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## Protection for Whom? Creditor Conflicts in Bankruptcy

by Stanley D. Longhofer and
Stephen R. Peters

**FEDERAL RESERVE BANK OF CLEVELAND**

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In this article we provide a rationale for bankruptcy law that is based on the conflicts among creditors that occur when a debtor's liabilities exceed its assets. In the absence of a bankruptcy law, the private debt-collection remedies that creditors pursue when a debtor is insolvent result in an ad hoc disposal of the debtor's assets, thereby reducing the aggregate value of creditors' claims. We show that coordination clauses can be used by creditors in their loan agreements that will result in coordination, ex post. Although all creditors would benefit from including these clauses in their contracts, they nevertheless choose not to in precisely those circumstances in which it is desirable to coordinate. This is an important insight because previous theories supporting a role for bankruptcy law are based on the notion that creditors want to contract about bankruptcy, but cannot. In contract, we demonstrate that creditors will *choose* not to coordinate ex ante, even though it is in their best interest ex post.

We also examine a variety of other contractual mechanisms, including covenants and seniority, and show that although including these terms in loan contracts can improve creditors' incentives to write coordination clauses, they do so only in special circumstances. Our analysis of creditor conflicts and the potential for private contracting remedies provides an economic rationale for the existence of a bankruptcy law that mandates ex post coordination among the creditors of an insolvent debtor.

# PROTECTION FOR WHOM?
# CREDITOR CONFLICTS IN BANKRUPTCY[*]

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## ABSTRACT

In this article we provide a rationale for bankruptcy law that is based on the conflicts among creditors that occur when a debtor's liabilities exceed its assets. In the absence of a bankruptcy law, the private debt-collection remedies that creditors pursue when a debtor is insolvent result in an ad hoc disposal of the debtor's assets, thereby reducing the aggregate value of creditors' claims.  We show that coordination clauses can be used by creditors in their loan agreements that will result in coordination, ex post.  Although all creditors would benefit from including these clauses in their contracts, they nevertheless choose not to in precisely those circumstances in which it is desirable to coordinate.  This is an important insight because previous theories supporting a role for a bankruptcy law are based on the notion that creditors want to contract about bankruptcy, but cannot.  In contrast, we demonstrate that creditors will *choose* not to coordinate ex ante, even though it is in their best interest ex post.

We also examine a variety of other contractual mechanisms, including covenants and seniority, and show that although including these terms in loan contracts can improve creditors' incentives to write coordination clauses, they do so only in special circumstances.  Our analysis of creditor conflicts and the potential for private contracting remedies provides an economic rationale for the existence of a bankruptcy law that mandates ex post coordination among the creditors of an insolvent debtor.

# 1. Introduction

Why do bankruptcy laws exist? Certainly, a fundamental role of government in any society is to provide an effective mechanism for enforcing contracts. Consequently, civil courts regularly interpret and enforce a wide variety of private contracts, including labor contracts, loan agreements, leasing agreements, and other performance contracts. Yet, most developed countries have special laws, with their own court systems, to resolve defaults on financial contracts.

In this paper we show that in the absence of a bankruptcy law, the ex post conflicts that arise among creditors create a social welfare loss because these conflicts result in an inefficient liquidation of the debtor's assets. Creditors can write "coordination clauses" in their contracts ex ante to avoid these conflicts, and doing so results in the first-best outcome. Nevertheless, we show that creditors (and their debtor) will *choose not* to write such contracts in precisely the circumstances in which they are welfare improving. We then demonstrate that contractual devices such as covenants, seniority, and collateral are incapable of resolving these conflicts in all circumstances. Furthermore, even when these contractual remedies do resolve these creditor conflicts, they inflict their own externalities such as monitoring costs or risk shifting. We argue that the unwillingness of creditors to privately contract about bankruptcy suggests a welfare-improving role for a bankruptcy law that mandates ex post coordination among the creditors of an insolvent firm.

The recognition of ex post creditor conflicts in our analysis is certainly not novel. Legal scholars have argued that the existence of bankruptcy law is a response to the common pool problem:[2]

> The basic problem that bankruptcy law is designed to handle, both as a normative matter and as a positive matter, is that the system of individual creditor remedies may be bad for the creditors as a group when there are not enough assets to go around. (Jackson, 1988, p. 10)

In other words, it would generally be socially desirable for creditors to coordinate their debt-collection activities, thereby increasing "the size of the pie" to be distributed. Nevertheless, once

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[2] See also Picker (1992), Posner (1986), and White (1990).

the firm has reached insolvency, a creditor's most profitable course of action is to stake a claim on a portion of the debtor's assets that is sufficiently large to make him whole. The resulting first-come, first-served ordering of creditors' claims leads to significant losses because the debtor's assets are liquidated in an ad hoc manner in order to satisfy individual creditor's claims.[3] This externality is the essence of the common pool problem.[4]

On its own, however, this justification for bankruptcy law is incomplete because it does not explain why creditors fail to write contracts ex ante that effect a coordinated liquidation. Legal scholars have recognized this and argue that creditors would write these contracts ex ante, but that they are unable to do so.[5] For example, Posner (1986) writes:

> All of these problems [ex post creditor conflicts] can be solved, in principle, by transactions among the creditors; but if there are many creditors, the costs of these transactions may well be prohibitive. The alternative is bankruptcy… (p. 376)

Creditors do, however, write extensive covenants into their loan agreements that protect them from the actions of other creditors. Furthermore, creditors often work together in making loans to a single firm, making their contracts contingent on one another. Thus, it is important to investigate if there are conditions under which creditors will contract about bankruptcy ex ante, and if creditors do not write such contracts, to understand why they do not. These questions are central to our analysis.

We analyze a model in which creditors can write enforceable coordination clauses in their loan agreements that commit themselves to coordinate ex post. Despite that fact that we

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[3] The optimality of this strategy follows from its legality. See Baird (1983) for a general discussion of this type of "grab law."

[4] The common pool problem is most typically illustrated in the context of share cropping and is familiar to economists as an example of a prisoners' dilemma. Jackson (1988) describes it as it relates to harvesting fish from a pond. A sole owner of the pond (ostensibly a sole owner of the rights to fish the pond) may choose to harvest, say, half of the fish each season to ensure the perpetuation of the crop and an annual cash flow, instead of harvesting all of the fish (and all of the cash flow) this season and none in the future. However, if there were 1000 individuals with rights to fish the pond, a collective (coordinated) harvest of half of the fish population each season is difficult to obtain. The reason is that it is privately optimal for an individual to harvest slightly more than $1/2000^{th}$ of the fish population this season (we are assuming equal ownership rights) because it brings him a bigger profit and would have a negligible impact on next year's fish population. This strategy is optimal for every individual, and so the entire fish population is extinguished with dispatch.

[5] Schwartz (1997b) summarizes three factors that limit creditors' *abilities* to contract about bankruptcy: i) multiple creditors, ii) sequentially contracting creditors, and iii) heterogeneous creditor preferences. His analysis presumes that creditors would want to coordinate.

assume that there are no costs to writing these contracts, creditors will choose not to include these clauses in precisely those circumstances in which they will be needed to resolve an ex post coordination problem. As a result, a mandatory bankruptcy system that forces creditors to coordinate their liquidation activities can be welfare improving.

The root cause of this incentive problem is a time-inconsistency problem induced by the sequential nature of a debtor's contracts with creditors. At the time a creditor contracts with a debtor an existing creditor's contract is already fixed, which encourages its exploitation by the subsequent creditor and the debtor. If the subsequent creditor is better off taking his chances by running the firm than it is sharing the debtor's assets in a coordinated liquidation, then it will charge a lower interest rate. This lower loan interest rate also means that the firm will have no incentive to encourage the second creditor to coordinate liquidation.

We also show that while contract terms such as covenants, seniority, or collateral can penetrate the time-inconsistency problem by increasing creditors' incentives to write coordination clauses in their contracts, such contract terms are themselves costly to enforce. As a result, they will be used to resolve ex post coordination problems only in special cases.

Although our model provides an economic rationale for the existence of mandatory bankruptcy institutions, it is important to keep in mind that it has little to say about the specific structure of bankruptcy law in the United States or other developed countries. "Bankruptcy" in the context of our model simply requires that all creditors coordinate their activities to liquidate or otherwise dispose of the firm's assets.[6] Thus, our model provides support for a basic bankruptcy system that imposes some type of an automatic stay on creditors—preventing them from pursuing private remedies outside of the collective procedure—and incorporates preference law provisions—preventing some creditors from being paid off by a debtor on the eve of bankruptcy, which would allow them to effectively opt out of the collective process.

Legal scholars have previously analyzed the question of whether creditors might contract about default resolution ex ante, thereby eliminating the need for a special bankruptcy law. For

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[6] Note that this may entail selling the firm as a going concern or allowing it to continue under existing management. The key feature is that creditors are prevented from unilaterally foreclosing on the firm's assets.

example, Adler (1993) argues that a hypothetical contracting arrangement that he labels "chameleon equity" would obviate the need for a bankruptcy law that imposes large costs through ex post asset valuation and distribution efforts.[7] Schwartz (1997a, 1997b) also illustrates the ability of private contracting to achieve ex post coordination among creditors.[8]

The arguments in Adler (1993, 1994, 1997) and in Schwartz (1997a, 1997b), however, rest on the *assumption* that creditors desire a coordinated liquidation, and therefore, would choose to write the necessary contracts if the direct contracting costs were low enough. This assumption loses sight of the fact that the common pool problem that bankruptcy solves arises precisely because creditors *do not have the incentive to coordinate their liquidation activities*. Our analysis illustrates the strict conditions under which creditors will choose to write contracts that effect coordination, and what those contracts look like.

According to our analysis, a bankruptcy law is socially desirable not because it protects debtors from creditors or creditors from debtors, but rather because *it protects creditors from one another*. To our knowledge, this conclusion is novel in the economics literature. Although other authors have looked at the conflicts that can arise among creditors during bankruptcy, none have used these conflicts as an explanation for why bankruptcy law exists in the first place.

For example, Bulow and Shoven (1978), White (1980), and Gertner and Scharfstein (1991) argue that when a firm is in financial distress, its equity holders and its bank-debt holders have an incentive to restructure their contract to expropriate value from senior public debt

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[7] See also Adler (1994, 1997). Chameleon equity is prioritized equity with common equity holders at the bottom of the priority chain, and preferred equity holders with fixed claims situated in higher priority classes. Firms would issue no traditional debt. "If a firm were to become insolvent, and default on its obligations the common equity class would vanish as would the fixed claims of the next lowest investor class, which would then become the new common equity class." (p. 312)

While there are several conceptual difficulties with this particular contracting mechanism, we concur with such a contract's ability to resolve creditor conflicts. After all, if the firm has no debt, then there will be no creditors with conflicting interests, and, thus, no need for a bankruptcy law. In fact, the chameleon equity contract assumes away the ex post coordination problem, and, thus, the need for a bankruptcy law ("no investor would have the right individually to collect a fixed obligation from the firm." [p. 312]) .

[8] Schwartz (1997a) argues for removing current legal restrictions on a firm's ability to choose, ex ante, its preferred bankruptcy procedure. He shows that under some conditions, firms and their creditors will contract about bankruptcy efficiently ex ante, provided they have a carefully chosen menu of bankruptcy options. In a similar vein, Schwartz (1997b) shows that if financial covenants were enforceable ex post, then an appropriate priority structure would result in an optimal liquidation procedure in the absence of bankruptcy law. He uses this result to argue in favor of making financial covenants in loan agreements binding on subsequent loan agreements.

holders.[9] Franks and Nyborg (1996) argue that conflicting incentives among creditors can arise because of their different private control rights, leading to inefficient ex post liquidations. Unlike our analysis, however, none of these analyses consider the initial pricing of debt claims nor do they explain why private agreements established ex ante cannot solve these conflicts without a special bankruptcy law.

Differences in creditor incentives can also explain why firms borrow from multiple investors (Bolton and Scharfstein, 1996; Green and Juster, 1994), the maturity and seniority attributes of a firm's capital structure (Diamond 1991, 1993), and creditor monitoring incentives (Rajan and Winton, 1995). However, none of these authors analyze how conflicts between creditors can explain the existence of a bankruptcy law

Brown (1989) is perhaps closet in spirit to our model, in that he attempts to explain why bankruptcy law can be beneficial. He assumes that the firm is financially distressed but economically viable (i.e., the debtor is solvent, which means there is no common pool problem) so that restructuring its debt is socially desirable, and then models the Chapter 11 reorganization process. He shows how its structure mitigates holdout problems among a firm's debt holders, thus allowing reorganization to occur. However, he does not attempt to explain why the firm and its creditors do not privately agree to this structure on their own, eliminating the need for a special law.

In the next section, we discuss the role of bankruptcy law with a particular emphasis on how an insolvent firm's assets would be divided in the absence of such a law. Using this background, in section 3 we develop a model of financial contracting in which creditors choose not to write simple coordination clauses in their contracts despite the fact that doing so is Pareto improving. In section 4 we show that covenants can offer a solution to this coordination problem, but only in special cases, and only at a cost. We also examine the impact of priority on coordination incentives and show that either seniority or collateral can effect coordination, but, as with covenants, only in special cases and only at a cost. As a result, mandatory bankruptcy

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[9] See also Mooradian (1994).

laws Pareto dominate any of these private contracting alternatives. Section 5 concludes, while proofs of all results can be found in the Appendix.

## 2. A World without Bankruptcy

The task we have set for ourselves in this paper is a tricky one. In order to examine whether or not creditors would coordinate their liquidation activities on their own, it is necessary to imagine a world in which bankruptcy law does not exit. Doing this requires precisely describing what rights creditors have in the remaining legal environment. That is, in the absence of bankruptcy law what legal rights do creditors have when a debtor defaults on its obligations?

In considering this question, we note that debt collection regularly takes place outside the realm of bankruptcy, even in the current legal environment. When a debtor defaults on its obligations, its creditors may file suit in civil courts in order to obtain repayment. Whether it be by granting the creditor claim to some of the debtor's assets or garnishing the debtor's wages, the civil court effectively acts to enforce the private debt agreement. The important point to note is that all such debt-collection activities take place outside the realm of bankruptcy law. Indeed, it is often to avoid or postpone such judgments that debtors file for bankruptcy.

If a firm has only one creditor, this private action is the end of the story. When a firm has multiple creditors, however, this private debt-collection process develops into a "first-come, first-served" feast on the firm. In other words, the first creditor to take action against the firm will be the first to obtain relief; later creditors will gain possession of whatever assets remain, if any. In essence, when the firm becomes insolvent each creditor is on its own to collect what it is owed, and cares little how its actions might affect the firm's other creditors.

It is this conflict between creditors that gives rise to the need for a separate bankruptcy law.

> The grab rules of non-bankruptcy law and their allocation of assets on the basis of first-come, first-served create an incentive on the part of individual creditors, when they sense that a debtor may have more liabilities than assets, to get in line today (by, for example getting a sheriff to execute on the debtors equipment), because if they do not, they run the risk of getting nothing. This decision by numerous individual creditors, however, may be the wrong decision for the

creditors as a group. Even though the debtor is insolvent, they might be better off if they held the assets together. Bankruptcy provides a way to make these diverse individuals act as one by imposing a *collective* and *compulsory* proceeding on them. (Jackson, 1988, pp.12-13)

In the next section, we build a formal model of lending and default consistent with this non-bankruptcy debt-collection process. If the firm is able to repay its creditors, it does so and keeps the balance of its assets. If the firm is insolvent, however, each creditor has the opportunity to pursue private debt-collection activities. In the absence of collective action, the first creditor to observe that the firm is insolvent becomes the first to request repayment and receives the lion's share of the firm's assets; the other creditor receives only what is left after paying off the first creditor.

Against this backdrop, we show that a mandatory collective bankruptcy procedure can be welfare improving. In particular, we demonstrate that even though creditors are able to write contracts that pre-commit themselves to coordinate liquidation, they will often choose not to do so. In contrast, bankruptcy law avoids these costs of inefficiently distributing the firm's assets, by ensuring that all creditors coordinate their liquidation activities.

## 3. A Model of Creditor Conflict

### A. The Structure of the Model

We employ a two-period model in which a firm contracts with two creditors. Creditors contract with the firm sequentially at time 0. We assume that there are no contracting costs. This allows the model to focus more sharply on creditors' *incentives* to coordinate, rather than their ability to do so. Creditor *i*, where $i \in \{A, B\}$, lends the firm $L_i$ dollars in return for $R_i$ to be paid from the firm's cash flow, $\tilde{v}$, in period 2. Both the firm and its creditors behave as if they were risk neutral, and all act as profit maximizers. We assume the lending market is perfectly competitive; all social surplus accrues to the firm as profit, denoted by $\pi$. Information about $\tilde{v}$ is symmetric but incomplete. At the time of initial contracting, both the debtor and its creditors know that $\tilde{v} = v_H$ with probability *q*; with probability (1 − *q*), $\tilde{v} = v_L$, where $v_H > v_L > 0$. During the life of the outstanding credit, creditors receive new information about the precise

value of $\tilde{v}$.[10] We designate this point as time $t = 1$. The sequence in which creditors receive this information is potentially very important. Let $p_i$ be the probability that creditor $i$ learns $\tilde{v}$ first, where $p_A + p_B = 1$. The order of events in our model is depicted in Figure 1.

Conditional upon observing the realization of $\tilde{v}$ at $t = 1$, a creditor may choose to allow the debtor to continue or it may initiate a liquidation.[11] We assume that the parameters of the model are such that both creditors will want to liquidate the firm early (i.e., at $t = 1$) whenever $\tilde{v} = v_L$ but not when $\tilde{v} = v_H$. Sufficient conditions for this to be true are $v_H \geq R_A + R_B$ and $v_L < L_A + L_B$; when $\tilde{v} = v_L$, the firm is insolvent.

In a liquidation, creditor $i$ has two options. Either it can either "run the firm," unilaterally staking a claim equal to $L_i$ on the debtor's assets, or it can coordinate its liquidation activities with the other creditor. When creditors coordinate the liquidation of the firm, it can be sold for its entire net present value, $v_L$, and each creditor receives a pro rata share of the proceeds (unless their contracts call for an alternative prioritization of claims). Define $\theta_i = L_i / (L_A + L_B)$ as lender $i$'s claim on the firm's assets when they coordinate and share pro-rata, and note that $\theta_A + \theta_B = 1$.[12] Thus, if creditors coordinate, creditor $i$ receives $\theta_i v_L$ in a liquidation.

In contrast, when creditors unilaterally run the firm, the debtor's assets are liquidated in an ad hoc manner, which may prevent them from being deployed at their highest-valued use. For example, certain combinations of the debtor's assets may fetch higher valuations than others: Custom-designed manufacturing equipment may be sold at a higher price as a unit than if each piece is sold separately. Similarly, the order in which assets are sold can impact their value: The execution of a creditor's claim on a debtor's warehouse may force its contents to be sold at fire-sale prices; machine tools or production equipment might be prematurely sold to meet an individual creditor's claim, leaving for the rest of the claimants poorly functioning machinery or inventories of partially completed products.

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[10] More generally, one could imagine that the creditors learn the *expected* value of the firm's cash flows, as in Diamond (1993).

[11] Although we refer to this as "liquidating" the firm, it is entirely possible that the best use of these assets is to sell them as a whole to new owners. Liquidation of the assets in our model refers only to their removal from the control of the firm's original owners to be redeployed at their highest-valued use. Such use may be either a piecemeal liquidation or a "restructuring."

[12] This assumes that there is no accrued interest between $t = 0$ and $t = 1$.

To model this problem, we assume a fixed fraction $c$ of the firm's value is destroyed when creditors do not coordinate liquidation. This cost simply measures the externality created by the ad hoc liquidation of the debtor's assets. If creditor $i$ is the first to observe $\tilde{v} = v_L$, he will receive $\min\{v_L(1-c), L_i\}$ if he runs the firm, while the other creditor receives the residual, $\max\{v_L(1-c) - L_i, 0\}$.

Because the lending market is assumed to be perfectly competitive, social welfare is measured by firm profit:

$$\pi = q(v_H - R_A - R_B). \tag{1}$$

Thus, social welfare is maximized by whichever contractual arrangements minimize the total face value of the firm's debt, $R_A + R_B$.

Given this structure, we can state the first-best outcome that obtains when both creditors coordinate their liquidation activities. In this case, the lenders' zero profit conditions are

$$qR_i + (1-q)\theta_i v_L = L_i, \quad i = A, B. \tag{2}$$

Solving this expression gives us

$$R_i^* = \frac{L_i - (1-q)\theta_i v_L}{q}, \quad i = A, B, \tag{3}$$

implying

$$\pi^* = qv_H + (1-q)v_L - L_A - L_B, \tag{4}$$

where "stars" indicate the first-best equilibrium values.

## B. The Ex Post Coordination Problem

Once the firm is insolvent, both creditors will prefer running the firm as long as the deadweight cost of an inefficient liquidation is not too high. To see this, note that upon observing $\tilde{v} = v_L$ creditor $i$ will run the firm as long as its payoff from doing so exceeds that from coordinating with the other creditor:

$$\min\{v_L(1-c), L_i\} > \theta_i v_L. \tag{5}$$

This gives us:

RESULT 1: *Once the firm is insolvent, each creditor prefers to run the firm if and only if the*

*deadweight cost of doing so is smaller than the fraction of the firm's assets owed to the other creditor; i.e., if $c < \theta_{-i}$.*

This result is simply a formalization of the point made by legal scholars that creditors will often make inefficient decisions once the firm is in financial distress. When deciding whether to run the firm, a creditor compares the costs associated with inefficient liquidation, $cv_L$, with the amount it will loose to the other creditor if it coordinates liquidation, $\theta_{-i}v_L$.

Given that running the firm entails the deadweight cost $cv_L$, both the debtor and its creditors would benefit from writing contracts that effect coordination. However, we show next that coordination is achieved ex ante only when it is unnecessary—that is, only when creditors would coordinate ex post anyway.

### C. The Ex Ante Coordination Problem

Recall that creditors write their contracts sequentially in period 0, and are thus unable to write contracts directly with one another. Nevertheless, creditors are able to write conditions into their loan agreements that allow them to make to commitments to each other. In particular, each creditor can include an enforceable "coordination clause" in its loan agreement mandating that, in the event of insolvency, it will coordinate any liquidation actions with the other creditor.[13] It is important to note that such a clause does not force the other creditor to coordinate as well.[14] Rather, it merely commits the creditor using the clause to coordinate should it be the first to observe $\tilde{v} = v_L$.

Without loss of generality, let creditor *A* be the first to contract with the firm. Because the loan market is perfectly competitive, creditor *A* will include any loan terms (such as a coordination clause) that lower the interest rate it must charge to earn zero expected profits. Thus, in writing its own contract *A* must anticipate the terms that will be included in *B*'s contract, including the possibility that *B* will not write a coordination clause. To determine the terms of

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[13] More specifically, we assume that by incorporating a coordination clause into its contract, a creditor commits itself to paying other creditors their pro rata share of any proceeds it receives from a unilateral liquidation of the firm. As a result, any creditor incorporating such a clause into its contract will have an incentive to ensure that the firm is liquidated in the most efficient manner possible.

[14] A coordination clause requiring coordination (or requiring anything else, including subordination) by subsequent creditors is not enforceable under U.S. law. We discuss this further below.

*A*'s contract, we must first analyze *B*'s.

The question to address is whether or not a coordination clause will be included in creditor *B*'s loan contract.  Because the terms of *A*'s contract are fixed by the time the second contract is written, competition causes creditor *B* and the firm that reaps the rewards of that competition to have less incentive to coordinate.

PROPOSITION 1:  *The second creditor will write a coordination clause if and only if $c \geq \theta_A$.*

This proposition holds regardless of whether creditor *A* incorporates a coordination clause in his loan agreement, and its intuition is straightforward.  The cost to *B* to coordinate is the fraction of the firm's liquidation value that will be given to *A* should *B* be the first to observe $\tilde{v}$; this equals $\theta_A v_L$.  As long as this cost is less than the deadweight loss associated with inefficient liquidation, $c v_L$, creditor *B* incorporates a coordination clause into its loan agreement because this allows it to charge the firm a lower interest rate.

Comparing the conditions in Proposition 1 and Result 1 illustrates that a coordination clause will not be included in *B*'s contract precisely when it would be needed.  That is, coordination clauses on their own would effect coordination only in cases in which an ex ante solution is not required because both creditors are willing to coordinate ex post.

The most important thing to note about Proposition 1 is that creditor *B* *chooses* not to write a coordination clause into its contract.  There are no contracting costs that prevent creditor *B* from writing such a clause.  Instead, the reason the clause is not included is because the creditor is ensured a higher payoff if the clause is not included than if it is.

One might suspect that Proposition 1 would imply that creditor *A* will likewise refuse to include a coordination clause in its contract.  After all, if creditor *B* is going to run ex post, creditor *A* might as well get in on the act.  As it turns out, creditor *A* will always coordinate in a competitive lending market.

RESULT 2:  *The first creditor's contract will always include a coordination clause.*

Regardless of what ultimately happens in the second creditor's contract, the first creditor can charge a lower interest rate if it agrees to coordinate. Doing so saves the firm $(1-q)p_A cv_L$ in expected liquidation costs.

With these results we can now calculate the equilibrium outcome when creditors are able to write coordination clauses into their loan agreements. If $c \geq \theta_A$, coordination clauses will be included in both loan agreements, and the first-best outcome results. If instead $c < \theta_A$, creditor *A* will rationally anticipate that the second contract will not incorporate a coordination clause and demand

$$R'_B = \frac{L_B - (1-q)[p_A\theta_A v_L + p_B \max\{v_L(1-c) - L_B, 0\}]}{q}. \tag{6}$$

The face value of the second creditor's debt will then be

$$R'_B = \frac{L_B - (1-q)[p_A\theta_B v_L + p_B \min\{v_L(1-c), L_B\}]}{q}, \tag{7}$$

implying

$$\pi' = qv_H + (1-q)v_L - L_A - L_B - (1-q)p_B v_L c. \tag{8}$$

As a consequence, the social welfare loss that occurs if the second creditor does not coordinate is equal to

$$\pi^* - \pi' = (1-q)p_B v_L c. \tag{9}$$

The expected cost of an inefficient liquidation represented in (9), along with the fact that coordination clauses are never able to effect coordination whenever this cost exists, provides the basic rationale for a bankruptcy law.

PROPOSITION 2: *A bankruptcy law that requires creditors to coordinate their liquidation activities improves social welfare.*

It is important to emphasize what this result does *not* imply. In particular, Proposition 2 says nothing about the relative efficiency of Chapter 11 reorganization procedures, which have been a primary focus of most economic analyses of bankruptcy.[15] Bankruptcy law in the context

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[15] Aghion and Bolton (1992), Bebchuk (1991), Bebchuk and Chang (1992), Berkovitch, Israel, and Zender (1998), Berlin and Mester (1992), Eberhart and Senbet (1993), Harris and Raviv (1995), and Longhofer (1997) are all

of our model is much more abstract, incorporating only the basic feature of coordination among creditors when the firm is unable to meet its debt obligations. Other important questions such as whether incumbent management should be allowed to maintain control over the firm during a reorganization or under what circumstances a firm should be liquidated or reorganized are beyond the scope of this paper.

So far, we have only considered the ability of simple coordination clauses to effect coordination. In the next section we examine the potential of several other contractual solutions.

## 4. Covenants, Seniority, and Collateral as Mechanisms for Coordination

As we have seen, on their own creditors will be unwilling to write private contracts that include coordination clauses in precisely those circumstances in which doing so is Pareto improving. Of course, there are a number of other contractual terms that may also have an impact on creditor incentives to include such coordination clauses in their debt agreements. In this section, we consider three common alternative contracting arrangements: covenants, seniority, and collateral. We describe the instances in which each of these contracting devices can effect coordination. As we show, each of them is capable of resolving creditor conflicts only in special cases and only at a cost. Thus, we reconfirm throughout this section our conclusion that a bankruptcy law that mandates coordination is socially desirable.

### A. Coordination Covenants

One possible solution to the creditor conflict is for the initial creditor to write a "coordination covenant" into its loan agreement. This covenant stipulates that *A*'s loan contract will be in default unless creditor *B* includes a coordination clause in its loan agreement. As before, this covenant cannot impose coordination on the second creditor. Instead, it gives the first creditor an "out," in that it can call its loan should it observe the firm enter into a non-coordinating contract with the second creditor.

In this respect, coordination covenants bear much resemblance to "seniority covenants"

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examples that examine the conflict between a debtor and a single creditor with respect to some particular aspect of bankruptcy law.

that are a common feature of actual loan agreements (and that we will examine next). Contrary to the language that is often used to describe financial contracts, there is no such thing as a "seniority clause" in loan agreements. Rather, senior lenders include covenants requiring that subsequent lenders *subordinate* their loans. If a senior lender learns of a violation of this covenant, he may declare the loan in default. Alternatively, a creditor can write a "subordination clause" that subordinates its claim to others.

The logic behind this practice follows from the idea that a contract should not be binding on any individual who was not a party to the writing of that contract. To enforce a seniority clause on a future creditor who had no knowledge of that clause would be fundamentally unfair. Such contract provisions are not enforceable under current U.S. case law. Thus, our assumption that covenants contained in the first creditor's contract are unenforceable against the second creditor is consistent with this general principle.

This does not imply, however, that the first creditor is wholly without recourse should the second loan agreement fail to incorporate a coordination clause, since the first creditor may call its loan should this breech occur. The creditor's ability to enforce coordination through this covenant, however, comes at a cost, since it requires monitoring the subsequent debt transaction. We model this by assuming that creditor $A$ must expend $k > 0$ to monitor the firm's second debt agreement. To simplify the analysis, we further assume that by paying this cost, $A$ can ensure with probability one that $B$ includes a coordination clause in its loan agreement.

A ***covenant equilibrium*** is characterized by both creditors using coordination clauses, with creditor $A$ enforcing this outcome through the use of a coordination covenant that requires monitoring $B$'s loan contract. Under this scenario,

$$R_A^{cov} = \frac{L_A + k - (1-q)\theta_A v_L}{q}, \tag{10}$$

$$R_B^{cov} = \frac{L_B - (1-q)\theta_B v_L}{q}, \tag{11}$$

and

$$\pi^{cov} = qv_H + (1-q)v_L - L_A - L_B - k. \tag{12}$$

Clearly, the first-best outcome dominates this covenant equilibrium because of the monitoring

cost $k$. As shown in Proposition 1, however, when $c < \theta_A$ the first-best cannot be attained. In this case, a covenant equilibrium will be preferred if and only if $\pi^{cov} \geq \pi'$, which is equivalent to

$$k \leq (1-q)p_B v_L c. \tag{13}$$

In other words, a covenant equilibrium maximizes social welfare whenever the deadweight cost of monitoring is less than the expected loss associated with having creditor $B$ run the firm.

This covenant equilibrium is only sustainable if creditor $A$ finds is privately optimal to monitor $B$'s loan agreement to ensure that it too includes a coordination clause. Fortunately, it is straightforward to verify that $A$ will monitor $B$'s loan contract whenever (13) holds. To see this note that $A$ will have an incentive to monitor whenever

$$(1-q)p_B \max[v_L(1-c) - L_B, 0] \leq (1-q)p_B \theta_A v_L - k \tag{14}$$

If $A$ does not monitor $B$'s contract, then Proposition 1 implies that $B$'s contract will not contain a coordination clause. If this is the case, the left hand side of (14) represents $A$'s expected payoff if $B$ observes $\tilde{v} = v_L$ first. If, however, $A$ does monitor, $B$'s contract will include a coordination clause and $A$'s expected return when $B$ learns first of the firm's financial condition is given by the right-hand side of (14).[16]

The inequality (14) can be simplified to

$$k \leq p_B(1-q)(v_L c - \theta_B v_L + L_B). \tag{15}$$

Recalling that $\theta_B = L_B/(L_A + L_B)$ and $v_L < L_A + L_B$, it is easy to see that this restriction on $k$ is less stringent than that given in expression (13). In other words, whenever it is welfare improving to include a coordination covenant in $A$'s contract, $A$ will have the incentive to follow through with the requisite monitoring.

There are two points to stress concerning the use of coordination covenants. First, although they can effect coordination in some circumstances in which it would fail otherwise, there is still a significant range of parameter values for which coordination covenants are too costly and will not be used. In this range, creditor $B$'s contract will not include a coordination clause, and the social loss in (9) will result. This loss is avoided in a regime in which a

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[16] Note that if $A$ learns of the firm's financial condition first then his payoff is the same regardless of whether or not he monitors because he has agreed to a coordination clause.

bankruptcy law mandates ex post coordination.

Second, even when coordination covenants can effect ex post coordination, the fact that monitoring these covenants is costly implies that such an equilibrium is a second-best outcome. A bankruptcy law that mandates that creditors coordinate with one another would avoid this costly monitoring, and thereby improve social welfare.[17]

PROPOSITION 3: *When $c < \theta_A$ and the cost of monitoring is sufficiently low ($k \leq (1-q)p_B v_L c$), a covenant equilibrium will obtain; coordination is effected at a cost k. Nevertheless, a bankruptcy law that requires creditors to coordinate their liquidation activities improves social welfare.*

The ideas discussed in this section are illustrated in Figure 2. This figure shows the possible outcomes that result for various combinations of $c$ and $k$. For $c \geq \theta_A$, creditor $B$ will coordinate its liquidation effort, and the first-best equilibrium outcome is achieved, with the firm earning $\pi^*$ (Result 1). For $c < \theta_A$, voluntary coordination will not work. Nevertheless, if $k \leq (1-q)p_B v_L c$, the costs of monitoring a coordination covenant will be small enough that it will be a solution, and firm profit (social welfare) will be $\pi^{cov}$. On the other hand, if this monitoring cost is too large ($k > (1-q)p_B v_L c$), social welfare will be higher without coordination (firm profit is $\pi'$). In any event, for $c < \theta_A$ social welfare would be improved by a mandatory bankruptcy law that ensures a coordinated liquidation.

## B. Seniority for the First Creditor

An alternative contractual device that may affect lender coordination incentives is priority. One such priority assignment would be to grant the first creditor seniority over the firm's assets. Thus, when the firm is liquidated, its assets are first used to repay creditor $A$ up to the value of its claim, $L_A$. Any residual is then used to pay off creditor $B$. This "me-first" rule was first described by Fama and Miller (1972) and is discussed extensively in White (1980). This priority structure arises out of a creditors' desire to protect its claim from dilution by

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[17] It may be tempting to recoil at this statement and instead suggest the notion that the bankruptcy process is itself costly. It is. But as we discuss in the conclusion, the costs associated with valuing and distributing the debtor's assets arise regardless of whether liquidation is effected privately or through a court-run bankruptcy.

subsequent creditors. Granting the first creditor seniority over the firm's assets ensures that the second creditor cannot expropriate any value from the first creditor's claim.

In attempting to grant creditor *A* a senior claim on the firm's assets, two problems become immediately apparent. The first is the fact that priority for either creditor is meaningless unless coordination is achieved. In other words, unless *B* can be forced to coordinate liquidation when he is the first to observe the firm in financial distress, creditor *A*'s senior position provides him no protection. This is because "seniority" is not enforceable; as discussed above, creditors may voluntarily subordinate themselves, but cannot have this junior status forced upon them without their consent.[18]

As a result, as with the coordination covenant, creditor *A* cannot unilaterally make itself senior over creditor *B*. Instead, *A* can only write a *seniority covenant* that stipulates that *B* must subordinate its claim.[19] This may seem like a subtle distinction, but it imposes the burden of ensuring the preservation of its priority on the senior creditor. That is, the seniority covenant, like the coordination covenant, does not restrict the firm and future creditors from writing contracts that have equal (or higher) priority to the existing creditor. The seniority covenant simply places in default the debt to which it is attached if a subsequent creditor does not subordinate; in order to ensure this priority, the senior creditor must monitor all future creditors.

Assuming that the cost of monitoring a seniority covenant is no different from that required to monitor the coordination covenant discussed above, it is clear that social welfare is the same whether *A* simply uses a coordination covenant or if *A* is granted priority over creditor *B*. In either case, social welfare is improved relative to the no coordination equilibrium if and only if $k \leq (1-q) p_B v_L c$.

One motivation for granting creditor *A* priority is the hope that it will improve its incentives to monitor this covenant. After all, since creditor *A* has a senior position, it has more to lose if future loan agreements do not contain coordination clauses. Indeed, when creditor *A*

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[18] Secured debt is an important exception that proves the rule. When a creditor obtains a security interest in a specific assets, it must file public notice of this action. As a result, future lenders extend credit with complete information about their relative standing with respect to the firm's assets. We discuss the impact of such security arrangements later in this section.

[19] This type of arrangement is known as "covenant priority."

has seniority over *B*, it will monitor *B*'s contract as long as

$$(1-q)p_B \max[v_L(1-c) - L_B, 0] \leq (1-q)p_B \min[v_L, L_A] - k. \tag{16}$$

Comparing this inequality with (14) above, it is easy to see that *A*'s incentive to monitor this covenant is improved when it has seniority.

Although *A* has a stronger incentive to monitor *B*'s contract when it has seniority, we showed above that this incentive problem never exist when $c < \theta_A$. As a result, the improved incentive to monitor that accompanies seniority does not improve on the ability of a coordination covenant to effect coordination. We summarize this fact in Proposition 4.

PROPOSITION 4: *Granting the first creditor seniority does not improve on the ability of a simple coordination covenant to effect coordination.*

In other words, granting seniority to creditor *A* achieves nothing that could not be achieved by a coordination covenant.

## C. *Seniority for the Second Creditor*

The other possible way to use seniority to influence coordination incentives is for creditor *A* to subordinate his claim to that of creditor *B* (and therefore implicitly coordinate as well). Because his loan agreement is written before the firm contracts with creditor *B*, *A*'s commitment to coordinate is fully credible just as it was in section 3. Furthermore, because *A* has taken a junior claim, it is impossible for the firm and creditor *B* to expropriate rents from *A* by refusing to write a coordination clause in their loan agreement. On the contrary, *B* has more incentive to coordinate if he has seniority because he gets paid in full (if the firm has sufficient assets) before creditor *A* gets anything. This is the same sharing rule that results if he chooses not to coordinate, but it avoids the deadweight cost *c*. It is straightforward to show that contractual terms that make the second creditor senior to the first would achieve coordination without the need of a bankruptcy law.

There is, however, a deadweight cost that arises if the first creditor subordinates his claim. This is the agency cost that arises out of the second lender and firm's incentive to exploit

the existing subordinated claim. This is commonly known as the "debt dilution" problem that the "me-first" rule suggested by Fama and Miller (1972) is intended to resolve.[20]

To see nature of this problem, imagine that the first creditor's loan finances an initial project, and that the second creditor's loan finances a follow-up project. If the first creditor subordinates, the second creditor has little incentive to ensure that the firm invests its loan wisely. The reason is that *B*'s priority grants it first claim on the firm's assets, which include the firm's *existing* assets. This significantly reduces the impact of the firm's follow-up investment decision on the value of the second creditor's claim.

Anticipating this behavior, the first creditor will either not accept a subordination clause, or will charge the borrower a premium adequate to compensate for the subsequent moral hazard. In the former case, coordination will not occur; in the latter case it will occur if and only if the agency cost of the moral hazard is lower than the cost of an inefficient liquidation. Thus, granting the second creditor priority can resolve the coordination problem only in limited circumstances. Here again, a resolution the coordination problem can be obtained privately by granting the second creditor seniority, but only in special cases and only at the cost of exacerbating the firm's risk-shifting problems. In the appendix we modify our model to accommodate this contracting possibility and prove

PROPOSITION 5: *Granting the second creditor seniority can effect coordination only if the costs of risk shifting are low relative to the costs of inefficient liquidation.*

We conclude that seniority, whether granted to the first creditor or the second creditor, resolves the coordination problem only in special cases, and even then, only at the expense of monitoring costs or inefficient investment, respectively. As a result, private contracts specifying seniority cannot accomplish what a bankruptcy law that mandates coordination can.

## D. Security Interests

The final contracting device we consider is to grant one of the creditors priority through a

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[20] See Schwartz (1989, 1997a) and Triantis (1992) for detailed discussions of debt dilution.

security interest in the firm's assets. A lien on the firm's assets is a legal claim that cannot be made subordinate to a future creditor's claim. Therefore, it provides a means of credibly committing both creditors to coordinate their liquidation activities. After all, if one creditor cannot subrogate the other's claim by running the firm, then both creditors will have an incentive to coordinate liquidation. In other words, collateral does not suffer from the same time-inconsistency problem as covenants because a lien is enforceable, ex post.

Perfecting a security interest, however, requires registering the claim with a governmental authority with a precise description of the assets serving as collateral.[21] Clearly, then, the extent to which assigning security interests can be used to eliminate the coordination problem depends on the degree to which the firm's assets are suitable to be collateralized. Intangible assets, growth opportunities, illiquid assets, and assets that can be easily misused, neglected, or absconded with will not be good candidates for collateral. As a result, although collateral may effect coordination in some cases, it cannot serve as a general replacement for a bankruptcy system that mandates creditor coordination.

## 5. Conclusion

We have developed a model in which ex post conflicts among creditors can occur, and when they do they lead to an inefficient liquidation of the debtor. When a debtor's liabilities exceed its assets, creditors will have private incentives to "run" the firm by staking claims on the firm's assets. The resulting ad hoc liquidation of the assets that is required to meet individual creditor's claims leads to deadweight losses when compared to a coordinated liquidation. Hence, creditors are faced with a prisoners' dilemma problem in which their equilibrium actions are not Pareto efficient.

Our primary contribution is to show that this problem can exist even when the firm and its creditors can anticipate these conflicts and can costlessly write enforceable clauses into their contracts committing themselves to coordinate their liquidation activities. This occurs because creditors contract with the firm at different points in time. Once the terms of the initial creditor's

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[21] The public nature of this collateralization ensures that future creditors can be fully aware of the conditions under which they can expect repayment of their loans.

contract are determined, neither future creditors nor the firm may have the incentive to write this clause in their loan agreements.

In addition, we have shown that other private solutions such as coordination covenants, seniority covenants, or collateral offer only limited success in enhancing incentives to include coordination clauses. Although a coordination problem that cannot be solved through private contracting does not afflict all firms in all circumstances, we have demonstrated that the conditions in which it does occur are quite general. On that basis, we argue that a bankruptcy law is socially desirable because it forces creditors to commit to the very behavior to which they would like to have committed in the first place.

One possible objection to our argument for the use of a mandatory bankruptcy system is that we have ignored the costs of administering such a system. If such administrative costs outweigh the social gain we model, then private debt-collection remedies will be preferable, despite the deadweight costs they entail.

Regardless of whether or not a bankruptcy law exists, however, the liquidation of a debtor's assets is costly. These costs can be attributed to three separate aspects of a liquidation: the cost of valuing the assets, the cost of distributing the assets, and the efficiency of the manner in which the assets are deployed. It is this third cost that a mandatory bankruptcy system can minimize.

What about the first two administrative costs? We argue that the magnitude of these costs—the valuation and distribution of assets—is unlikely to differ based on whether or not the liquidation is public or private. These costs are likely to be minimized, however, if liquidation is handled in a coordinated manner, regardless of whether such coordination is effected through private contracts or a public bankruptcy procedure.[22] Thus, when circumstances are such that private contracts are unable to achieve coordination, we argue that these administrative costs will be lower when liquidation is handled through a mandatory bankruptcy system.[23]

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[22] The reason is that a coordinated liquidation avoids a costly duplication of these tasks. Thus, the cost savings are similar to those associated with monitoring firm projects in Diamond (1984).

[23] This is not to suggest that current bankruptcy law in the United States handles these tasks in the most efficient manner possible. Rather, we are simply arguing that there is no reason, in principle, that a centralized bankruptcy

It is important to note that although our analysis does suggest that a bankruptcy law that mandates ex post creditor coordination is socially beneficial, it makes no claims about the relative desirability of specific features of bankruptcy law in the United States or in other countries. In our model, bankruptcy law is designed to achieve one primary purpose: to coordinate the debt-collection activities of a firm's various creditors. To this end, our analysis suggests that basic bankruptcy laws would include provisions such as the automatic stay and the return of payments made to creditors on the eve of bankruptcy as mandated in the U.S. bankruptcy code. More specific questions such as how to administer negotiations during a reorganization, for example, are beyond the scope of this paper.

## 6. Appendix

### *Proof of Result 1*

We begin by proving sufficiency. Suppose that $c < \theta_{-i}$. From expression (5) there are two cases to consider. If $L_i \leq v_L(1-c)$, creditor $i$ will prefer running if and only if

$$L_i > \theta_i v_L = \frac{L_i}{L_A + L_B} v_L. \tag{17}$$

This inequality is equivalent to $L_A + L_B > v_L$, which holds by assumption. On the other hand, if $L_i > v_L(1-c)$, then creditor $i$ will prefer running if and only if

$$\begin{aligned} v_L(1-c) &> \theta_i v_L \\ c &< 1 - \theta_i = \theta_{-i} \,, \end{aligned} \tag{18}$$

proving that creditor $i$ will always run the firm if $c < \theta_{-i}$.

Next we show that if $c \geq \theta_{-i}$, creditor $i$ will never run the firm (necessity). First, note that $c \geq \theta_{-i}$ implies that $L_i > v_L(1-c)$, since $\theta_{-i} = 1 - L_i/(L_A + L_B)$ and $L_A + L_B > v_L$. If $L_i > v_L(1-c)$, however, expression (5) implies that creditor $i$ will run only if $c < 1 - \theta_i = \theta_{-i}$, proving that creditor $i$ will never run the firm when $c \geq \theta_{-i}$. ♠

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system of the type envisioned by our model is necessarily more costly to administer than private debt-collection efforts.

*Proof of Proposition 1*

Suppose first that creditor *A* included a coordination clause in his debt agreement. If creditor *B*'s debt agreement also includes a coordination clause,

$$R_B^{CC} = \frac{L_B - (1-q)\theta_B v_L}{q},$$

(19)

while

$$R_B^{CN} = \frac{L_B - (1-q)[p_A \theta_B v_L + p_B \min\{v_L(1-c), L_B\}]}{q}$$

(20)

if *B*'s contract does not include this clause. In these expressions, the *CC* superscript denotes the case where both creditors include the coordination clause, while the *CN* superscript denotes the case in which creditor *A* includes a coordination clause but creditor *B* does not; the superscripts *NC* and *NN* are interpreted similarly. Using these, firm profit will be higher when the coordination clause is used if and only if[24]

$$
\begin{aligned}
\pi^{CC} &= q(v_H - R_A - R_B^{CC}) \geq q(v_H - R_A - R_B^{CN}) = \pi^{CN} \\
&- L_B + (1-q)\theta_B v_L \geq -L_B + (1-q)[p_A \theta_B v_L + p_B \min\{v_L(1-c), L_B\}] \\
&(1-p_A)\theta_B v_L \geq p_B \min\{v_L(1-c), L_B\} \\
&\theta_B v_L \geq \min\{v_L(1-c), L_B\}.
\end{aligned}
$$

(21)

This condition, however, is the mirror image of (5) in the text. Thus, analogous arguments to those used in the proof of Result 1 imply that the firm will require creditor *B* to use a coordination clause if and only if $c \geq \theta_A$.

The second case to consider is that in which creditor *A* does not include a coordination clause in his contract. In this case,

$$R_B^{NC} = \frac{L_B - (1-q)[p_A \max\{v_L(1-c) - L_A, 0\} + p_B \theta_B v_L]}{q},$$

(22)

and

$$R_B^{NN} = \frac{L_B - (1-q)[p_A \max\{v_L(1-c) - L_A, 0\} + p_B \min\{v_L(1-c), L_B\}]}{q},$$

(23)

implying once again that the firm will require a coordination clause of creditor *B* whenever

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[24] Note that face value of creditor *A*'s debt is fixed at the time creditor *B*'s contract is written. Thus, $R_A$ will be the same in both of these expressions for firm profit.

$$\pi^{NC} = q(v_H - R_A - R_B^{NC}) \geq q(v_H - R_A - R_B^{NN}) = \pi^{NN}$$

$$\theta_B v_L \geq \min\{v_L(1-c), L_B\}. \tag{24}$$

Thus the firm will require a coordination clause of creditor $B$ if and only if $c \geq \theta_A$. ♠

### *Proof of Result 2*

Consider first the case where $c \geq \theta_A$, so that the firm requires $B$ to use a coordination clause. In this case,

$$R_A^{CC} = \frac{L_A - (1-q)\theta_A v_L}{q} \tag{25}$$

if $A$ includes a coordination clause and

$$R_A^{NC} = \frac{L_A - (1-q)[p_A \min\{v_L(1-c), L_A\} + p_B \theta_A v_L\}]}{q} \tag{26}$$

if he does not. Using these, we see that the firm will prefer $A$ to use a coordination clause if

$$\pi^{CC} = q(v_H - R_A^{CC} - R_B^{CC}) > q(v_H - R_A^{NC} - R_B^{NC}) = \pi^{NC}$$

$$qv_H + (1-q)v_L - L_A - L_B > qv_H + (1-q)v_L - L_A - L_B - (1-q)p_A v_L c, \tag{27}$$

which always holds.

If $c < \theta_A$, the firm will not require $B$ to use a coordination clause. Thus,

$$R_A^{CN} = \frac{L_A - (1-q)[p_A \theta_A v_L + p_B \max\{v_L(1-c) - L_B, 0\}]}{q} \tag{28}$$

if $A$ includes a coordination clause and

$$R_A^{NN} = \frac{L_A - (1-q)[p_A \min\{v_L(1-c), L_A\} + p_B \max\{v_L(1-c) - L_B, 0\}]}{q} \tag{29}$$

if he does not. Using these, we see that the firm will prefer $A$ to use a coordination clause if

$$\pi^{CN} = q(v_H - R_A^{CN} - R_B^{CN}) > q(v_H - R_A^{NN} - R_B^{NN}) = \pi^{NN}$$

$$qv_H + (1-q)v_L - L_A - L_B - (1-q)p_B v_L c > qv_H + (1-q)v_L - L_A - L_B - (1-q)v_L c \tag{30}$$

$$(1-q)p_A v_L c > 0,$$

which once again must always hold. ♠

### *Proof of Proposition 2*

Immediate from expression (9) in the text. ♠

*Proof of Proposition 3*

      Immediate from the discussion in the text.  ♠

*Proof of Proposition 4*

      Immediate from the discussion in the text.  ♠

*Proof of Proposition 5*

      Suppose that the firm has two separate projects, each financed individually by one of the creditor's loans. To simplify, we will assume that $L_A = L_B$ and that the project financed by the initial lender has a payoff of $\frac{1}{2}v_H$ with probability $q$ and a payoff of $\frac{1}{2}v_L$ with probability $1 - q$. When the second lender arrives, the firm has two mutually exclusive projects that can be funded with the second loan. The first of these projects is identical to the initial project. The alternative project has a payoff of $\frac{1}{2}v'_H$ with probability $q$ and a payoff of $\frac{1}{2}v'_L$ with probability $1 - q$, where $v_H + \frac{1-q}{q}v_L > v'_H > v_H > v_L > v'_L = 0$. Under these assumptions, the alternative project is riskier and also has a lower (but perhaps positive) net present value.

      Clearly, the firm will have an incentive to "shift risk" onto the creditors and invest in the riskier project. To capture the impact of a senior creditor's incentive to dilute an existing subordinated creditor's claim, we make the following assumption: If the first creditor subordinates, then the second creditor dilutes and allows the firm to invest in the risky project; if the first creditor does not subordinate, then both creditors take pro rata claims and the second creditor, because it has significantly less incentive to dilute, will require the firm to invest in the safe project.

      Thus, the tradeoff that drives the level of social welfare is between the agency cost of the risk shifting and the cost of inefficient liquidation. Of interest, then, is the profit of the firm in a coordination equilibrium in which the first creditor is subordinated, relative to the firm's profit in a non-coordination equilibrium.

      Under this setup, if both creditors agree to use coordination clauses we have

$$R_A = \frac{L_A - (1-q)\max\{\frac{1}{2}v_L - L_B\}}{q} \tag{31}$$

and

$$R_B = \frac{L_B - (1-q)\min\{\tfrac{1}{2}v_L, L_B\}}{q},$$
(32)

implying that firm profit under this scenario would be

$$\pi^B = q\frac{v_H + v'_H}{2} + (1-q)\frac{v_L}{2} - L_A - L_B.$$
(33)

The firm will then prefer to effect coordination by making creditor $B$ senior if this profit is higher than that it earns in the no-coordination outcome, as measured by $\pi'$ in expression (8) above.

Thus, coordination results in higher social welfare whenever

$$\pi^B - \pi' = (1-q)p_B v_L c - q\frac{v_H - v'_H}{2} - (1-q)\frac{v_L}{2} > 0,$$
(34)

which can be rewritten as

$$c > \frac{p_B}{2}\left[1 - \frac{q(v'_H - v_H)}{(1-q)v_L}\right].$$
(35)

When $c$ exceeds this bound, the cost of risk shifting is lower than the cost of inefficient liquidation that occurs without coordination. As a result, the firm will have the first creditor subordinate his loan to the second; coordination is achieved at the expense of risk shifting. ♠

## 7. Figures

Figure 1

$t = 0$        $t = 1$        $t = 2$

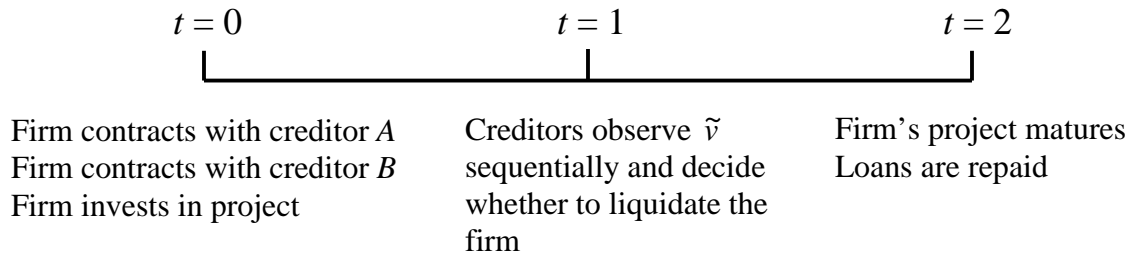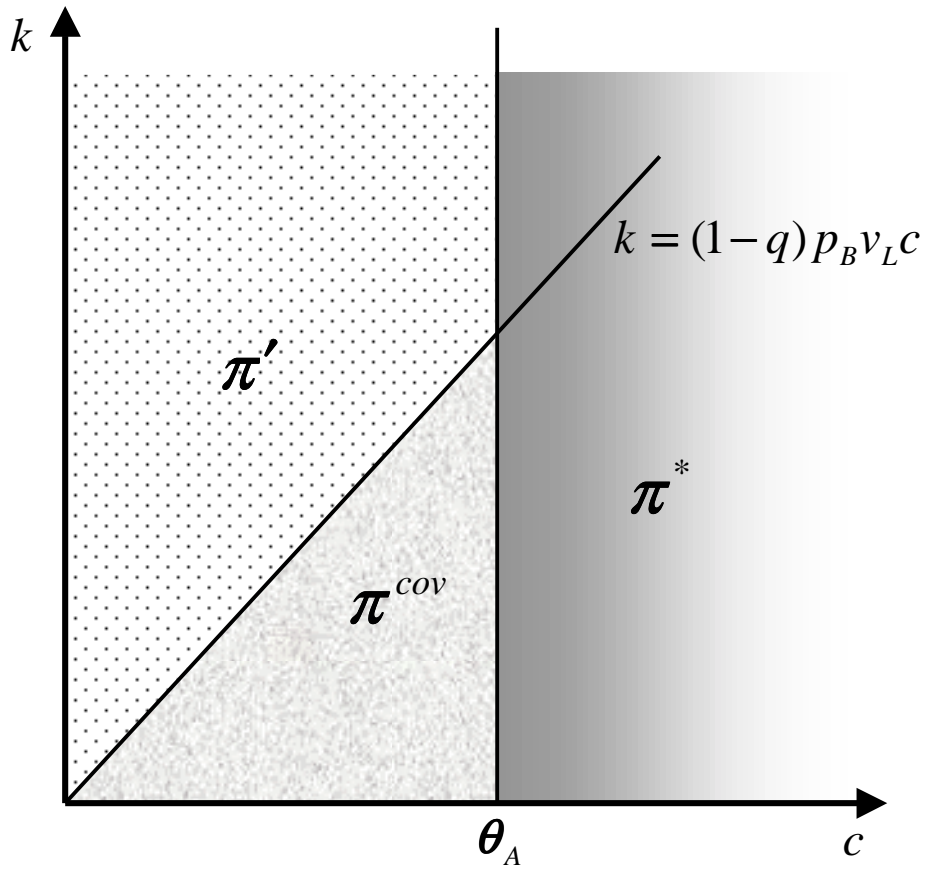| | | |
|---|---|---|
| Firm contracts with creditor $A$ | Creditors observe $\tilde{v}$ | Firm's project matures |
| Firm contracts with creditor $B$ | sequentially and decide | Loans are repaid |
| Firm invests in project | whether to liquidate the | |
| | firm | |

Figure 2

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