows to court with certainty. But then creditor 2's optimal request in receivership is $\Pi_2(V_L) + (B + \Delta)/2$, which is a contradiction. Thus we must have $s = y^*$. (The reader can verify that if creditor 1 follows if and only if $b + \Delta \geq 2y^*$, this would be consistent with $s = y^*$). ■

In the text preceding Lemma 5, we observed that if Φ is nonempty then $a = y^*$. This implies that in equilibrium, one of the following two items must hold.

1. Creditor 1 offers a for some b (Φ is nonempty) and $a = (s) = y^*$. In this case we must have $y^* \leq (B + \Delta)/2$. To see this, suppose $y^* > (B + \Delta)/2$ and $a = y^*$. Now creditor 2's equilibrium side payment request in receivership s is bounded above by what he would request if creditor 1's strategy is to never offer $\Pi_2(V_L) + y^*$ at the workout stage, which by Lemma 6 is $(B + \Delta)/2$. But this contradicts Lemma 4 which says that $s = a$. Thus, $a = y^*(= s)$ is only possible if $y^* < (B + \Delta)/2$. There are numerous equilibria in which creditor 1 offers y^* with positive probability. Their common denominator is that the probability that creditor 1 offers y^* at the workout stage or refrains from following creditor 2 to court is such that creditor 1's optimal request in receivership is also y^*.[40] Thus the outcomes of these equilibria in terms of the payoffs to the creditors and whether or not the firm is kept as a going concern are identical.

2. The trivial case that creditor 1 actually never offers $\Pi_2(V_L) + a$. If $y^* \geq (B + \Delta)/2$, we see from Lemma 6 that this implies $(a =)$ $s = (B + \Delta)/2$. If $y^* < (B + \Delta)/2$, Lemma 7 says that $(a =)s = y^*$. But as pointed out in the proof of the lemma, this would involve a positive probability of creditor 1 refraining from following to court.

[40] An example is

$$x(b) = \begin{cases} \Pi_2(V_L) + a & \text{if } b + \Delta \geq 2a \text{ and } a \leq (B + \Delta)/2 \\ z(< \Pi_2(V_L)) & \text{otherwise.} \end{cases}$$

The outcome of this equilibrium is identical to the outcome of the equilibrium described in the first item of this list (except that a workout always involves creditor 2 going to court).

This concludes the proof. ■

Appendix B: Numerical examples of inefficient liquidations

B.1 Pure liquidation code with side payments

This example illustrates how side payments (i.e., initial bargaining) can reduce the incidence of inefficient liquidations, although not necessarily eliminate them.

The same numbers as in Table 1 apply. Equal seniority is assumed. But b varies: $b = 9, 13, 17$, or 21, with equal probabilities.

From Table 1 the lower bound on what creditor 1 must offer creditor 2 to prevent him from going to court is 32. Anything in excess of 32 can be thought of as a side payment from creditor 1 to creditor 2. Given b, we determine the payoff to creditor 1 under going concern and under liquidation, assuming creditor 2 receives the lower bound payment, 32. Any positive difference between these two payoffs gives the maximum side payment.

Table 3 highlights the information contained in an offer by creditor 1 to creditor 2. For example, creditor 1 is only willing to make an offer in excess of 32 if $b \geq 13$. Hence an offer of say, 33, will not be accepted by creditor 2 because this offer tells creditor 2 that the private benefits of creditor 1 are either 13, 17, or 21, with equal probabilities. We will show that creditor 2's expected payoff from rejecting the offer of 33 and going to court is $34\frac{2}{3}$.

To see this, consider creditor 1's action if creditor 2 goes to court. Suppose first that $b = 13$. For creditor 1, not following creditor 2 to court is the same as making an offer of 40, that is, creditor 2 receives the full face value of his claims. However, from Table 3 we see that when $b = 13$, creditor 1 is not willing to offer more than 35. Thus creditor 1 will follow creditor 2 to court, and the latter receives 32. The outcome is the same if $b = 17$. However, when $b = 21$, creditor 1 is willing to offer 43 and will therefore not follow creditor 2 to court. In this case creditor 2 receives 40. Thus the expected payoff of creditor 2 from going to court after an offer of 33 is $34\frac{2}{3}$ $(= 2/3 \times 32 + 1/3 \times 40)$.

This implies that creditor 2 will always accept an offer of $34\frac{2}{3}$. This is the equilibrium offer if $b \geq 13$.[41] If $b = 9$, the equilibrium offer must be *less than* 32. The reason that the offer must be less than and

[41] It is possible for offers greater than $34\frac{2}{3}$ to be the equilibrium minimum acceptable offer. However, the supporting beliefs do not pass the Grossman and Perry criterion.

Table 3
Maximum side payment and equilibrium offers as a function of b

	$b = 9$	$b = 13$	$b = 17$	$b = 21$
Payoff to C_1 if going concern	47	51	55	59
	$(70 + 9 - 32)$	$(70 + 13 - 32)$	$(70 + 17 - 32)$	$(70 + 21 - 32)$
Payoff to C_1 if liquidated	48	48	48	48
	$(80 - 32)$	$(80 - 32)$	$(80 - 32)$	$(80 - 32)$
Maximum side payment	0	3	7	11
		$(51 - 48)$	$(55 - 48)$	$(59 - 48)$
Maximum offer by C_1 to C_2	32	35	39	43
		$(32 + 3)$	$(32 + 7)$	$(32 + 11)$
Equilibrium offer	*Less than* 32	$34\frac{2}{3}$	$34\frac{2}{3}$	$34\frac{2}{3}$

$V_L = 80$; $V_G = 70$; $F_1 = 60$; $F_2 = 40$; equal seniority.

The maximum side payment is calculated by taking the difference between what C_1 receives if the firm is a going concern (and C_2 receives the lower bound payment, 32) and what C_1 receives in liquidation. The maximum side payment is bounded below by 0.

not equal to 32 is that if creditor 1 follows a strategy of offering 32 when $b = 9$ and $34\frac{2}{3}$ otherwise then creditor 2 will accept an offer of 32. But then it is no longer optimal for creditor 1 to offer $34\frac{2}{3}$ when $b \geq 13$ since creditor 2 cannot distinguish between an offer of 32 based on high or low private benefit. The offer of less than 32 will always be rejected by creditor 2 and can be interpreted as creditor 1 not even trying to make an offer to creditor 2.

We can see from Table 3 that the equilibrium minimum acceptable offer of creditor 2—$34\frac{2}{3}$—is less than creditor 1's maximum offer when $b \geq 13$. Therefore the firm is maintained as a going concern in all those states. We saw in Table 1 that without side payments when $b = 13$ and the creditors were equally senior the firm would be inefficiently liquidated.[42]

[42] By changing the probability distribution of $\tilde{b}$ it is possible to construct an example where side payments cannot keep the firm from being liquidated when $b = 13$. Suppose that the probability of $b = 21$ is .7 and the other three states have equal probabilities. Again, an offer of more than 33 tells creditor 2 that $b \geq 13$. The probability that $b = 13$ is 1/9, the probability that $b = 17$ is also 1/9, and the probability that $b = 21$ is 7/9. Thus the expected payoff to creditor 2 from going to court is 38.22 ($2/9 \times 32 + 7/9 \times 40$). Since creditor 1 is willing to offer a maximum of 35 if $b = 13$, creditor 2 thus rejects anything less than or equal to 35. Hence, the minimum acceptable offer is 39 because an offer between 35 and 39 will only be made if $b \geq 17$; and if b is known to be be 17 or 21 with probabilities 1/8 and 7/8, respectively, creditor 2 will not accept anything less than 39. He is indifferent between rejecting or accepting an offer of 39 ($1/8 \times 32 + 7/8 \times 40 = 39$). Thus, for $b = 13$, the outcome is the same as in a game with no side payments (as illustrated in Table 1).

B.2 Receivership, creditor 2 appointor, $V_L > V_G$

This example illustrates that receivership can lead to a higher incidence of inefficient liquidations than a pure liquidation code. For the purposes of comparison we use the same numbers in this example as above. The equilibrium in this example has the following characteristics: the minimum acceptable offer at the workout stage is 39, but it is never offered; creditor 2's request in receivership is also 39, and it is accepted if and only if $b \geq 17$. If $b = 13$ there is thus an inefficient liquidation. This is in sharp contrast to the efficient outcome achieved under the pure liquidation code.

Let us first assume that creditor 2 knows b. If $b = 9$, creditor 1 will wait or liquidate for any request larger than 32. This implies that creditor 1 receives 48 and creditor 2 receives 32. If $b = 13$, creditor 2 requests 35, leaving creditor 1 with 48, the same amount that he would receive in a liquidation. If $b = 17$, creditor 2 requests 39, again leaving creditor 1 with 48. If $b = 21$, creditor 2 requests 43, leaving creditor 1 with 48. It follows that when creditor 2 does not know b, his optimal request is 35, 39, or 43.

If creditor 2 requests 43, his expected payoff is

$$\frac{1}{4} \times 43 + \frac{3}{4} \times 32 = 34\frac{3}{4}.$$

Similarly, if creditor 2 requests 39, his expected payoff is $35\frac{1}{2}$. And if he requests 35, his expected payoff is $34\frac{1}{4}$. Thus, the optimal request by creditor 2 is 39. As a result, if $b = 13$, creditor 1 rejects creditor 2's request of 39 and there is an inefficient liquidation. We show next that this inefficiency will not be resolved by adding the workout stage.

We first show that the minimum acceptable offer at the workout stage is 39. Suppose to the contrary that 35 is acceptable. Then creditor 1 offers 35 whenever $b \geq 13$. But then creditor 2's expected payoff from rejecting 35 is $2/3 \times 39 + 1/3 \times 32 = 36\frac{2}{3}$, contradicting that 35 is acceptable. This is obtained from the following argument.

Suppose that if creditor 2 deviates by going to court if creditor 1 offers 35, creditor 1 always follows. Receivership results, and a similar calculation to that above shows that creditor 2's optimal request is 39.[43] This confirms the conjecture that creditor 1 will follow to court regardless of the value of b, since by following to court he pays at most 39 as compared to 40 by not following to court. In conclusion, if creditor 1 offers 35 at the workout stage (because this presumably

[43] The optimal request is 35 if $b = 13$, 39 if $b = 17$, and 43 if $b = 21$. However, creditor 2 only knows that b is 13, 17, or 21, with equal probabilities. If creditor 2 requests 39, his expected payoff is $36\frac{2}{3}$. If he requests 43 his expected payoff is $35\frac{2}{3}$. Therefore, he will ask for 39.

is acceptable to creditor 2), then creditor 2 can improve his expected payoff by going to court. He will collect 39 if $b = 17$ or 21, and 32 if $b = 13$.

The above illustrates that 35 cannot be the minimum acceptable offer at the workout stage. Anything between 35 and 39 also cannot be the minimum acceptable offer. Suppose, for example, that 38 is acceptable. An offer of 38 tells creditor 2 that b is either 17 or 21. In this case, creditor 2 knows that he can extract at least 39 from creditor 1 by going to court. If creditor 1 follows creditor 2 to court, whether $b = 17$ or 21, creditor 2's optimal request in receivership is 39. The alternative request, 43, yields an expected payoff of $\frac{1}{2} \times 32 + \frac{1}{2} \times 43 = 37.5$. This shows that it is in fact optimal for creditor 1 *not* to follow creditor 2 to court if b is known to be 17 or 21, with equal probabilities. It also implies that the minimum acceptable offer at the workout stage must be at least 39. Since the most creditor 2 can obtain by rejecting an offer of 39 at the workout stage is 39 in receivership, we conclude that 39 is the minimum acceptable offer.

Although creditor 1 can afford to offer 39 if $b = 17$ or 21, he will not do so. For if he did, creditor 2 would know that if the firm entered receivership, b would be equal to 9 or 13. In that case, his optimal request would be 35, and it would no longer be optimal for creditor 1 to offer 39 at the workout stage for $b = 17$ or 21. In equilibrium, creditor 1 never offers 39 at the workout stage. No information about creditor 1's private benefits are transmitted during the workout stage, and creditor 2's request in receivership is 39. Notice that this is equivalent to the minimum acceptable offer at the workout stage. This is not a coincidence; Lemma 4 states that it is a necessary condition in equilibrium.

Appendix C: New Financing in Receivership when Creditor 1 is the Appointor

We retain the three-date model studied in Section 4.3. As before, we start the analysis by examining creditor 1's decision whether to liquidate the firm or keep it as a going concern after negotiations with creditor 2 have broken down (i.e., creditor 2 has rejected creditor 1's offer and decided to *wait*). Analogous to the analysis in Section 4.3, if creditor 1 keeps the firm as a going concern, there is a wealth transfer to creditor 2 equaling

$$T = .5(\Pi_2(V_G + k) - \Pi_2(V_G)). \tag{13}$$

On the other hand, by keeping the firm as a going concern, creditor 1 preserves his private benefits. Hence, creditor 1 will keep the firm

as a going concern if and only if

$$\Pi_1(V_G) - T + b \geq \Pi_1(V_L). \tag{14}$$

Because of the uncertainty about b, from creditor 2's point of view it may be uncertain whether creditor 1 will liquidate. As a result, there may be inefficient liquidations. However, if it is certain what creditor 1 will do, there will be no inefficiencies.

Below we will focus on the case that it is uncertain whether creditor 1 liquidates. This is the case if

$$\Pi_1(V_G) - T < \Pi_1(V_L) < \Pi_1(V_G) - T + B. \tag{15}$$

There are two cases:

C.1 Case 1: Creditor 2 prefers liquidation to a going concern

This is the case if $\Pi_2(V_L) > \Pi_2(V_G) + T$. This can occur only if $V_L > V_G$. Now creditor 2 would do better by forcing liquidation of the firm than by choosing to *wait*. Hence, creditor 2 would always accept an offer of $\Pi_2(V_L)$. There are no inefficient liquidations.

C.2 Case 2: Creditor 2 prefers a going concern to liquidation

This is the case if $\Pi_2(V_G) + T > \Pi_2(V_L)$. Now if creditor 2 receives what he deems an inadequate offer in receivership, he prefers waiting and allowing creditor 1, the appointor, to decide what to do with the firm rather than forcing liquidation. As mentioned above, creditor 1 will keep the firm as a going concern if and only if Equation (14) is satisfied. This is uncertain from creditor 2's point of view. The question is how this uncertainty affects creditor 1's offer to buy out creditor 2 within receivership and at the workout stage.

Recall that at the workout stage, creditor 1 does not need to offer more than F_2 to keep creditor 2 from going to court. This is what creditor 2 would collect by going to court if creditor 1 did not follow. But in receivership under the situation currently considered, creditor 1 need not offer more than

$$\Pi_2(V_G) + T = .5(\Pi_2(V_G + k) + \Pi_2(V_G)) \leq F_2. \tag{16}$$

Thus if creditor 2 goes to court at the workout stage, creditor 1 would follow.

The game within receivership in the current case parallels the game in Section 3 where we studied workouts under the pure liquidation code. If creditor 2 *waits*, he receives $\Pi_2(V_L)$ if creditor 1 liquidates and $\Pi_2(V_G) + T$ if creditor 1 keeps the firm as a going concern, where T is defined by Equation (13). Thus, the action *wait* is analogous to the action by creditor 2 to go to court in the workout game in Section

3. A decision by creditor 1 to liquidate is analogous to the decision in Section 3 to follow to court. A decision by creditor 1 to keep the firm as a going concern despite the wealth transfer to creditor 2 is analogous to the decision in section 3 not to follow to court despite paying an implicit side payment of y^* to creditor 2. Essentially, in the current case, attaching receivership to the workout game is equivalent to adding a second workout round to the game played in Section 3; that is, to allow creditor 1 to make another offer to creditor 2 when creditor 2 goes to court, thereby disallowing creditor 2 to jump the queue of absolute priority. In this second round of play, creditor 2 can once more take an action that forces creditor 1 to make an implicit side payment to creditor 2 if the firm is to be kept as a going concern; alternatively, creditor 1 can liquidate the firm. Since the creditors do not discount delayed agreements in our model, the first round of play will not affect equilibrium allocations. Put another way, since there is no incentive for creditor 1 to reveal that he has relatively high private benefits at the workout stage, and since creditor 1 cannot credibly communicate that he has low private benefits at the workout stage, we conclude (1) the minimum acceptable offers must be equal at the workout stage and in receivership, and (2) the minimum acceptable offer in receivership is the same as if there were no workout stage. This parallels the results derived in Section 4.2.

To allow us to use the analysis of Section 3 in the current situation, it is useful to define

$$y^T \equiv T + \Pi_2(V_G) - \Pi_2(V_L), \tag{17}$$

where T is as defined in Equation (13). Thus $\Pi_2(V_L) + y^T$ is the maximum creditor 1 needs to offer creditor 2. In other words, y^T is the maximum side payment creditor 1 needs to offer creditor 2 if the game proceeds to receivership.[44] To complete the parallel with the analysis in Section 3, we can rewrite the condition [Equation (15)] under which creditor 1's reply is uncertain when creditor 2 *waits* as

$$\Delta < y^T < B + \Delta.$$

By the same argument as in Section 3, we have the following result.

Theorem 4. *Suppose case 2 holds so that (i) it is uncertain whether creditor 1 will liquidate the firm when creditor 2 waits, and (ii) creditor 2 prefers to wait rather than to force liquidation. Let a denote the minimum acceptable side payment at the workout stage and in*

[44] As always in this article we define a side payment to creditor 2 to be an amount beyond creditor 2's liquidation payoff, $\Pi_2(V_L)$.

receivership. If $y^T \leq (B+\Delta)/s$ *then* $a = y^T$. *If* $y^T > (B+\Delta)/2$ *then*

$$a = \begin{cases} \frac{B-(y^T-\Delta)}{B} y^T & \text{if } y^T \geq B \\ B + \Delta - y^T & \text{if } y^T < B. \end{cases}$$

This theorem parallels Lemma 1, with y^T in place of y^*. It is an important question whether there are more inefficient liquidations in the current scenario than under the pure liquidation code. Recall that $y^* \equiv F_2 - \Pi_2(V_L)$. It follows directly from Equations (16) and (17) that $y^T \leq y^*$. Refer now to Figure 2. By Theorem 4, this figure also applies with y^T on the x-axis. Thus, if $y^* < (B+\Delta)/2$, it follows that receivership, when new financing is required, reduces inefficient liquidations relative to the pure liquidation code. If $(B+\Delta)/2 < y^T$, receivership, when new financing is required, increases inefficient liquidations relative to the pure liquidation. If $y^T < (B+\Delta)/2 < y^*$, it is ambiguous whether receivership increases or decreases inefficient liquidations. To summarize: if creditor 2 is relatively senior and/or small, receivership improves on the pure liquidation code. But if creditor 2 is relatively junior/large, receivership may be worse. Both of these conclusions derive from the fact that receivership reduces the maximum side payment, that is, the maximum amount that creditor 2 can obtain above and beyond his liquidation payoff. When this amount is relatively small, receivership makes it easier to pay off creditor 2. However, when this amount is large, receivership increases the credibility of creditor 2's threat to take actions which will lead to the liquidation of the firm and the loss of creditor 1's private benefits.

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