Bankruptcy, Creditor Protection and Debt Contracts

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Abstract

We study theoretically how creditor protection affects the parties' ability to resolve financial distress by contract. Our central finding is that better creditor protection allows parties to write more sophisticated contracts, including options and court intervention – as opposed to cash auctions – to decide whether to liquidate or continue a financially distressed project, thereby attaining higher welfare. Our analysis yields novel predictions on how debt contracts and debt structure should vary around the world. We reconcile current conflicting proposals for bankruptcy reform, and rationalize resolutions of financial distress around the world as a function of creditor protection. The normative implication of our analysis is that bankruptcy law should facilitate contractual resolutions of financial distress by providing an ex post enforcement mechanism to deter debtors' self-dealing and tunneling activities.

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1 Introduction

The efficient resolution of financial distress calls for liquidating unprofitable firms and reorganizing those firms that are only temporarily insolvent, while at the same time ensuring that creditors are repaid. To achieve these goals, firms and investors could include in their debt contracts clauses and procedures dealing with the possibility of financial distress in the most efficient manner. The incomplete contracts approach to bankruptcy (e.g. Hart 1995) assumes that such contracts cannot be written, either because of writing costs or because of the unpredictability of financial distress. As a result, an optimal bankruptcy procedure should be provided by the state (Hart 2000).

The importance of state-provided bankruptcy procedures is widely recognized.[1] In this paper we instead explore theoretically the idea that parties try to resolve financial distress by contract, but the extent of creditor protection shapes their ability to do so. Indeed, recent empirical evidence shows that better legal protection allows the parties to write more sophisticated financial contracts, for example including more convertibility clauses in private equity contracts (Lerner and Schoar 2005), and more covenants in debt contracts (Qian and Strahan 2004). This evidence suggests that poor legal protection may hinder courts' ability to enforce efficient but sophisticated contractual procedures to resolve financial distress. As a result, the parties may prefer to use procedures that are less efficient but more likely to be enforced under weak creditor protection.

Three main procedures have been proposed to resolve financial distress, namely options (e.g. Aghion, Hart and Moore 1992), court intervention (e.g. Bolton and Rosenthal 2002) and cash auctions (e.g. Jensen 1989). We present a simple model where each of these three procedures emerges as part of the optimal contract depending on creditor protection, and then we show that these contracts cannot be dominated. Our model helps rationalize and evaluate existing resolutions of financial distress around the world as a function of creditor protection, and yields several novel empirical predictions. The normative implication is that the two key ingredients of optimal bankruptcy law are strong creditor protection against fraud and freedom of contracting.

In our model, creditor protection shapes the ability of courts to enforce contractual repayment and it is parameterized by the share of the firm's cash flows that courts can pledge to creditors. This

[1] Bulow and Shoven (1978) and Gertner and Scharfstein (1991) argue that bankruptcy law should fill contractual gaps ex post and facilitate renegotiation rather than enforce what the parties have written ex ante. Other papers derive optimal state-mandated bankruptcy procedures by solving an ex ante welfare-maximization problem. Unlike our paper, they do not focus on creditor protection and do not allow the parties to write fully contingent debt contracts (Berglof, Roland and von Thadden 2003, Cornelli and Felli 1997, Povel 1999, Berkovitch and Israel 1999, Bernhardt and Nosal 2004, Giammarino and Nosal 1994, Chen and Sundaresan 2003).

parameter captures the extent to which creditors are protected against managerial self-dealing or tunneling (Shleifer and Vishny 1997, Djankov et al. 2005). Self-dealing ranges from outright theft to related-parties' transactions, transfer pricing, and so on. As a result of such activities, those who control a corporation can divert its profits to themselves without repaying the investors, and may even precipitate financial distress. By reducing repayment, weak creditor protection against self-dealing and tunneling may thus undermine the bonding role of debt.

One form of tunneling that is particularly relevant in the context of bankruptcy is the strategic acquisition of personal assets by the debtor with the creditors' money. For example, three Enron executives started building million-dollar homes in Texas with Enron money before the Enron bankruptcy filing, because in Texas "the law permits a debtor to fraudulently invest ill-gotten gains in a homestead to beat his or her creditor" (LoPucki 2005, p. 150). Consistent with this example, Berkowitz and White (2004) document that, across U.S. states, greater homestead exemption in bankruptcy is associated with reduced access to credit by small firms.[2] Creditor protection against managerial self-dealing not only depends on the law in the books (La Porta et. al 1998), but also on the quality of courts because courts may lack the ability to detect managerial misbehavior, especially if the law is unclear or requires interpretation (Glaeser et al. 2001). The magnitude of these problems is likely to be much amplified in transition and emerging economies, where underfinanced, incompetent or even corrupt courts cannot be expected to effectively resolve difficult cases of managerial self-dealing, thereby reducing creditors' ability to seize the project's cash flows. In such cases, the only way for creditors to recoup money from a financially distressed firm may be to oust its management and liquidate its physical assets.

In addition to creditor protection, we consider another determinant of parties' ability to contract about financial distress, namely courts' ability to efficiently liquidate or continue a financially distressed project. We model this aspect of courts' expertise as the precision of the bankruptcy courts' estimates of the project's continuation value. The precision of courts' estimates may depend for example on whether bankruptcy judges are former bankruptcy practitioners, the training of judges or the strictness of disclosure rules, which also varies across countries (e.g. Djankov et al. 2006). In turn, courts' ability to choose the efficient liquidation policy may affect the parties' willingness to delegate such power to the courts by contract.

Under the enforcement constraints above, we study a model of debt under uncertainty where

[2] In our framework, greater homestead exemption provisions allow debtors to divert more of their firms' profits, thereby reducing contractual repayment by investing in a homestead.

an investment project can be liquid or not, and if it is not liquid, it can either be optimal to continue or to liquidate. In principle, parties can write a "complete" contract mandating that the project be continued if and only if its continuation value is greater than its liquidation value, while at the same time pledging the project's entire cash flows to the creditor. With perfect enforcement, the "complete" contract efficiently resolves financial distress because it maximizes both ex post efficiency, as courts always implement the correct liquidation policy, and ex ante efficiency, because with perfect creditor protection the repayment to the investor is maximized. However, if courts make mistakes in estimating the project's continuation value, they will implement the wrong liquidation policy with positive probability. As a result, the "complete" contract no longer yields ex post efficiency. What is then the parties' contractual reaction to imperfect enforcement?

We find that bankruptcy courts' imprecision in estimating the project's continuation value does not prevent parties from efficiently resolving financial distress by contract. Provided that creditor protection is large enough, parties can still achieve the first best by using options. For example, in financial distress the contract may give the creditor the option to liquidate the project by paying a strike price to the entrepreneur. The strike price reduces the creditor's liquidation proceeds, ensuring that he does not over-liquidate the project. This way, the entrepreneur and the investor contract around the court's mistakes by exploiting their perfect information about the project's continuation value. Crucially, the option's strike price decreases with creditor protection: as the pledgeability of cash flows falls, the creditor obtains less under continuation, and thus must forsake a greater share of liquidation proceeds not to over-liquidate. Eventually, for low creditor protection options are no longer feasible: the strike price is so large that it undermines break even.[3]

When options are infeasible, debt contracts can no longer attain the first best, and the optimal resolution of financial distress must trade off the ex post cost of over-liquidation with the ex ante cost of continuation. A natural way of solving this trade-off is to always mandate a cash auction for a financially distressed project. This contract sacrifices ex post efficiency for ex ante break-even. Can parties do better by exploiting the courts' information about the project's continuation value?

The answer is yes, provided that creditor protection is intermediate. In this range, the optimal contract asks bankruptcy courts to shape the liquidation policy depending on their estimates of the project's continuation value. While the efficiency of court intervention depends on whether renegotiation is allowed, two results stand out. First, court intervention improves upon cash auctions by preventing some inefficient liquidation ex post. Second, court intervention is more feasible than

[3]In Section 5, we discuss how to map into our model the specific procedure proposed by Aghion et al. (1992).

options because it avoids the cost of incentivizing the creditor to efficiently continue the project. Thus, court intervention is optimal if creditor protection is both large enough so that liquidation is not the only way for creditors to recoup money, and small enough so that options are not feasible.

The key determinant of contractual resolutions of financial distress is thus creditor protection. By increasing pledgeable income, stronger creditor protection facilitates the implementation of incentive schemes, thereby fostering more flexible resolutions of financial distress. In particular, if creditor protection is high, parties can use options and attain the first best. If creditor protection is intermediate, parties can use ex post court intervention. Such **a** contract may also attain the first best, but only if courts' expertise is large enough and renegotiation is allowed. If creditor protection is low, the only way of financing the project is to always liquidate it in financial distress. Section 4 extends the model to allow for multiple creditors. We find that in the ideal debt structure the entrepreneur efficiently resolves financial distress by borrowing from a large secured option-holder and a dispersed set of unsecured creditors. Yet, this debt structure is only feasible when creditor protection is large enough. Otherwise, the debtor sacrifices ex post efficiency for ex ante break-even by issuing fewer, homogeneous, secured claims. These results yield the novel predictions that better creditor protection facilitates both the issuance of unsecured claims and debt dispersion.[4] By confirming that enforcement quality affects contract flexibility (Gennaioli 2005), our model thus suggests that one important channel through which better creditor protection and enforcement may spur financial market development (Lerner and Schoar 2005, Qian and Strahan 2004, La Porta et al. 2006) is by facilitating more efficient resolutions of financial distress.

Our results also imply that the way financial distress is resolved around the world should depend on creditor protection. To illustrate this point, Section 5 examines creditor protection in the U.K., U.S. and Sweden.[5] According to La Porta et al.'s. (1998) and Djankov et al.'s (2006) measure of creditor rights, the U.K. scores a maximum of four, while both the U.S. and Sweden score one. Along these lines but closer to our analysis, we read the U.K., U.S. and Swedish bankruptcy codes to gather some evidence on how they protect creditors against managerial self-dealing, defined in the context of bankruptcy as fraudulent conveyances or wrongful trading. In line with the anti-self-dealing index of Djankov et al. (2005), we find creditor protection against fraudulent conveyances to be highest in the U.K. code, intermediate in the U.S. code and lowest

[4] We obtain these predictions because in our model debt dispersion protects the *debtor* against over-liquidation. Hence, debt dispersion increases with creditor protection. In contrast, in most of the literature (e.g. Bolton and Scharfstein 1996) debt dispersion protects creditors by deterring strategic default.

[5] Real-world bankruptcy codes typically combine elements of these three codes (e.g. La Porta et al. 1998).

in the Swedish code. Interestingly, Section 5.2 shows how our model can rationalize the different resolutions of financial distress adopted in those three countries as optimal, given each country's creditor protection. Consistent with our model, in the U.K. parties typically write a debt contract giving the senior creditor the contractual option (*floating charge*) to appoint a receiver, who in turn liquidates (Franks and Sussman 2005a). Similarly, in the U.S. there is a frequent resort to court-supervised reorganization procedures under Chapter 11 of the 1978 Code. By contrast, despite the recent introduction of a court-supervised reorganization procedure along the lines of U.S. Chapter 11, parties in Sweden still overwhelmingly choose a cash auction to liquidate insolvent firms (Strömberg 2000), once more consistent with our model.

Even though our model can rationalize resolutions of financial distress around the world, there are reasons to suspect that they might not always be optimal, especially because most real-world bankruptcy procedures are mandatory. As a result, parties may be unable to efficiently resolve financial distress by contract, precisely because they are not allowed to opt out of the state-provided bankruptcy procedures. These observations lead naturally to the normative implication of our theory, which is that bankruptcy law should accommodate rather than supersede private contracting. This idea has two implications. First, bankruptcy procedures should be set as default as opposed to mandatory rules, in line with Rasmussen (1992) and Schwartz (1997). A mandatory bankruptcy procedure is costly because it limits contractual flexibility. This insight has important implications for bankruptcy reform in transition and emerging economies, where – due to weak creditor protection – it may be very costly to mandate procedures borrowed from more developed economies. For example, suppose parties wrote a contract where the project is always liquidated in financial distress. Then, asking courts to supersede ex post such a contract by distributing options or intervening directly in reorganization may undermine financing altogether if the parties chose liquidation precisely because they did not trust courts to enforce these more sophisticated contracts. Hence, bankruptcy procedures should try to accommodate existing contracting practices.

Second, bankruptcy law should facilitate private contracting by enhancing creditor protection. In fact, our model indicates that the most efficient resolution of distress is achieved when creditor protection is high. As a result, bankruptcy reforms should primarily aim at creating an ex post mechanism for detecting and deterring managerial misbehavior, for example by setting strict rules for avoiding and rescinding fraudulent conveyances. Private contracts will then do all the rest.

2 The Model

We describe the basic setup in Section 2.1 and contract enforcement in Section 2.2.

2.1 The Basic Setup

We study a two-period investment project that requires an initial outlay of $K > 0$ for the purchase of a physical asset. The project is run by a penniless entrepreneur whose human capital is indispensable. In period 1, with probability π the project is liquid and produces a cash flow $y_1 > 0$; with probability $1 - \pi$ the project is illiquid and its cash flow is 0. If the project was liquid in period 1, its period 2 cash flow is $\overline{y}_2$; if instead the project was illiquid, its period 2 cash flow is $\overline{y}_2$ with probability μ or $\underline{y}_2$ with probability $1 - \mu$. To simplify the algebra, we set $\mu = 1/2$.

Figure 1. States of Nature

ω	$\Pr(\omega)$	$y_1(\omega)$	$y_2(\omega)$
G	π	y_1	$\overline{y}_2$
U	$(1-\pi)/2$	0	$\overline{y}_2$
B	$(1-\pi)/2$	0	$\underline{y}_2$

The project can be in one of three states of nature, G ("good"), U ("unlucky") and B ("bad"), (Figure 1). At the end of period 1 and before period 2 cash flows are generated, the physical asset can be liquidated, yielding L. One can think of L as either the value of physical assets under an alternative management, or as their value after piecemeal liquidation. Both investment and liquidation are zero-one decisions (Section 4 allows for partial liquidation). We assume:

A.1: $y_1 > \overline{y}_2 > L > \underline{y}_2 > 0$.

Besides imposing $y_1 > \overline{y}_2$ (which only simplifies the exposition and does not entail a loss in generality), A.1. implies that in the first best the project should be liquidated if and only if second period profits are low; in G the project is both liquid and profitable, in U the project is illiquid but eventually profitable. Only in B is the project both illiquid and unprofitable so that it should be liquidated. We also assume:

A.2: $\pi(y_1 + \overline{y}_2) + (1-\pi)L > K$.

A.2 implies that the net present value of the project is positive even if its assets are liquidated in U, when continuation is efficient. This assumption only simplifies the exposition of our findings on contract choice; its implications will become clear after Proposition 1. To finance the project, E tries to borrow from a wealthy investor I under a contract ensuring that I breaks even. To describe the set of feasible contracts, we must specify the enforcement constraints in our model.

2.2 Creditor Protection and Courts' Expertise

We characterize contract enforcement with two parameters. The first is the share $\alpha \in [0, 1]$ of the project's cash flows that can be pledged to I. The remaining share $(1 - \alpha)$ goes to E.[6] As discussed in the introduction, α captures the ability of courts to ensure contractual repayment by protecting creditors against managerial divertive activities. In the spirit of Shleifer and Wolfenzon (2002), one can think of α as representing the probability with which courts catch such divertive activities. Alternatively, courts may be so inefficient that it takes months or even years to get a dispute resolved. Hence, one can also think of a lower α as measuring the reduction in the value of claims associated with courts' delay.

Our model nests the Hart and Moore (1998) case of unverifiable cash flows as a special case when $\alpha = 0$. When instead $\alpha > 0$, our model departs from Hart and Moore (1998) by allowing the parties to write fully contingent debt contracts. Crucially, this is true even in states of liquidity (i.e. non-strategic) default, when parties must decide whether or not to liquidate the project.

The second dimension of contract enforcement is the precision with which courts estimate the continuation value of the project. The issue of whether the physical asset should be liquidated or continued only arises when the firm is illiquid.[7] We assume that in a state of illiquidity courts correctly estimate the continuation value with probability $1 - \theta$. As a result, in state B (U) the court mistakenly believes that the entrepreneur is unlucky (bad) and that the project should be continued (liquidated) with probability $\theta \leq 1/2$. Hence, θ captures the court's imprecision in estimating the project's continuation value.[8]

In line with Hart and Moore (1998), we assume that physical assets are harder for E to divert than other less tangible property. As a result, the total liquidation proceeds for I in the first period

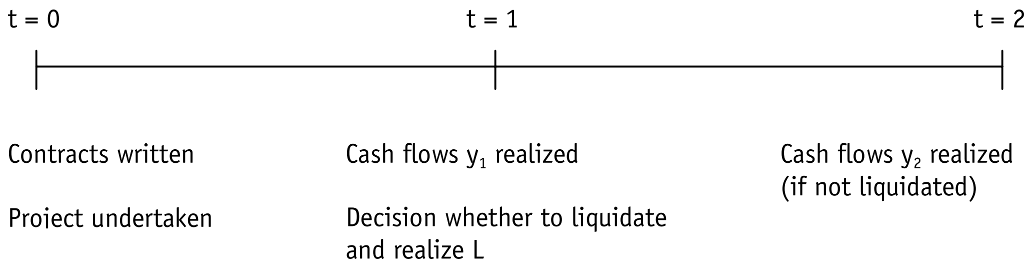
[6] Thus, in the spirit of Aghion and Bolton (1992), one could think of creditor protection as affecting the size of non-dissipative private benefits.

[7] Because in our model courts can always extract a share α of current cash flows, they can perfectly tell whether current profits are positive (in which case default is strategic) or zero (in which case it is not). The alternative assumption that courts cannot perfectly tell apart strategic and liquidity default would only complicate the analysis without changing our main results.

[8] In line with Hart and Moore (1998), we assume that both E and I perfectly observe the state of nature. The assumption of symmetric information could be relaxed at the cost of complicating the analysis of renegotiation. Most of our results would go through under the weaker assumption that E is more informed than the judge.

in state G are $L + \alpha y_1$, that is the sum of the liquidation value L of the physical asset and the liquidation value αy_1 of E's less tangible property. Notice that only the latter, αy_1, depends on creditor protection, but all our results hold even if creditor protection affects L, as long as physical assets are easier to pledge than cash flows. Further, our formulation implies that, even if we assume that physical assets are worthless in period 2, the project has a positive period 2 liquidation value of $\alpha y_2(\omega)$. One can think of such liquidation value as what is left for I after E defaults on the second period repayment. Such liquidation value thus determines I's ex post incentive to continue the project. In sum, both in period 1 and 2, irrespective of the state, the liquidation value of the project increases in the extent of creditor protection α. Figure 2 shows the timing of the model.

Figure 2. Timeline



We consider financial contracts where I lends an amount $D \geq K$ to E in exchange for a repayment schedule. First period repayments can be made contingent on the state of nature. The liquidation decision (as well as the allocation of liquidation proceeds) can be made contingent both on the state of nature and whether the debtor repaid or not in the first period. Finally, second period repayments can be made contingent on the state of nature, first period repayment and whether the project was liquidated or not. Thus, we allow the parties to specify in their debt contract two aspects that incomplete contracts scholars consider to be the key dimensions of a state-provided bankruptcy procedure (Hart 2000): how to allocate the project's cash flows (i.e. "who gets what") and whether to continue or liquidate (i.e. "what to do with the firm").

3 Creditor Protection and Debt Contracts

We now study how optimal contracts depend on α and θ, i.e. the two dimensions of contract enforcement. To gain intuition on the logic of our model, we first study the case when the parties do not renegotiate ex post. This analysis is summarized in Proposition 1. We then turn to the case of renegotiation and summarize the results in Proposition 2.

Section 3.1 studies optimal contract terms when the project is liquid (i.e. in state G). Because courts perfectly determine if the initial cash flow is 0 or y_1 (i.e. whether the state is G or not), we can focus on G in isolation and find the optimal contract terms for this state. Section 3.2 focuses on how to resolve with financial distress in states U and B where the project is illiquid.

3.1 Optimal Contract Terms when the Project is Liquid

Optimal contract terms in state G consist of first and second period repayments $d_1(G)$ and $d_2(G)$, as well as a liquidation policy such that the investor does not strategically default and the project is continued (i.e. $\lambda(G) = 0$). In line with Hart and Moore (1998), E's incentive to default on the promised repayment $d_1(G)$ is minimized by inefficiently liquidating the project upon default and by giving I all liquidation proceeds $\alpha y_1 + L$.[9] As a result, I can get at most:

$$d_1(G) + d_2(G) \leq \alpha y_1 + \overline{y}_2. \tag{1}$$

In addition, $d_2(G) \leq \alpha \overline{y}_2$ and $d_1(G) \leq y_1$, because E cannot be induced to repay more than share α of period 2 cash flows and more than y_1 in period 1.[10] Under A.1, we have $d_2(G) = \alpha \overline{y}_2$, $d_1(G) = \alpha y_1 + (1 - \alpha)\overline{y}_2$. Notice that both first and second period repayments increase with α. In this sense, one can interpret $(1 - \alpha)$ as a measure of E's incentive to default strategically. If $\alpha = 0$, creditor protection against E's divertive activities is nil. As a result, E will always default and repay 0 in the second period, and the maximum first-period repayment is the same as in the case of unverifiable cash flows (Hart and Moore 1998), where the threat of foreclosure cannot induce E to pay out more than the project's continuation value $d_1(G) = \overline{y}_2$. If instead $\alpha = 1$, creditor protection is perfect and the threat of foreclosure is unnecessary: E has no incentive to default and thus repays I up to all present and future cash flows. Therefore, (1) already shows a benefit of creditor protection: the repayment E can promise I increases in α. Thus, consistent with Berkowitz and White (2004)'s evidence across U.S. states, better creditor protection leads to higher debt capacity. The question now arises, how does creditor protection affect contracting

[9] Notice that E has no money to pledge to I besides the project's cash flow, because we study the case where I lends the sum $D = K$ to E. In the Proofs we show that under no renegotiation this is always optimal.

[10] We implicitly assumed that E entirely consumes first-period cash flows before the second period. This assumption simplifies the analysis but it is not important for our results.

about states of financial distress? To answer this question, consider states B and U when the project is illiquid.

Under perfect enforcement ($\alpha = 1$, $\theta = 0$), the resolution of financial distress is trivial, as the first best can always be attained under a "complete contract" mandating liquidation only in state B and promising I enough repayments so that I breaks even on average. Under this contract, the parties effectively ask the courts to intervene ex post to decide whether to liquidate the project (i.e. to verify if the state is U or B). However, if $\theta > 0$, imperfectly informed courts may give rise to over- or under-liquidation when intervening on the decision of whether to liquidate. What is the optimal contract under imperfect enforcement?

3.2 Optimal Contract Terms when the Project is Illiquid

We answer this question by first noting that three main procedures have been proposed and are commonly observed in practice to resolve financial distress, namely options (e.g. Aghion, Hart and Moore 1992), court intervention (e.g. Bolton and Rosenthal 2002) and cash auctions (e.g. Baird 1986, Jensen 1989). However, such procedures have either been proposed without a formal model, or not been formally derived from a common set of assumptions. In this section, we first show how these three procedures emerge as part of the optimal debt contract, and how their optimality depends on creditor protection. Second, we show that these three contracts cannot be dominated.

Options are optimal when creditor protection is high. If α is sufficiently high, it is not necessary to ask courts to decide whether to liquidate the project, as in the "complete contract". If $\alpha\overline{y}_2 \geq L$ the parties can attain the first best by contractually giving I the option to liquidate the project or not, while at the same time transferring all cash flows to I. This way, I is virtually the residual claimant of the project and only liquidates in state B when it is efficient to do so.[11]

More generally, when the project is illiquid, the contract may give I a call option (I-call) to buy the project, liquidate it and obtain L.[12] The strike price of the option is $S_{IC} = \max[0, L - \alpha\overline{y}_2]$. If the option is exercised, I pays the strike price to E. If the option is not exercised, I obtains a share α of continuation cash flows. This contract gives I the incentive to continue if and only if future cash flows are $\overline{y}_2$. If $\alpha \geq \alpha^* \equiv L/\overline{y}_2$, then the optimal strike price is 0. If instead $\alpha < \alpha^*$, then

[11]Notice that if $\alpha\overline{y}_2 \geq L$, this option works as "selling the firm to the investor". The reason is that when $\alpha\overline{y}_2 \geq L$, the investor has the incentive to take the right decision with respect to liquidation. However, important legal issues make the two contracts profoundly different from an enforcement standpoint. For example, under "selling the firm to the investor", I is the sole shareholder and E owes I fiduciary duty.

[12]Because transferring control of the project to the investor avoids the use of E's human capital, we view I's option to buy as equivalent to I's option to liquidate.

the strike price ($S_{IC} > 0$) must be positive, otherwise I would always liquidate. Intuitively, the optimal strike price avoids overliquidation in state U by equalizing I's continuation and liquidation payoffs in that state. The I-call is not the only way to implement the first best liquidation policy. An alternative *option* contract gives E a put option to sell the project to I (i.e. to liquidate) for the strike price $S_{EP} = (1-\alpha)\underline{y}_2$. This strike price persuades E to liquidate the project in state B by equalizing his continuation ($(1-\alpha)\underline{y}_2$) and liquidation ($S_{EP}$) payoffs.

Thus, by using options parties can do away with courts' mistakes and implement the efficient liquidation policy by exploiting their own information about the project's continuation value. As emphasized by Bebchuk (1988) and Aghion, Hart and Moore (1992), an important benefit of options is to allow for endogenous information revelation. However, the parties' ability to write *option* contracts crucially hinges on α. When $\alpha < \alpha^*$, the parties must allocate some liquidation proceeds to E through a positive strike price to provide incentives for efficient continuation. Because the strike price reduces I's payoff from liquidation, the use of options may conflict with break even.

In both *option* contracts, the strike prices S_{IC} and S_{EP} summarize the ex ante cost of incentives because they represent the amount of the liquidation proceeds I must forsake to implement the optimal liquidation policy. Let $\widetilde{L} = L - \min[S_{IC}, S_{EP}]$ be the largest liquidation payout I can obtain under I-call or E-put.[13] Then, under these contracts, I lends at most:

$$\pi(\alpha y_1 + \overline{y}_2) + (1-\pi)(1/2)(\widetilde{L} + \alpha\overline{y}_2). \tag{2}$$

The first term in (2) represents the maximal ex ante repayment I can extract in state G; the second term is the maximal average repayment I can extract in U and B under *option* contracts. If (2) is larger than K, then either I-call or E-put (or both) achieve the first best and I breaks even. Crucially, (2) increases with creditor protection α. The larger is α, the lower the ex ante cost of options, as measured by the strike price. As a result, I's break even is more likely. Conversely, the lower is α, the greater the conflict of interest between I and E over whether to liquidate, the steeper must be the incentives, and the larger the share of liquidation proceeds that must accrue to E (the smaller is $\widetilde{L}$). Thus, options are less likely to be feasible if creditor protection (α) is low.

Notice that if α is sufficiently low, *options* may not ensure break even. As a result, the parties

[13]It is helpful to compare repayment under the two debt plus option contracts. They both yield the same to I in G and U. In B, the investor call repays more if $(1-\alpha)\underline{y}_2 \geq \min[L, \alpha\overline{y}_2]$, i.e. if α is small. Because $\overline{y}_2 > \underline{y}_2$, as α goes down, I's bias for liquidation increases more than E's bias for continuation. As a result, providing incentives to I is relatively more costly at low levels of α.

may need to sacrifice ex post efficiency to be able to finance the project. A simple way to go for the parties is to mandate a "cash auction" whereby the project is liquidated if E fails to repay $d_1(G)$ and all liquidation proceeds go to I. This contract is akin to the optimal debt contract studied by Hart and Moore (1998) in the case of unverifiable cash flows, whereby foreclosure automatically follows non-repayment. Thus, we call this arrangement a *straight debt* contract to stress its similarities with the standard notion of debt. However, we note that in our framework the use of automatic foreclosure endogenously depends on creditor protection α. Because under *straight debt* the project is liquidated both in states B and U, I lends at most:

$$\pi(\alpha y_1 + \overline{y}_2) + (1 - \pi)L. \tag{3}$$

By comparing (2) and (3), one can see that if $\alpha < \alpha^*$, investor break even is easier to attain under *straight debt* than *options*, for two reasons. First, because $\alpha\overline{y}_2 < L$, even under efficient continuation I obtains less than under liquidation. Second, in this parameter range options are costly because, in contrast to *straight debt*, they allocate some liquidation proceeds to E. However, differently from *options*, *straight debt* imposes ex post inefficiencies because in state U, the project is over-liquidated and the parties lose $(1 - \pi)(\overline{y}_2 - L)/2$. Can the parties improve upon *straight debt* by calling for courts' intervention ex post on the decision of whether to liquidate the project?

It turns out that the answer is yes. First, if courts are precise (i.e. if θ is low enough) then court intervention is better than *straight debt* from an ex post standpoint. Intuitively, precise courts give rise to lower overliquidation costs than *straight debt*. Second, for a given α, court intervention verifying whether the state is U or B reduces the incentive cost of options. Intuitively, courts' intervention allows the parties to increase the share of liquidation proceeds accruing to I by reducing the need for endogenous information revelation. Formally, the parties may write a *court intervention* contract whereby I is given a call option with a state-contingent strike price, $S_{IC}(B) = 0$, and $S_{IC}(U) = L - \alpha\overline{y}_2$. If first-period cash flows are zero, the court intervenes by estimating the project's future prospects, thus enforcing the state-contingent strike price. As a result, if $\theta = 0$, then in state B all liquidation proceeds go to I, who lends at most:

$$\pi(\alpha y_1 + \overline{y}_2) + (1 - \pi)(1/2)(L + \alpha\overline{y}_2). \tag{4}$$

By comparing (4) and (2), one can see that if $\alpha < \alpha^*$, *court intervention* avoids the ex ante cost of incentives because it allocates all liquidation proceeds to I. As a result, *court intervention* is more feasible than *options*. Interestingly, this is also true when courts make mistakes, i.e. $\theta > 0$, because expression (4) still holds. The intuition here is that θ does not affect repayment because there is no bias towards continuation or liquidation. As a result, courts' mistakes cancel out and do not affect average repayment (under a pro-continuation bias instead, break even would require such a bias not to be too large). This discussion implies that *court intervention* is more feasible than *options*. As a result, for intermediate α, *court intervention* improves upon *straight debt* when *options* are infeasible. This observation does not mean that court intervention is costless ex post. If the precision of the courts' estimate is low (i.e. $\theta > 0$), courts may enforce the wrong strike price. The resulting ex post loss is the cost of court intervention. In particular, the cost of *court intervention* arises in U if courts enforce $S_{IC}(B) = 0$, thus inducing the over liquidation loss $(1-\pi)(1/2)\theta(\overline{y}_2 - L)$. Such expected ex post loss is smaller than that arising under *straight debt* but larger than that arising under *options*. In addition, when α is low, *court intervention* is also costly from an ex ante standpoint, so that mandating a cash auction under *straight debt* is the only way to finance the project. In fact, by inducing continuation in U, *court intervention* reduces repayment to I relative to *straight debt*.

To sum up, the resolutions of financial distress under the above contracts differ as to how they trade off investor break even (ex ante efficiency) with efficient continuation (ex post efficiency). *Straight debt* maximizes the former at the expense of the latter; *options* maximize the latter at the expense of the former; *court intervention* is in between the previous two. Hence, *options* yield the first best, *court intervention* the second best and *straight debt* the third best. Are there other contracts that resolve financial distress more efficiently? More importantly, how does contract enforcement (α, θ) affect contracting and welfare? We find:

Proposition 1 *There exist $\alpha_O \geq \alpha_C \geq \alpha_S$ such that the project is financed if and only if $\alpha \geq \alpha_S$. For $\alpha \geq \alpha_O$, the parties cannot improve upon options (I-call or E-put), which attain the first best. For $\alpha \in [\alpha_C, \alpha_O)$, the parties cannot improve upon court intervention, which attains the second best. In this range, social welfare decreases in θ. For $\alpha \in [\alpha_S, \alpha_C)$, the parties cannot improve upon straight debt, which attains the third best.*

Straight debt, *options* and *court intervention* are the most efficient contracts for the parties to use.[14] Crucially, creditor protection α shapes contracting by shaping the tradeoff between ex

[14]Notice that other option contracts can never dominate the two discussed here. For instance, if $\alpha < 1$, giving E a call to buy the project at the strike price $\alpha\overline{y}_2$ will always lead to continuation because E always prefers the latter

ante and ex post efficiency. If α is high ($\alpha \geq \alpha_O$), investor break even is easy to attain and the parties reach the first best by using *options*. If α is intermediate ($\alpha_C \leq \alpha < \alpha_O$), the cost of incentives undermines break even and the parties complement options with court intervention. Notice that our framework features optimal court intervention as the enforcement of an option's state-contingent strike price. In contrast to the standard form of ex post court intervention, where courts directly mandate liquidation or continuation, our mechanism reduces ex post inefficiencies for given courts' expertise θ.[15] If α is low ($\alpha_S \leq \alpha < \alpha_C$), break even is hard to attain and the parties sacrifice ex post efficiency by writing a *straight debt* contract.[16]

As a result, creditor protection (α) affects welfare by shaping the parties' ability to resolve financial distress by contract. As α becomes smaller, ex post inefficiencies increase because parties must move away from *options* to *court intervention* and eventually to *straight debt*. If α is very low, no debt contract is feasible and the project is not financed. Thus, creditor protection affects how strong is the trade-off between ex ante and ex post efficiency. In addition, when *court intervention* is used, welfare decreases in θ because poorer courts' expertise increases the likelihood of over-liquidation. An objection to our result is that if the parties were allowed to renegotiate inefficient contract terms ex post, ex ante contracts would matter less than in Proposition 1. By allowing for ex post renegotiation we establish:

Proposition 2 *If I has all the bargaining power in renegotiation, then for $\alpha_C \leq \alpha < \alpha_O$ there is a function $\theta_R(\alpha)$ increasing in α such that for $\theta \leq \theta_R(\alpha)$ I lends $K + \theta(L - \alpha\overline{y}_2)$ and parties attain the first best under court intervention. For every (α, θ) outside this region, contract choice and welfare are the same as in Proposition* 1.

In our model ex post renegotiation improves little over ex ante contracts because the ex ante enforcement constraints also hold ex post when renegotiation occurs. Full bargaining power on

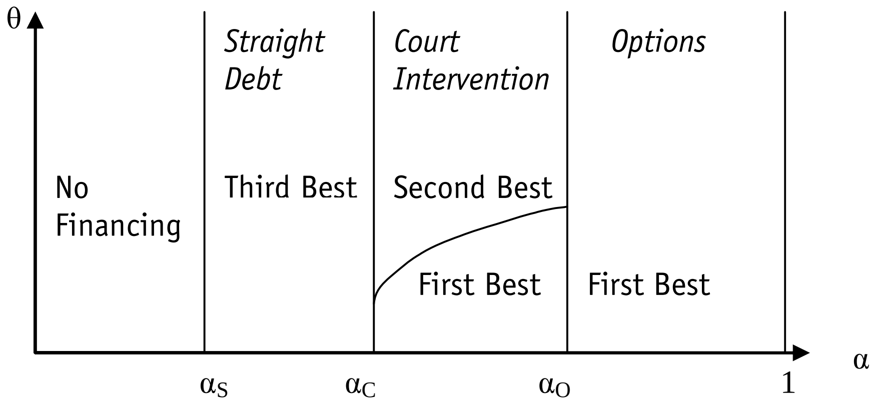
outcome (yielding him at least $(1-\alpha)\underline{y}_2$) to liquidation (yielding him 0). Indeed, E's promise to pay $\alpha\overline{y}_2$ is not credible in state B. Even if E can borrow from a third party in state U or B, the E-call does not work for low α for two reasons. First, third party borrowing only helps if that party perfectly knows the continuation value of the project. This is unreasonable, especially because the main virtue of options is that they give incentives for ex post efficiency without using third party information. If third party information were perfect, options would be useless in the first place. Second, even if the third party lender is perfectly informed, if $\alpha < \alpha^*$ I would bribe him not to lend to E, thus leading to over-liquidation. Table $A1$ in the appendix compares the properties and the performance of all option contracts.

[15] Also, our model rationalizes ex post court intervention from an ex ante standpoint without resorting to either managerial moral hazard (e.g. Giammarino and Nosal 1996) or unforeseen contingencies (e.g. Bolton and Rosenthal 2002).

[16] Assumption A.2 matters here: it implies that if *straight debt* guarantees financing, E prefers to sign it rather than doing nothing. Yet, the main features of contract choice remain valid, even if A.2 does not hold.

I's part shows this intuition very clearly. Now *debt plus option* contracts are renegotiation proof not only because they yield ex post efficiency, but also because they already maximize repayment to I, which discourages him from strategically renegotiating ex post. But *straight debt* is also renegotiation-proof when optimal, because E does not have enough resources to bribe I to continue the project in U (this is more generally the case if $\alpha < \alpha^*$). Renegotiation only matters if $\alpha \in [\alpha_C, \alpha_O)$, when *contingent debt* is optimal. In this case, it is optimal for I to lend E the extra amount $\theta(L - \alpha\overline{y}_2)$ ex ante, which allows E to bribe I ex post so as to avoid the over liquidation cost of courts' imprecision. Yet, this contract is feasible only if courts are sufficiently precise (i.e. if $\theta \leq \theta_R(\alpha)$), otherwise I should lend so much as to undermine break even. Thus, our main findings also hold when we allow for renegotiation. Figure 3 summarizes the pattern of contract choice and welfare emerging from Proposition 2:

Figure 3. Contract Choice



These results change little if E has all the bargaining power. We study this case in the appendix and find that, with respect to Proposition 2, this shift in bargaining power only affects the contract where E is given a put option. Now, E may strategically use his decision rights to reduce the payment to I ex post. This reduces the feasibility of the E-put and lowers the threshold above which *options* are feasible to $\widetilde{\alpha}_O \leq \alpha_O$. Yet, the main thrust of Proposition 1 is preserved.

Overall, these results indicate that creditor protection affects the parties' ability to resolve financial distress by contract. By increasing the pledgeable income, stronger creditor protection facilitates the implementation of incentive schemes, thereby fostering more sophisticated and flexible resolutions of financial distress. In particular, better creditor protection allows the parties to attain the first best by using options. When creditor protection is intermediate, options become too costly and the parties complement them with direct court intervention in the continuation/liquidation decision. In this parameter range, the quality of information produced in bankruptcy becomes a key determinant of ex post efficiency and welfare. When creditor protection is instead low, the parties write a *straight debt* contract that maximizes repayment to the investor at the cost of over-liquidating the project. Finally, if creditor protection is lowest the project is not financed.

These results confirm the idea that the enforcement quality of courts affects contractual flexibility (Gennaioli 2005) and rationalize the recent evidence in law and finance that better enforcement fosters the use of more sophisticated financial contracts (Lerner and Schoar 2005, Qian and Strahan 2004), thereby spurring the development of financial markets (Djankov et al. 2005, La Porta et al. 2006). Section 5.2 shows that these results can also help rationalize different approaches to resolutions of financial distress across countries as being optimal depending on creditor protection. In particular, we rationalize the use of options and strict contract enforcement in U.K. Receivership, the use of court supervision in U.S. Chapter 11, and the use of cash auctions in Sweden. Section 5.1 discusses how our model can rationalize existing proposals for bankruptcy reforms, and lays out our key normative implications.

4 Multiple Creditors

We now extend our model to the case where the entrepreneur borrows from multiple creditors. Our goal is to study how debt structure (defined as the relative number and size of dispersed/unsecured claims) responds to creditor protection so as to efficiently resolve financial distress. We introduce multiple creditors by assuming that the project's physical assets feature constant returns to scale and can be partially liquidated. That is, after liquidating a share $f < 1$ of the firm's assets, total output is fL plus the continuation value $(1-f)y_2(\omega)$.

4.1 Contracts and Coordination Among Creditors

We now establish that, for given contract enforcement (α, θ), under multiple creditors the debtor can always replicate the single-creditor outcome by suitably choosing debt structure. Thus, we want to address the often made point that the key issue in resolving financial distress is to regulate conflicts among multiple creditors (Jackson 1986) that could lead to inefficient runs on the assets of the company (e.g. Bulow and Shoven 1978). Suppose that the project is financed by a number $n > 1$ of creditors and that renegotiation is not allowed. We establish:

Proposition 3 *For any given (α, θ), the firm can always replicate the optimal one-creditor contract by issuing $n > 1$ identical claims, each of the same type as that the one-creditor would obtain, and with a face value equal to $(1/n)^{th}$ of the face value of the one-creditor's debt.*

The one creditor outcome can be replicated under $n > 1$ creditors by dividing, for any (α, θ), what formerly was a single claim into n identical claims. For example, if it is optimal for a single investor to lend under *options*, each of the n investors is given a debt contract whose face value is $(1/n)^{th}$ of the single-creditor contract, whereby either E or I is given the option to continue or liquidate $(1/n)^{th}$ of the project. The same logic can be applied to all other contracts. The intuition is straightforward: under constant returns to scale, the project can be divided into n identical but smaller projects, each financed by only one creditor. As a result, ex post inefficient runs on the project's assets are avoided, except when they are necessary for ex ante break even, i.e. when straight debt is optimal.

Thus, lack of coordination among creditors is not a concern if parties can contract ex ante. In fact, Proposition 3 does not require any coordination among creditors. Optimal contracting is achieved because under competitive credit markets the entrepreneur internalizes the costs and benefits of different contracts, thus working as an effective coordination mechanism.[17] Proposition 3 does not say, however, whether the entrepreneur can actually do better than in the single-creditor case by suitably choosing the debt structure. Moreover, Proposition 3 takes (α, θ) as given, even though it is natural to expect that the number of creditors affects contract enforcement. In the next section we study optimal debt structure and ask to what extent it depends on creditor protection.

4.2 The Optimal Debt Structure

We study the impact of creditor protection on debt structure in two steps. Section 4.2.1 takes (α, θ) as given, while Section 4.2.2 endogenizes α as a function of debt structure.

In our model debt structure is defined by the relative number and size of secured claims with respect to unsecured ones. In fact, a crucial difference between the single-creditor and the multiple-

[17] This observation implies that the replicability of the one creditor outcome under multiple creditors does not hinge on the assumption of constant returns either. For example, if the project's assets are complementary, E only needs to add a provision in each of the n debt plus option contracts whereby the entire project is liquidated when at least one option holder exercises. See the proof of Proposition 3 for details.

creditors case is that now E can always finance part of the project by issuing unsecured debt. In the one-creditor case, an unsecured claim guarantees financing only when α is very high. We call "unsecured" any creditor that in no state of nature has the individual right to liquidate (a share of) the project's assets. Holders of *options*, *court intervention* or *straight debt* contracts are all regarded as secured. Fully unsecured claims – i.e. claims distributing 0 in liquidation – are only feasible if $\alpha > 0$.[18] The face value of a fully unsecured claim paying out only in G (when the project is liquid) is at most $\pi\alpha(y_1 + \overline{y}_2)$. Indeed, if an unsecured claim is repaid more than $\alpha(y_1 + \overline{y}_2)$, E selectively defaults on it and only repays the secured creditors.

Unsecured debt plays a crucial role in our model. Its coexistence with secured claims in a debt structure allows E to reduce the ex ante costs of options and thus improve both ex post and ex ante efficiency. To see this, suppose that $\alpha \geq \alpha_C$. Proposition 1 showed that in this range, under a single creditor full ex post efficiency is only attained under an *option* contract giving E some liquidation proceeds via the strike price, thereby reducing repayment to I and thus debt capacity. If instead E borrows from two creditors, one secured holding I-call and another unsecured, the secured one can pay the option's strike price $S_{IC} = \max[0, L - \alpha\overline{y}_2]$ to the unsecured one. The combination of these two contracts attains full ex post efficiency and allows E to borrow up to:

$$\pi(\alpha y_1 + \overline{y}_2) + (1 - \pi)(1/2)\left[\max(L, \alpha\overline{y}_2) + \alpha\overline{y}_2\right]. \tag{5}$$

The comparison of (5) and (2) shows that borrowing from a secured and an unsecured creditor allows the entrepreneur to exploit the ex post benefit of *options* without paying their ex ante cost. Because the option holder can now pay the option's strike price to the unsecured creditor, total debt capacity is unaffected by incentive costs. In other words, mixing secured and unsecured claims allows the entrepreneur to separate liquidation rights and repayment,[19] which reduces the cost of incentives and facilitates break even. Yet, such separation of liquidation and repayment rights can be hard to achieve in practice, especially if courts' ability to protect creditors is low. If $\alpha < \alpha^*$, creditors as a group lose from continuation. Hence, if they collude against the debtor, the project is always liquidated in state U.

[18] We also call "secured" a creditor in the case of an E-put *option* contract because, provided that E exercises his option, then I liquidates the project. Moreover, notice that we introduce the notion of "fully unsecured" creditors because a creditor may have no rights to decide whether to liquidate or continue the project, but still be entitled to some liquidation proceeds. We return to this issue below.

[19] This is the most important distinction between secured and unsecured claimants in our model. The former have the right to liquidate the project, the latter do not have any such right even though they may be entitled to some liquidation proceeds.

4.2.1 Renegotiation and the Benefit of Debt Dispersion

Can the debt structure, i.e. the relative number, size and type of secured claims, be designed so as to counter the impact of ex post collusion among creditors? To address this issue, we need to specify a process of coalition formation among $n > 1$ creditors. We assume:

A.3: With n creditors, a coalition of $s \leq n$ of them forms with probability $P(s\,|n) = [n!/(n-s)!s!]\,/2^n$

Thus, coalitions among players form by random assignment. $A.3$ captures the intuitive notion that if n is larger it becomes harder to form an encompassing coalition of creditors. Renegotiation works as follows: after a coalition is formed, its members bargain over liquidation and unsecured creditors have all the bargaining power (this assumption only simplifies the analysis but is not important for our results). Under $A.3$, we find:

Proposition 4 *If $\alpha \geq \alpha_C$, E attains the first best by borrowing the amount $\pi(1-\alpha)\overline{y}_2 + (1-\pi)(1/2)(L - S_{IC} + \alpha\overline{y}_2)$ from a large secured creditor holding an I-call option with strike price $S_{IC} = (L - \alpha\underline{y}_2)$ and the amount $\pi(\alpha y_1 + \alpha\overline{y}_2) + (1-\pi)(S_{IC}/2)$ from infinitely many unsecured creditors. If $\alpha_S \leq \alpha < \alpha_C$, E cannot do better than by borrowing $\pi(1-\alpha)\overline{y}_2 + (1-\pi)L$ from a large secured creditor holding straight debt and the amount $\pi(\alpha y_1 + \alpha\overline{y}_2)$ from infinitely many unsecured creditors. If $\alpha < \alpha_S$, the project is not financed.*

If $\alpha \geq \alpha^*$, all creditors benefit from continuing the project when it is efficient to do so. Thus, the optimal debt structure is not renegotiated and attains the first best. If $\alpha < \alpha_C$, not only does every creditor find it optimal to always liquidate but it is also efficient to do so, because it is the only way to ensure break even. As a result, the secured creditor is given *straight debt* $-$ which is not renegotiated.[20] If $\alpha < \alpha_S$, the project is not financed.[21]

The most interesting case arises if $\alpha^* > \alpha \geq \alpha_C$. Now E can attain the first best by issuing a debt structure similar to the two-creditors structure above, except for the strike price S_{IC} now being larger and the unsecured debt now being dispersed among infinitely many bondholders.

[20] Under multiple creditors, we have allowed for partial liquidation. Thus, for $\alpha_S \leq \alpha < \alpha_C$, break even is also attained by a *straight debt* contract that in U and B liquidates a fraction $f < 1$ of the project. Intuitively, partial liquidation improves upon full liquidation if and only if over-liquidation is more costly than under-liquidation, i.e. if $L < (\overline{y}_2 + \underline{y}_2)/2$. See the appendix for details.

[21] Other debt structures yield the same outcome for $\alpha \notin [\alpha_C, \alpha^*)$ as there need not be only one secured creditor nor many unsecured ones. In general, the set of possible debt structures is very large, as any liquidation policy can be attained under different packages of contracts (e.g. a liquidation pattern can be attained by arbitrarily dividing liquidation rights among different creditors). Yet, our goal here is to illustrate, by reference to some specific and intuitive debt structures, what E can at most achieve as a function of α.

Importantly, E grants all continuation proceeds (i.e. $\alpha\overline{y}_2$) to a single, large option holder and sets the largest strike price at which the option holder continues in U but liquidates in B. This debt structure is optimal for two reasons. First, by maximizing the option holder's incentive to continue in U, it makes it harder for any coalition of unsecured creditors to bribe the option holder into inefficient liquidation. Second, for given repayment to the option holder, dispersion of unsecured debt among infinitely many creditors minimizes the probability of any given coalition of them having enough resources to convince the option holder to liquidate.[22]

To gauge the benefit of debt dispersion, suppose that there are $n-1$ unsecured creditors. Then, because every creditor benefits from liquidation, the project is always efficiently liquidated in state B. In state U instead, a coalition of $m \leq n-1$ unsecured creditors successfully bribes the option holder to inefficiently liquidate if:

$$L - S_{IC} + \frac{m}{n-1} S_{IC} \geq \alpha\overline{y}_2 \quad \Leftrightarrow \quad m \geq \widetilde{m}(n) = (n-1)\,\frac{\alpha(\overline{y}_2 - \underline{y}_2)}{L - \alpha\underline{y}_2}. \tag{6}$$

The left-hand side of (6) identifies the size of the smallest coalition of unsecured creditors m such that the coalitions' bribe to the option holder in state U, $(m/n)\,S_{IC}$, induces the option holder to inefficiently liquidate the project. As the right-hand side of (6) shows, the size of such a smallest coalition increases with the number of unsecured creditors for when n is larger, each unsecured creditor obtains a smaller fraction of the liquidation proceeds.

As a result, over-liquidation in state U occurs with probability $\Pr(m \geq \widetilde{m}(n)\,|n-1)$, i.e. when a coalition with at least $\widetilde{m}(n)$ unsecured creditors forms. For $n \to +\infty$, this probability goes to zero as the only coalition inducing liquidation eventually becomes the grand coalition, which forms with probability zero.[23] Hence, by dispersing unsecured debt, E can bring to zero the cost of incentives and the parties no longer rely on the court's intervention.

This result indicates that borrowing from multiple creditors under the optimal debt structure allows a more efficient resolution of financial distress by reducing the ex ante costs of incentives. Due to the separation between repayment and liquidation rights, this effect is attained and made robust to ex post collusion among creditors by 1) concentrating liquidation rights to a large secured

[22] This result may seem to contradict the idea that unsecured creditors favor continuation over liquidation. In our model, this effect does not hold because there are no violations of priority among creditors. It would instead hold if, for example under straight debt, continuation allowed the secured creditors' priority to be violated. We return to the issue of violation of priorities at the end of section 4.2.2 below.

[23] The same benefit of debt dispersion (and the same optimal debt structure) also arises under the alternative assumption that each unsecured creditor individually decides whether to bribe the option holder or not. In this case, collective bribing fails because of holding out of dispersed creditors (Gertner and Sharfstein 1991).

creditor and 2) dispersing repayment among unsecured creditors. This result differs from existing studies on the optimal number of creditors; for example, Bolton and Scharfstein (1996) show that debt dispersion beneficially increases creditors' bargaining power by reducing the debtor's incentives for strategic default. By contrast, dispersion of unsecured debt here reduces creditors' power by preventing them from colluding against the debtor.[24] Another strand of the literature focuses on multiple investors holding *different* claims, such as debt vs. equity (Dewatripont and Tirole 1994) and short-term debt vs. long-term debt (Berglof and von Thadden 1994). These papers take the basic financial contracts as given and study how to combine them in an optimal financial structure. Instead, we derive at the same time the optimal contracts and the optimal financial structure.[25]

4.2.2 Moral-Hazard-in-Teams and the Cost of Debt Dispersion

Proposition 4 stresses a benefit of debt dispersion, but it does not fully pin down debt structure as a function of creditor protection, because it does not explain how the latter affects the optimal number of creditors n. For instance, when the secured creditor is given *straight debt* (in $\alpha_S \leq \alpha < \alpha_C$), the number of unsecured claimants is indeterminate because no ex post renegotiation can ever occur.

However, borrowing from many creditors may be costly because their uncoordination might make them vulnerable to the debtor, eventually undermining break even. This is especially true in bankruptcy, where creditors' dispersion can severely impart their overall litigation strategy by hindering, for example, their individual incentives to invest resources in gathering evidence, hiring lawyers, bringing motions to the court to catch, void or rescind managerial divertive activities. As a result, by shaping the litigation costs of dispersed creditors, creditor protection can affect the optimal number of creditors. In this exploratory section, we introduce some of these considerations in our model of contracting.

For simplicity, we only focus on how litigation among multiple creditors may affect α, i.e. the share of cash flows that creditors can seize. Concretely, assume that if creditor i engages in (unverifiable) legal effort x_i, he prevents the debtor from diverting a share x_i/n of each creditor's repayment. This assumption captures the nature of litigation as a public good: a creditor's successful attempt to monitor the debtor restrains the diversive activities of the latter at the benefit

[24] However, it is interesting to notice that in the case of asset complementarity, the Bolton and Scharfstein (1996) trade-off on the number of secured creditors also arises in our model, but only for $\alpha = 0$.

[25] In a costly-state-verification model, Winton (1995) derives the optimal mix of secured and unsecured claims as a function of exogenous verification costs. In our model, the ex ante and ex post costs of different claims are instead endogenously determined as a function of imperfect enforcement.

of all creditors. To exert x_i (e.g. to produce evidence or bring a motion to the court), creditor i spends a share $(1/2)\delta x_i^2$ of his own repayment.[26] Parameter $\delta \geq 0$ characterizes creditor protection in this section. If δ is higher creditors are less protected, thus increasing the amount of resources they should expend to avoid self dealing and obtain repayment. Each creditor individually invests $x_i = 1/(\delta n)$.[27] As a result, all creditors obtain the same share of their due repayment, which also corresponds to the overall share of cash flows the debtor is forced to disgorge:

$$\alpha(n, \delta) = \frac{2n - 1}{2\delta n^2}. \tag{7}$$

Intuitively, the share of cash flows the debtor must disgorge decreases with the number of creditors, because a larger n worsens the moral hazard in team among creditors. Bris and Welch (2005) exploit this effect to study the optimal concentration of creditors. Interestingly, the severity of the moral-hazard-in-teams problem depends on creditor protection δ. If creditor protection is perfect ($\delta = 0$), then the number of creditors becomes irrelevant. If creditor protection is instead imperfect ($\delta > 0$), creditors' uncoordination is costly and debt dispersion reduces $\alpha(n, \delta)$.[28]

Expression $\alpha(n, \delta)$ can be integrated into our previous analysis. Now enforcement is described by (δ, θ) and the earlier predictions obtained in the (α, θ) space can be formulated in the (δ, θ) space, with the main difference that our model also yields predictions on the number of creditors n. By inverting (7), one can define the function $n(\delta, \alpha)$, which indicates the number of creditors from which E can borrow so as to disgorge a fraction α of cash flows under creditor protection δ. The larger is δ, the larger is the cost of creditors' uncoordination as reflected in a smaller α and, in turn, the smaller is the maximum number of creditors consistent with financing. Thus, better creditor protection reduces the cost of creditors' multiplicity.

Creditor protection also affects debt structure. In line with Proposition 3, if $\delta \leq 1/2\alpha^*$, then E can credibly commit to pledge at least a share α^* of cash flows to creditors by issuing *options* to $n \leq n(\delta, \alpha^*)$ creditors, attaining the first best. If $\delta > 1/2\alpha_C$, E cannot do better than disgorge a share α_C of cash flows. Thus, E attains the third best by issuing *straight debt* to $n(\delta, \alpha_S)$

[26] This amounts to assuming that creditors' expenditures are perfect substitutes in increasing the total share of pledgeable cash flows. This assumption is only made for simplicity and ensures that creditors' incentives do not depend on the value of their claims.

[27] That is, each creditor solves $\max_{x_i} x_i/n - (1/2)\delta x_i^2$. For simplicity, we rule out the formation of coalitions that coordinate creditors' litigation efforts. The main thrust of the results would not change if such coalitions could form.

[28] The model could also be enriched to study the effect of violation of priority among creditors. By reducing the certainty of property rights over cash flows, such violation would presumably exacerbate the public good nature of creditors' litigation strategies.

creditors at most. For $\delta > 1/2\alpha_S$, the project is not financed. The interesting case now arises for $\delta \in (1/2\alpha^*, 1/2\alpha_C]$ as the project could either be financed by *options* or *court intervention.* As in Proposition 3, if E can set $n = \infty$, *court intervention* is never optimal. However, for $\delta \in (1/2\alpha^*, 1/2\alpha_C]$ the creditors break even only if E issues at most $n(\delta, \alpha_C) - 1 < \infty$ unsecured claims. As a result, giving a call option to a large secured creditor as in Proposition 3 results in over-liquidation in U with probability $\Pr(m \geq \widetilde{m}(n(\delta, \alpha_C)))$, i.e. whenever a sufficiently large coalition of unsecured forms (see (6) for reference). As a result, *court intervention* may still be optimal if courts' mistakes are small. For instance, for θ low enough the "complete contract" directly asking the bankruptcy court to decide whether to liquidate or continue may yield greater ex post efficiency than *options.* In this case, *court intervention* avoids that coalitions of creditors lead to over-liquidation. Thus, when weak creditor protection makes debt dispersion costly, *court intervention* might be the only way of effectively solving the conflict of interest between the debtor and the creditors, even if courts make mistakes. Because $n(\delta, \alpha)$ decreases in δ, our model predicts that better creditor protection should facilitate debt dispersion.

In sum, section 4.2 shows that also debt structure adjusts to creditor protection so as to efficiently resolve financial distress. When creditor protection is high (α is high or δ is low) the entrepreneur borrows from a large secured creditor under *options* (or *court intervention*) and from a set of dispersed unsecured creditors. When creditor protection is instead low (α is low or δ is high), sophisticated debt structures do not work. In this case, entrepreneurs borrow from fewer creditors, issue fewer unsecured claims and strengthen the liquidation rights of secured creditors by mandating a cash auction in financial distress. Thus, our model delivers the novel prediction that better creditor protection should facilitate the issuance of dispersed and unsecured claims.

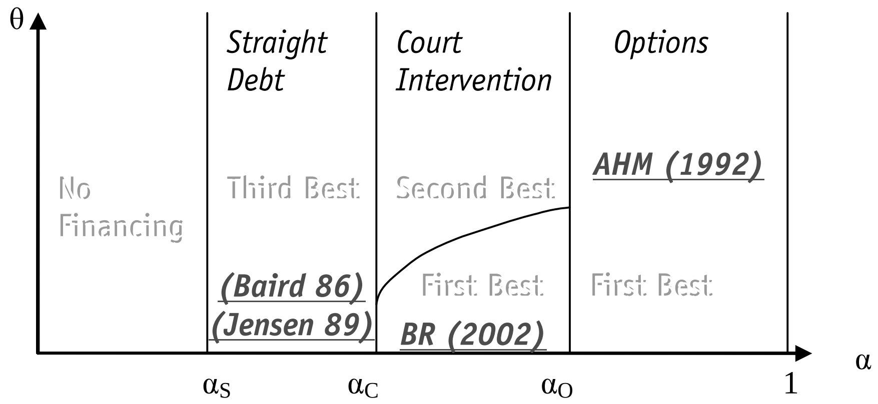
5 Normative Implications

Our analysis underscores the role of private contracting in the resolution of financial distress. Accordingly, we stress the general normative principle that bankruptcy law should accommodate rather than supersede private contracting. There are two main implications. First, bankruptcy should be set as default instead of mandatory rules, so as to allow parties to opt out of them by contract (Rasmussen 1992, Schwartz 1997). Second, bankruptcy reforms should foster parties' ability to flexibily contract about financial distress by improving creditor protection against managerial self dealing. Section 5.1 discusses the costs of mandatory bankruptcy procedures by reconciling previously conflicting proposals for optimal bankruptcy reform. Section 5.2 examines the benefits of increasing creditor protection against managerial self dealing by rationalizing existing resolutions of financial distress around the world.

5.1 Costs of Mandatory Bankruptcy Procedures

By limiting the space of feasible contracts, mandatory bankruptcy procedures are likely to prevent parties from achieving the most efficient resolution of financial distress. Indeed, in the real world parties often fail to include in their debt contracts detailed clauses to deal with financial distress because the law explicitly forbids them to opt out of the state-mandated procedure. What is then the cost of mandatory bankruptcy procedures? This question is best addressed by examining how, in our model, the leading current proposals for bankruptcy reform emerge as part of the optimal contract depending on creditor protection. We start by discussing the single creditor model, which already conveys the main messages of our analysis. Figure 4 below shows when the use of options (Aghion, Hart and Moore 1992, AHM henceforth), ex post court intervention (Bolton and Rosenthal 2002, BR henceforth) and cash auctions (Baird 1986, Jensen 1989) are optimal as a function of (α, θ). Because we find that no procedure is optimal for every (α, θ), we can evaluate the welfare costs of mandating any of these proposals irrespective of creditor protection and courts' expertise.

Figure 4. Bankruptcy Reform Proposals



Because *options* are the optimal contract when $\alpha \geq \alpha_O$, our model rationalizes the optimality of the AHM procedure when courts' ability to protect creditors against managerial self dealing is sufficiently high. The basic idea of AHM, which also uses options, goes as follows. First, when a firm goes bankrupt, all the firm's debts are cancelled, and all claims are converted into equity. Then, in line with Bebchuk (1988), former claim-holders are either allocated equity in the new company (in the case of senior creditors) or given an option to buy equity (in the case of junior creditors or shareholders), according to the amount or priority of their claims. Then, cash and non-cash bids are solicited for all or part of the new firm. After the options have expired, the new shareholders vote on whether to select one of the cash bids or maintain the company as a going concern, either under existing management or under some alternative management team. The firm then exits from bankruptcy.

In the context of our model, this scheme amounts to: 1) transferring control of the project to I, and 2) giving E (i.e. the only shareholder) a call option to buy back the project from I. By exercising the option, E avoids liquidation and continues the project.[29] Because in AHM the strike price of the option ensures that upon exercise, I is repaid in full with respect to the original (incomplete) debt contract, it seems reasonable to assume that the call option given to E has a strike price of L.

The way this scheme works depends on whether E is given the right to exercise the option by making a cash or a non-cash payment. In the former case, E can raise up to $\alpha\overline{y}_2$ from capital markets in state U. As a result, the AHM scheme yields full efficiency for $\alpha\overline{y}_2 > L$ and over-liquidation otherwise. If instead E is allowed to exercise the option by making a non-cash payment (i.e. by issuing shares), the AHM scheme yields always over-continuation because E will always claim that the state is U and promise to pay out L out of second period cash flows $\overline{y}_2$. By always continuing, E obtains at least $(1-\alpha)\, y_2(\omega) > 0$ as opposed to 0 under liquidation. In line with our findings in Section 3, this discussion suggests that for $\alpha \geq \alpha_O$, the AHM procedure as discussed above is (weakly) dominated by one that gives a call option to I or a put to E. In fact, for $\alpha \geq \alpha_O$, unlike AHM, either I-call, E-put or both guarantee the first best.[30] More generally, irrespective of the type of options used, if $\alpha < \alpha_O$, our analysis indicates that the ex ante cost of options is larger than their ex post benefit and options are no longer optimal. In this case, a bankruptcy procedure mandating the distribution of options ex post is costly, either because it

[29] As stressed by AHM, options serve two roles. First, options are a way to endogenously reveal information of the project's continuation value. Second, options are a way to preserve absolute priority. Because we focus only on the former, to map the AHM proposal into our model it does not matter whether there is only one or many creditors.

[30] Our optimal I-call and E-put can thus be interpreted as mandating violation of absolute priority of I with respect to liquidation proceeds to the extent that the option's optimal strike price is positive.

leads to ex post inefficiencies or because it undermines break even.[31]

If creditor protection is intermediate ($\alpha_C \leq \alpha < \alpha_O$), *court intervention* is the optimal contract and our model rationalizes the optimality of the BR procedure mandating ex post court intervention on the decision whether to liquidate. BR argue that a key role of bankruptcy is to adapt debt contracts ex post by making them contingent on a state of nature that was unforeseen ex ante. By contrast, our model rationalizes court intervention as a way of avoiding the ex ante cost of incentives, not of remedying ex ante unforeseeability. Once more, Figure 4 shows the costs of mandating bankruptcy procedures, irrespective of creditor protection. On the one hand, mandating court intervention when creditor protection is high ($\alpha \geq \alpha_O$) is likely to result in over-liquidation ex post, although the exact welfare consequences depend on whether renegotiation is allowed. On the other hand, mandating court intervention to guarantee efficient continuation when creditor protection is low is costly because it undermines break even.

Finally, when creditor protection is weak ($\alpha_S \leq \alpha < \alpha_C$), our model rationalizes the optimality of cash auctions to liquidate the project upon default and distribute the proceeds to the investor (Baird 1986 and Jensen 1989). In fact, in this case creditor protection is so low that parties cannot expect courts to enforce more sophisticated contracts such as options or court intervention. As a result, this procedure seems particularly appealing for transition and emerging economies where creditor protection is likely to be low and the only way of ensuring break even is to always liquidate an illiquid project upon default. On the other hand, mandating cash auctions when creditor protection is high may result in over-liquidation.

The analysis of financing under multiple creditors shares many similarities with the one-creditor case, but it may also provide a rationale for violating the priority of secured creditors in favor of unsecured ones (and not shareholders, as in the one-creditor case). With many creditors, the optimal bankruptcy procedure should give a secured creditor the option to liquidate the project by paying to the dispersed unsecured an amount S_{IC} of liquidation proceeds, thus violating absolute priority. In the spirit of Proposition 4, such a procedure attains the first best for $\alpha \geq \alpha_C$. Notice that here violations of priorities in liquidation are not desirable because they induce equal treatment of creditors as commonly argued. In our model there is no benefit of equal treatment, as only break even on average matters. Violations of secured creditors' priority may instead help remove the pro-liquidation bias of secured creditors, thus leading to efficient continuation. Of course,

[31] Moreover, proposals mandating automatic conversion of debt into equity upon default may undermine break even if creditor protection against self dealing is low.

violations of priority are only optimal if α is large enough, otherwise break even is undermined.

To conclude, by examining different proposals for setting "who gets what" and "what to do with the firm", we have shown that it is unlikely that "one size fits all" (Hart 2000). In particular, any state-mandated bankruptcy procedure should take creditor protection into account. Furthermore, we suggests that bankruptcy rules should be set as default rules, as opposed to mandatory rules, so as to allow contracts to flexibly adjust to legal protection of creditors.

5.2 Creditor Protection: Suggestions for Bankruptcy Reform

The economic literature on bankruptcy has mainly focused on designing procedures about how to best liquidate or continue a financially distressed project. In this section, we argue that another fundamental goal of bankruptcy is to facilitate contractual resolutions of financial distress by providing an ex post mechanism for detecting and deterring managerial misbehavior, thereby increasing creditor protection. Obviously, we do not mean that bankruptcy law is the only way of enhancing creditor protection. For example, Djankov et al. (2005) stress the role of ex ante mechanisms to curb managerial self dealing such as the effectiveness of independent reviews. In this paper instead, in line with La Porta, Lopez-de-Silanes, Shleifer and Vishny (1998, LLSV henceforth), we focus on the role of bankruptcy codes to provide creditor protection.

In particular, we read the U.K, the U.S. and the Swedish bankruptcy codes and in Section 5.2.1 we describe how they deal with the problem of managerial self dealing (Shleifer and Vishny 1997, La Porta, Lopez-de-Silanes and Shleifer 2005). We build on LLSV and focus explicitly on creditor protection against managerial self dealing in bankruptcy.[32]

In light of our model, Section 5.2.2 rationalizes resolutions of financial distress under those codes as optimal given the code's creditor protection, and derives implications for bankruptcy reform. We focus on the U.K., U.S. and Swedish bankruptcy codes because it has been argued that most real-world bankruptcy procedures are a linear combination of those three, e.g. LLSV.

[32] LLSV (1998) do not focus on detecting and deterring managerial self dealing and tunneling in bankruptcy. They consider the absence of an automatic stay on the assets, the right for secured creditors to collateral in reorganizations, the need of creditors' consent for filing for reorganization, and the removal of the management pending the resolution of the reorganization procedure. LLSV also consider one remedial creditors' right, namely the existence of a legal reserve requirement forcing firms to maintain a certain level of capital to avoid automatic liquidation. It protects creditors who have few other rights by forcing an automatic liquidation before all capital is stolen by the insiders.

5.2.1 Creditor Protection in U.K., U.S. and Sweden

Managerial self dealings in the context of bankruptcy are known across different codes as fraudulent transactions, fraudulent conveyances, wrongful trading, and similar headings. Notice that these transactions could be perfectly legal *per se*, but still seriously impart creditors' ability to recoup their contractual claims (e.g. LoPucki 2005). In this section, we show that the U.K., the U.S. and the Swedish bankruptcy codes differ with respect to how these dealings can be identified, where the burden of proof is placed and the remedies available to creditors.[33]

The U.K. administrative receivership[34] is generally considered as a superior code on the score of protecting creditors against fraudulent conveyances and wrongful trading. In insolvency, directors owe a duty of care to the company to protect with a primary regard the interests of its creditors rather than those of its shareholders. Such duty of care implies that all managerial dealings prior to entering bankruptcy may be reviewed as potentially fraudulent or wrongful, with a view of avoiding them if that helps creditors recoup their contractual claims. No time limit is specified for such review. The duty of care can be enforced in the name of the company by a liquidator, administrator or administrative receiver, who is usually appointed in practice. Moreover, not only does the code protect creditors by avoiding fraudulent conveyances, it also imposes personal liability on the directors to contribute to the assets of the company for the benefits of its creditors in case of fraud (§ 214 of the 1986 Insolvency Act). Directors can only get away with it if they prove that they acted with "due diligence", but the burden of proof is squarely placed on them.

By way of contrast, the U.S. Bankruptcy code, known as Title 11 of the U.S. laws,[35] is much less concerned with the interests of creditors than the U.K. Code. To begin, unlike in the U.K., in bankruptcy directors still need to have a primary regard for the interests of shareholders rather than the interests of creditors. Furthermore, in the U.S. there is a time limit to review potentially fraudulent transfers, which must not be undertaken more than two years before the date of the filing of the petition (§ 544).[36] Unlike in the U.K., the burden of proof is placed on the trustee, who has

[33] Davydenko and Franks (2006) study bankruptcy in U.K., France and Germany and find that creditors' recovery rates increase with the extent of creditor protection, as measured by the LLSV index, in the three codes.

[34] The discussion below is based on Lightman and Moss (2000), the leading authority on U.K. receivership.

[35] Title 11 of the code of the laws of the U.S., known as the U.S. bankruptcy code, includes eight evenly numbered Chapters. Chapters 1, 3 and 5 contain the general provisions of the code regarding case administration and determination of the estate for the purpose of the debtor and the creditors. The provisions of Chapters 1, 3 and 5 then apply to the other Chapters, including among others, Chapter 7 concerning liquidation, and Chapter 11 concerning reorganizations.

[36] Interestingly, the lookback period for fraudulent conveyances used to be one year, and has been raised to two years by the 2005 Bankruptcy Reform Act.

also to meet the "preponderance of the evidence" test of actual intent to hinder, delay or defraud.[37] Importantly, although the court may in principle appoint a trustee to control the firm in the interest of creditors under Chapter 5, such appointment is almost never observed in practice. As a result, creditors have little protection against fraudulent conveyances because it is often the trustee alone who stands to bring action against the directors. Notice that courts fail to appoint a trustee even in cases when it is specifically mandated by the code. For example, § 1104 states that "the court shall order the appointment of a trustee for cause, including fraud, dishonesty, incompetence, or gross mismanagement of the affairs of the debtor by current management, either before or after the commencement of the case". However, not even in such famous bankruptcy cases of corporate fraud as Enron, Worldcom, Global Crossing and Adelphia was a trustee appointed by the court. (see LoPucki 2005 p.145-151 for a detailed account). Even when trustees are appointed, their role is still determined by the court and may thus conflict with the interest of the creditors (e.g. Weiss and Wruck 1998). These observations indicate that U.S. creditors' ability to recoup their claims can be seriously impaired.

Finally, the Swedish code deals with fraudulent conveyances in a way similar to the U.S. code, by applying to these dealings the standard of "bad faith" (knew or ought to have known) and by placing the burden of proof on the trustee (e.g. Lennander 1983).

These observations are consistent with the view that the U.S. and the Swedish codes are much more debtor friendly than the U.K. Code (e.g. Skeel 2001) and that they provide very few rights to creditors during bankruptcy: Djankov et al. (2006) document that the U.S. and Sweden score only 1 out of 4 in their creditor rights' index, as compared with the U.K. that scores the maximum of 4. Moreover, again consistent with the view that creditor protection is highest in the U.K. and lowest in Sweden, Djankov et al. (2005) document that the U.K. has the highest protection against self dealing in company law (0.93 out of a maximum of 1), the U.S. scores an intermediate 0.65, and Sweden scores 0.34. In the context of our model, Table 1 shows that it is possible to rationalize the U.K. Receivership code as providing contracting parties with a very high α (close to 1), and the U.S. and Swedish code as providing contracting parties with a relatively low/intermediate α. Table 1 reports bankruptcy procedures, resolutions of financial distress and creditor protection in U.K., U.S. and Sweden.

[37] Importantly, a creditor who possessed fraudulent conveyance action under non-bankruptcy law lacks standing to bring the same action under § 544(b), unless authorized by court after trustee fails to act, (see Nebraska State Bank v. Jones, 846 F.2d 477 (8th Cir. 1988)).

Table 1 - Creditor Protection and Resolutions of Financial Distress in 3 Countries

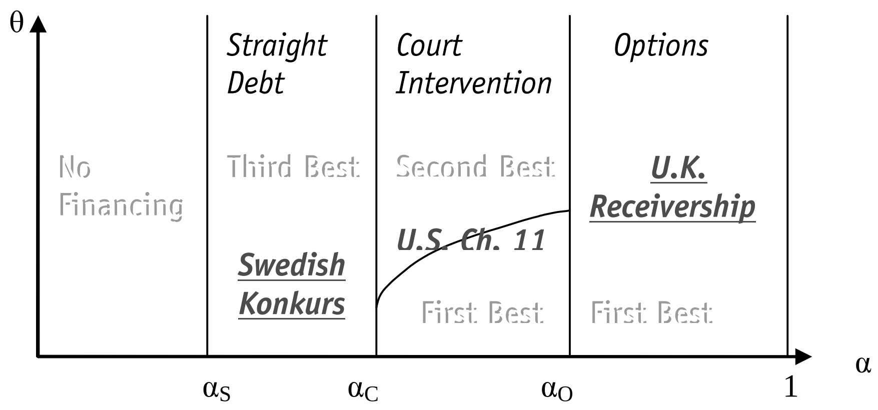
		Sweden	U.S.	U.K.
Main Bankruptcy Procedure		Konkurslagen	Chapter 11 of 1978 Code	Administrative Receivership
Description		Cash auction (Reorganizations not observed in practice)	Court-supervised reorganization (Ch. 7 for liquidations)	Strict contract enforcement; *floating charge* gives senior creditor contractual option to appoint receiver (who in turn liquidates)
		Creditor Protection in Bankruptcy Codes		
Creditor Protection vs. Self-Dealing in Bankruptcy	Burden of Proof	Trustee	Trustee	Directors
	Standard of Proof	"Bad Faith"	"Preponderance of Evidence"	"Due Diligence"
	Remedies	Avoidance	Avoidance	Avoidance, Personal Liability, Jail
α		Low	Intermediate	High
Creditors' Rights Score (LLSV 1998, DLLS 2006)	Secured Paid First?	Yes	Yes	Yes
	Automatic Stay?	Yes	Yes	No
	Debtors File?	Yes	Yes	No
	Management Stay?	Yes	Yes	No
Creditors' Rights Score (max=4)		1	1	4
		Anti Self-Dealing Provisions in Company Law		
Anti Self Dealing Score (DLLS 2005)	Ex ante (Disclosure and Review)	0.17	0.33	1.00
	Ex post (Standing to Sue and Punish)	0.51	0.97	0.85
Anti Self Dealing Score (max=1)		0.34	0.65	0.93

5.2.2 Resolutions of Financial Distress in the Shadow of the Bankruptcy Code

In light of our model and the evidence on creditor protection discussed above, it is possible to rationalize the resolutions of financial distress in the U.K., the U.S. and Sweden as constrained optimal given the extent of creditor protection in these three countries (see Figure 5).

As reviewed above, the U.K. code puts a strong emphasis on creditor protection (high α). Interestingly, the U.K. code leaves reorganizations under the complete contractual freedom of the parties (e.g. Franks and Sussman 2005b). Consistent with our model, creditors seek security by means of *floating charges* on the company's undertakings as a going concern. In turn, the secured creditor holding a floating charge, usually a bank, is given the exclusive contractual option (debenture) to appoint a receiver conditional on default. Such appointment takes the management of the company out of the hands of the directors and places it in the hands of the receiver, who then acts exclusively as agent of his debenture-holder appointer. The receiver may then either seek to liquidate piecemeal, or sell the firm as a going concern. In practice, more than 80% of receiverships end up in liquidation (see Franks and Nyborg 1996, who do not, however, provide evidence on whether such liquidations are actually efficient). While we note that one concern about U.K. bankruptcy is that it may lead to too much inefficient liquidation, it is also true that in the U.K. credit markets are among the most developed of the world (Djankov et al. 2006), indicating that overliquidation is unlikely to be a serious problem in practice. Overall, the practice of debt contracts in the U.K. may be rationalized as an optimal response to a bankruptcy code that focuses on seizing the debtors' property to meet creditors' contractual claims (high α).

Figure 5. Bankruptcy Codes and the Optimal Resolution of Financial Distress



Unlike in the U.K., the resolution of financial distress in the U.S. relies strongly on court intervention and direct supervision. Especially in Chapter 11, U.S. bankruptcy courts have strong discretionary powers, for example to approve supra-priority finance if they are convinced that the company has a reasonable chance of survival, with a view of avoiding inefficient liquidations. The role of U.S. bankruptcy courts in Chapter 11 can be understood in terms of our model as the third-party intervention in resolving financial distress, which can be rationalized as optimal given the U.S. code's limited focus on upholding creditors' contractual claims (low/intermediate α).

To gauge the efficiency of court intervention, in particular of Chapter 11, our model indicates that a natural dimension to examine is the precision of the information available to courts to resolve financial distress ($1-\theta$). On the one hand, intervention by a third party need not necessarily achieve the first best. In fact, it has been argued that recurring mistakes by too powerful judges may be very costly (e.g. Weiss and Wruck 1998), and may often result in reorganizing inefficient companies that should otherwise have been liquidated, consistent with the widespread observation of Chapter 11 refilings, commonly referred to as "Chapter 22" (e.g. LoPucki 2005). On the other hand, it has been noted that U.S. bankruptcy judges are particularly expert, because they are appointed by courts of appeal (§ 152 Title 28), often among bankruptcy practitioners, unlike in the U.K. where they come from the career judiciary (Posner 1996). Consistent with this view, our model suggests that the large reliance of U.S. debtholders on contractual covenants (Smith and Warner 1979) can be rationalized as the parties' attempt to write a contingent debt contract so as to exploit the strong expertise of U.S. bankruptcy courts and the high disclosure standards under U.S. law (La Porta et al. 2006). After all, the U.S. credit markets are very developed, suggesting that the observed resolutions of financial distress cannot be too far from efficiency.[38]

Finally, resolutions of financial distress in Sweden can also be rationalized as constrained optimal, again consistently with our model. Although the Swedish bankruptcy code has two chapters dealing with reorganizations ("Ackordslagen," similar to U.S. Chapter 11) or liquidations through cash auctions ("Konkurslagen," similar to U.S. Chapter 7), parties overwhelmingly choose to liquidate insolvent firms and almost entirely disregard the possibility of reorganizing them. Interestingly, even a recent reform in 2003 to introduce even more features of the U.S. Chapter 11 reorganization code has failed to affect the parties' choice of liquidating distressed firms via cash auctions. This choice can be rationalized in light of our model as the optimal contractual response to the relative ineffectiveness of Swedish bankruptcy courts against fraudulent conveyances (low α). In fact, while the benefits of cash auctions have been widely recognized,[39] cash auctions have often been argued to lead to over-liquidations (e.g. Leijon 1996). Indeed, the Swedish credit markets are much less developed than their U.S. or U.K. counterparts (Djankov et al. 2006).

These arguments lead to the main implication of our analysis for the theory of optimal bankruptcy. Even if our model can rationalize existing resolutions of financial distress as (constrained)

[38]Incidentally, but outside the scope of our analysis, the U.S. bankruptcy system of court intervention may also suffer from excessive litigation, as a result of the unpredictability of judges' decisions. Indeed, several studies have documented the large emphasis of the U.S. system on bankruptcy litigation, especially in reorganizations under Chapter 11, e.g. Andrade and Kaplan (1998), Asquith, Gertner and Scharfstein (1994), and Gilson (1997). In contrast, Franks and Sussman (2005a) document that bankruptcy litigation is nearly absent in the U.K., consistent with the practice of U.K. bankruptcy courts to leave corporate reorganizations under the parties' complete contractual freedom (Franks and Sussman (2005b)).

[39]Thorburn (2000) notes that Swedish cash auctions are quick, have a low cost, avoid deviations from absolute priority, and often end up in firms sold as going concerns. Strömberg (2000) notes that, when markets are illiquid, auctions can end up in a sale-back to the management of the bankrupt firm.

optimal responses to the bankruptcy code's enforcement provisions, our analysis indicates that optimal bankruptcy law should focus on maximizing creditor protection against managerial self dealing. This implication follows from two considerations. First, the resolution of financial distress is first-best efficient only if such a dimension of creditor protection is high, but not otherwise. Second, the inclusion of covenants in debt contracts to constrain management in states of low earnings (Smith and Warner 1979) suggests that parties are able and willing to contract about financial distress. In this respect and in line with recent empirical evidence (Lerner and Schoar 2005, Qian and Strahan 2004), we have shown that the parties' ability to include in their contracts flexible clauses to efficiently deal with financial distress hinges on creditor protection. As a result, to facilitate efficient contracting bankruptcy law should provide an ex post mechanism for detecting, punishing and thus deterring managerial misbehavior, thereby increasing creditor protection. As discussed above, such a mechanism might include seeking strict avoidance of fraudulent conveyances, placing the burden of proof and personal liability on directors, and maximizing mandated disclosure.

6 Conclusions

We study how creditor protection affects the parties' ability to resolve financial distress by contract. We find that greater creditor protection reduces the costs of using sophisticated contractual incentives such as options and direct court intervention to govern the continuation/liquidation decision. Accordingly, also debt structure (the relative proportion of dispersed and unsecured claims) optimally adjusts to creditor protection. Our model sheds light on several empirical findings in law and finance showing that better enforcement facilitates private contracting (Lerner and Schoar 2005; Qian and Strahan 2004) and financial markets development (e.g. La Porta et al. 2006). We also rationalize the different approaches to resolving financial distress in the U.K., U.S. and Sweden as special cases, depending on each country's creditor protection. The normative implication is that optimal bankruptcy law should have two key ingredients: strong legal protection of creditors against fraud and freedom of contracting.

It is worth pointing out that our theory does not imply that there should be no role for state-provided bankruptcy procedures. In particular, if some investors lack the resources or the financial sophistication to write complex contractual arrangements, the availability of a state-provided bankruptcy procedure (or a menu of procedures) is clearly beneficial, as it reduces contracting costs, thereby increasing the likelihood of financial distress being resolved efficiently. In one respect, our theory implies that state-provided procedures should take into account creditor protection against fraud, because different procedures are optimal depending on creditor protection. More importantly, our theory points out that a state-provided procedure should not be mandatory but instead endorse freedom of contracting, so as to allow "sophisticated" parties to experiment innovative contractual resolutions of financial distress.

Of course, our paper is only a first step towards understanding the impact of creditor protection on the resolution of financial distress. For example, in our model courts' mistakes in assessing the project's continuation value are pure noise. It has been argued however that real life bankruptcy courts can be biased systematically towards continuation or liquidation (e.g. Franks and Torous 1993). Recently, Bris, Welch and Zhu (2006) show that the extent of violations of absolute priority varies systematically across bankruptcy courts. Clearly, incorporating bankruptcy judges and their biases into our model is an exciting topic for future research. Moreover, future research should aim at understanding costs and benefits of specific legal rules affecting creditor protection, and how optimal bankruptcy codes should be designed.

Finally, we have only considered how creditor protection affects debt contracts. However, the costs of bankruptcy that we study are also likely to affect the use of other financial securities such as equity. As a result, our perspective on bankruptcy may also help explain features of capital structure decisions across countries, as documented for example by Rajan and Zingales (1995) and Acharya, John and Sundaram (2004).

7 Proofs

Debt Contracts. We consider the following contracts. I advances $D \geq K$ to E, who agree to a first and second period state contingent repayment $d_1(\omega)$, $d_2(\omega)$, $\omega = G, U, B$ and to a liquidation policy $\lambda(\omega)$. Feasibility requires $d_1(\omega) \leq \alpha y_1(\omega) + \lambda(\omega)L$, $d_2(\omega) \leq \alpha y_2(\omega)$, $\lambda(\omega) \in \{0, 1\}$. First period repayment can also be contingent on liquidation. The contract also specifies a first and second period repayment and liquidation policies $d_1^D(\omega_3)$, $d_2^D(\omega_3)$ $\lambda^D(\omega)$ that are enforced if E defaults. The parties can also delegate the liquidation decision to themselves by writing into the contract a control allocation $i(\omega) \in \{0, 1\}$. If $i = 1$, I decides whether to liquidate; if $i = 0$, E does. By allocating the liquidation/decision to themselves, the parties may improve ex post efficiency by using their superior information, because bankruptcy courts may erroneously enforce a state contingent liquidation policy $\lambda(\omega)$.

Proof of Proposition 1. The general expression for the contracting problem solved by E and I is cumbersome, but its logic is simple. Suppose that I advances $D = K$. Consider state G first. Because courts can perfectly determine if $\omega = G$, $\lambda(G)$ is perfectly enforced. To avoid ex post inefficiencies, the parties set $\lambda(G) = 0$. The incentive compatible repayments $d_1(G), d_2(G)$ satisfy:

$$y_1 - d_1(G) + \overline{y}_2 - d_2(G) \geq y_1 + \lambda^D(G)L - d_1^D(G) + \left[1 - \lambda^D(G)\right]\overline{y}_2 - d_2^D(G).$$

Subject to the feasibility constraints $d_1(G) \leq y_1, d_2(G) \leq \alpha\overline{y}_2$, $d_1^D(G) \leq \alpha y_1 + \lambda^D(G)L$, $d_2^D(G) \leq \left[1 - \lambda^D(G)\right]\alpha\overline{y}_2$. E's income in case of default is minimized at $\lambda^D(G) = 1$, $d_1^D(G) = L + \alpha y_1$. This yields (1). Because $\overline{y}_2 > L$, $\lambda(G) = 0$, $\lambda^D(G) = 1$ is optimal at every (α, θ) and maximizes ex ante and ex post efficiency. Looking at G in isolation was indeed correct. What about B and U? As hinted in section 3.1, there is a tradeoff between ex ante and ex post efficiency. We look for optimal contracts as follows. First, at each (α, θ), we find the maximal repayment I can attain under different arrangements on the liquidation/continuation decision. Then, at each (α, θ) the parties choose the most efficient arrangement among those guaranteeing that I breaks even.

1) First consider contracts maximizing ex post efficiency by exploiting the parties' information on $y_2(\omega)$. **1.1)** E sets liquidation ($i(B) = i(U) = 0$). Call d_L the amount of liquidation proceeds going to I. The transfers such that I sets $\lambda(B) = 1$, $\lambda(U) = 0$ satisfy constraints $L - d_L \geq \underline{y}_2 - d_2(B)$ in B and $\overline{y}_2 - d_2(U) \geq L - d_L$ in U, as E must obtain more by liquidating today than he expects to get tomorrow from continuing in B, while the opposite should hold in U. By relabeling $S_{EP} \equiv L - d_L$, this contract is equivalent to the E-put as described in section

3.1. Since $d_2(\omega) \leq \alpha y_2(\omega)$ and $d_L \leq L$, I's payoff is maximized at $d_2(B) = \alpha \underline{y}_2$, $d_2(U) = \alpha \overline{y}_2$ and $d_L = L - (1-\alpha)\underline{y}_2$. This debt contract with an E-put (EP henceforth) repays I at most (2) where$\widetilde{L} \equiv L - S_{EP}$. **1.2)** I sets liquidation ($i(B) = i(U) = 1$). The transfers such that I sets $\lambda(B) = 1$, $\lambda(U) = 0$ satisfy constraints $d_L \geq d_2(B)$ in B and $d_2(U) \geq d_L$ in U. Call $L - d_L \equiv S_{IC}$. Then, this contract is equivalent to the I-call described in section 3.1 with strike price S_{IC}. I's payoff is maximized at $d_2(B) = \alpha \underline{y}_2$, $d_2(U) = \alpha \overline{y}_2$ and $d_L \equiv L - S_{IC} = L - \max[L - \alpha\overline{y}_2, 0]$. This debt contract with an I-call (IC henceforth) repays I at most (2)**,** where $\widetilde{L} \equiv L - S_{IC}$. For $\alpha \geq \alpha^*$**,** this contract is equivalent to an I-put with strike price $\alpha\overline{y}_2$. **1.3)** Like in 1.1) E sets liquidation ($i(B) = i(U) = 0$), but $d_L(\omega)$ is state contingent, where $d_L(U)$ and $d_L(B)$ are enforced by courts, with error if $\theta > 0$. Contingent liquidation transfers give E the incentive to do different things in different states, otherwise nothing changes with respect to 1.1). It is optimal to set $d_L(B) = L - (1-\alpha)\overline{y}_2$, $d_L(U) = L$ to maximize repayment. Yet, notice that this contract is never optimal, because by setting $d_L(U) = L - (1-\alpha)\overline{y}_2$, one could improve on it both ex post and ex ante. **1.4)** Like in 1.2), I sets liquidation ($i(B) = i(U) = 1$), and the contract specifies $d_L(U)$ and $d_L(B)$. This contract is equivalent to the contingent debt contract described in section 3.1, where $L - d_L(\omega) \equiv S_{IC}(\omega)$. Contingent liquidation transfers must give I the incentive to do different things in different states, otherwise nothing changes with respect to 1.2). It is optimal to set $S_{IC}(B) = 0$, $S_{IC}(\omega) = \max[L - \alpha\overline{y}_2, 0]$ because they maximize repayment. Under *contingent debt* (CD henceforth) I obtains at most (4) and ex post losses yield an over-liquidation cost of $(1-\pi)(1/2)\theta(\overline{y}_2 - L)$. Figure A1 summarizes the properties of options:

Figure A1. Properties of Options

Option	Default Decision	Strike Price	Repayment	F.B. Liq.?
I-Call	Continue	$\max[0, L - \alpha\overline{y}_2]$	$\alpha\overline{y}_2 + \min[\alpha\overline{y}_2, L]$	Yes
E-Put	Continue	$(1-\alpha)\,\underline{y}_2$	$\alpha\overline{y}_2 + L - (1-\alpha)\,\underline{y}_2$	Yes
E-Call	Liquidate	$\alpha\overline{y}_2$	$\alpha\left(\overline{y}_2 + \underline{y}_2\right)$	No
I-Put	Liquidate	$\alpha\overline{y}_2$	$\underline{y}_2$	No

2) We now study contracts where the bankruptcy court directly takes the liquidation decision ($\lambda(B) = 0, \lambda(U) = 1$). I gets L under liquidation, $\alpha y_2(\omega)$ under continuation. The average ex post loss under this contract is $(1-\pi)(1/2)\theta(\overline{y}_2 - \underline{y}_2)$ and maximal repayment to I is

$$\pi(\overline{y}_2 + \alpha y_1) + (1/2)(1-\pi)\left[L + \alpha\theta\underline{y}_2 + (1-\theta)\,\alpha\overline{y}_2\right]. \tag{8}$$

To anticipate another result on contract choice, notice that *CD* dominates this contract in terms of ex post and ex ante efficiency. The intuition is that *CD* at least uses some of the investor's superior information, thus avoiding under-liquidation losses. Hence, this contract is never chosen.

3) We now study contracts where the parties mandate a non-contingent liquidation policy. **3.1)** Parties write $\lambda(B) = \lambda(U) = 1$, $d_L = L$. This is *straight debt* (*SD* henceforth) with ex post losses $(1-\pi)(1/2)(\overline{y}_2 - L)$ and maximal repayment (3). **3.2)** Parties write $\lambda(B) = \lambda(U) = 0$, $d_2(\omega) = \alpha y_2(\omega)$. Ex post losses are $(1-\pi)(1/2)(L-\underline{y}_2)$ and repayment to I is at most $\pi(\overline{y}_2+\alpha y_1)+(1/2)(1-\pi)(\alpha\underline{y}_2 + \alpha\overline{y}_2)$. To anticipate another result, notice that *EP* dominates this contract in terms of ex post and ex ante efficiency. Hence, this contract is never chosen.

Note: there is no gain for I to lend $D > K$. For any extra dollar lent, I gets back at most a fraction $\alpha \leq 1$ of it in G and no more than $D - K$ in any other state. As a result, increasing the size of the loan only undermines break even without bringing any benefit. We will see that ex post renegotiation between I and E gives rise to a benefit of $D > K$.

Optimal Contracts as a Function of (α, θ). The above analysis reveals the following properties of optimal contracts. In terms of ex post efficiency, for $\theta > 0$ the ranking among the contracts not yet ruled out is: *IC*$\sim$*EP* $\succ$ *CD* $\succ$ *SD* $\succ$ *no contract* (if $\theta = 0$ and/or $\alpha \geq \alpha^*$, then *CD* ranks the same as *IC*). In terms of ex ante efficiency, for $\alpha < 1$ there are two regimes: i) if $\alpha \geq \alpha^* = L/\overline{y}_2$ then *IC* $\sim$ *CD* $\succ$ *EP*, *SD* is last if $\alpha \geq \widetilde{\alpha} = (L+\underline{y}_2)/(\overline{y}_2+\underline{y}_2)$ and third otherwise; ii) if $\alpha < \alpha^*$ then *SD* $\succ$ *CD* $\succ$ *IC*, *EP* is last if $\alpha \geq \widehat{\alpha} = (L-\underline{y}_2)/(\overline{y}_2-\underline{y}_2)$ and third otherwise. For $\alpha = 1$, all contracts are feasible and *IC, EP* or *CD* is chosen (but also an E-call with $S_{EC} = \overline{y}_2$ may be chosen). In general, there exist α_{IC}, α_{EP}, α_{SD}, α_{CD}, which represent the feasibility thresholds for *IC*, *EP*, *SD* and *CD*, respectively. A contract is only feasible whenever α is non smaller than the corresponding threshold. Then, there are two cases: i) $\alpha_{SD} > \alpha^*$ (i.e. at α^* *SD* is infeasible), then define $\alpha_O \equiv \min[\alpha_{IC}, \alpha_{EP}]$, $\alpha_C = \alpha_O$, $\alpha_S = \alpha_O$. In this case, *SD* is never optimal because when it is feasible it is dominated ex post by *IC* and *EP*, which are also feasible; ii) $\alpha_{SD} < \alpha^*$ (i.e. at α^* *SD* is feasible), then define $\alpha_O \equiv \min[\alpha_{IC}, \alpha_{EP}]$, $\alpha_C = \alpha_{CD}$, $\alpha_S = \alpha_{SD}$. In this case, if *SD* is feasible, it is also optimal provided other contracts are infeasible (i.e. if $\alpha_S \leq \alpha < \alpha_C$); if *CD* is feasible, it is also optimal provided *IC* and *EP* are not feasible (i.e. if $\alpha_C \leq \alpha < \alpha_O$). *IC* and/or

EP are optimal whenever feasible (i.e. if $\alpha_O \leq \alpha$) because they yield the first best. ■

Proof of Proposition 2. With ex post renegotiation, I may benefit from lending $D = K+t$, $t > 0$ to E. Notice that setting $t > 0$ is never optimal under *debt plus option* (i.e. EP and IC). Because I on average recoups only a fraction of t, setting $t > 0$ only undermines break even (especially if E has all the bargaining power). That is, it is profitable for the parties to set $t > 0$ only if this reduces ex post inefficiencies. Because EP and IC yield full ex post efficiency, setting $t > 0$ and letting the parties renegotiate can only be optimal under CD and SD. We study the model under two alternative assumptions on bargaining power, when I (resp. E) has full bargaining power.

I) I has all the bargaining power. In state G, incentive compatibility implies $d_1(G) + d_2(G) \leq \alpha(y_1 + t) + \overline{y}_2$, i.e. $d_1(G) = \alpha(y_1 + t) + (1-\alpha)\overline{y}_2$, $d_2(G) = \alpha\overline{y}_2$. Notice that in this **case**, ex post renegotiation does not affect EP and IC. When $t = 0$ repayment in G is the same as in the no-renegotiation case. Moreover, because EP and IC are designed to maximize I's payoff, they are renegotiation proof also in B and U when I has all the bargaining power. What about CD and SD? i) CD. With probability θ, this contract induces over liquidation in U. The goal here is to find a $t > 0$ allowing E to bribe I in U to continue the project before the court's intervention. When $\alpha < \alpha^*$ (this is the relevant case, otherwise IC and/or EP, $t = 0$ attain the first best)**,** I's average payoff in U is $\alpha\overline{y}_2 + \theta(L - \alpha\overline{y}_2)$. If $t^* = \theta(L - \alpha\overline{y}_2)$, E can bribe I to continue in U. This contract yields the first best if feasible, i.e. when:

$$t^* \equiv \theta(L - \alpha\overline{y}_2) \leq \left[\pi(\overline{y}_2 + \alpha y_1) + (1/2)(1-\pi)(L + \alpha\overline{y}_2) - K\right]/(1 - \alpha\pi). \quad (9)$$

The numerator of the right-hand side of (9) is a measure of slackness of I's break even constraint under CD if $t = 0$. The denominator says in how many states of nature such slackness should be "spent" to finance the upfront payment t from I to E. The logic of (9) is that only if t^* is sufficiently small can CD achieve the first best when (under renegotiation) I advances $K + t^*$ to E. Condition (9) defines a function $\theta_R(\alpha)$ such that break even is attained iff $\theta \leq \theta_R(\alpha)$. For $\theta > \theta_R(\alpha)$**,** the parties use CD with $t = 0$. Notice that it is optimal to set t at the lowest level t^* (which yields no surplus to I despite the fact he has all the bargaining power) because it maximizes the chances of break even. It is also easy to show that in U and B**,** it is optimal to leave t "in E's hands" without using it to increase contractual repayment because it reduces the amount of resources E needs to bribe I in renegotiation. ii) SD. Here we should have $t = L - \alpha\overline{y}_2$ (again the minimum amount such that E can bribe I). This contract yields the first best if:

$$\pi(\overline{y}_2+\alpha y_1)+(1-\pi)\alpha\overline{y}_2-(1-\alpha)(L-\alpha\overline{y}_2)\geq K.$$

Hence, I obtains less than under *IC* and cannot be feasible when *IC* is not. If *SD* is optimal, $t=0$ and over liquidation cannot be renegotiated away. However, for α sufficiently large, *SD* with $t=L-\alpha\overline{y}_2$ can be as good as *debt plus option.*

Optimal Contracts as a Function of (α,θ). The main difference with respect to Proposition 1 is that for $\alpha_S\leq\alpha<\alpha_C$ there exists an increasing function $\theta_R(\alpha)$ such that, for $\theta\leq\theta_R(\alpha)$ *CD* plus $t^*=\theta(L-\alpha\overline{y}_2)$ yields the first best. Otherwise, nothing changes. Additionally, for large α (but still $\alpha<\alpha^*$), several contracts can yield the first best (e.g. *SD* with $t=L-\alpha\overline{y}_2$ or, equivalently, *IC* with $S_{IC}=0$ and $t=L-\alpha\overline{y}_2$).

II) E has all the bargaining power. Besides reducing ex post inefficiency, renegotiation may allow E **to** reduce repayment. In G, incentive compatibility is $d_1(G)+d_2(G)\leq\alpha(y_1+t)+\max[L,\alpha\overline{y}_2]$, attained with $\lambda^D(G)=1$, $d_1^D(G)=L+\alpha(y_1+t)$ if $\alpha<\alpha^*$ and at $\lambda^D(G)=0$, $d_1^D(G)=\alpha(y_1+t)$, $d_2^D(G)=\alpha\overline{y}_2$ if $\alpha\geq\alpha^*$. Intuitively, this is less than (1). Let us now look at B and U, considering different contracts. i) *EP*. In B, incentive compatibility implies $t+L-d_L\geq t+L-d_2(B)$ and thus $d_L=d_2(B)=\alpha\underline{y}_2$. Thus, E can always bribe I in U, which implies $\overline{y}_2-d_2(U)\geq\overline{y}_2-d_L$, or $d_2(U)=\alpha\underline{y}_2$. If E has full bargaining power, *EP* is thus less feasible than before, as I in B and U only gets $\alpha\underline{y}_2$ on average. ii) *IC*. Under this contract I has the right to liquidate/continue the project, so, even if E has full bargaining power, renegotiation does not alter I's incentives. As a result, *IC* is unaffected by renegotiation. iii) *CD*. The same can be said of *CD*, where I has still the right to liquidate/continue the project. The only difference now is that by setting $t^*=\theta(L-\alpha\overline{y}_2)$, over liquidation is renegotiated away in U**.** Thus, if $\theta\leq\theta_R(\alpha)$ this contract yields the first best. Notice that the shift in bargaining power from I to E does not alter renegotiation under *CD* because t is set at the smallest level making renegotiation possible. iv) *SD*. Also under *SD* nothing changes as $t=L-\alpha\overline{y}_2$ is infeasible when *SD* is optimal. It is only feasible when *IC* is also feasible. Optimal Contracts. The only difference between the case where E has full bargaining power with respect to the case where I has full bargaining power is that in the former case renegotiation undermines *EP*, which is now less feasible at any α. ■

Proof of Proposition 3. With $n>1$, E offers a menu of n creditors, at $t=0$. The project has nondecreasing returns, i.e. liquidating share $1/n$ of its assets yields $(1/n)L$ in liquidation and

$y_2(1-1/n)$ in continuation value, where $y_2(1-k/n)-y_2(1-(k-1)/n) \geq y_2(1-(k-1)/n)-y_2(1-(k-2)/n)$, $\forall k \geq 0$, where $y_2(0)=0$. E can replicate the single creditor outcome in G by setting, for each creditor, repayments $d_1(G) = (\alpha y_1 + (1-\alpha)\overline{y}_2)/n$, $d_2(G) = \alpha\overline{y}_2/n$ and by granting him $(L+\alpha y_1)/n$ upon default. E defaults on $k \leq n$ creditors if $y_2(1)-y_2(1-k/n) < (k/n)(y_2(1)-y_2(0))$ the assumption of nondecreasing returns implies that this condition is never satisfied. Thus, $k=0$ and the one-creditor outcome is attained in G. The same outcome would also be replicated under decreasing returns by specifying that the project's physical assets should be fully liquidated upon default. What about states U and B? At any α, the debt structure of Proposition 3 attains the same outcome of the one-creditor case. In particular, in equilibrium (where no liquidation occurs in U), the incentive properties of options and CD also hold under the new contract. ■

Proof of Proposition 4. For $\alpha < \alpha_S$, the project cannot be financed under multiple creditors. The presence of multiple creditors cannot increase total repayment in G above $\alpha y_1 + \overline{y}_2$ (the same would be true also in the presence of multiple secured creditors, even if default on a single one of them is punished by fully liquidating the asset). Since $\alpha_S < \alpha^*$, in U and B investors can at most obtain L. Since *SD* is infeasible for $\alpha < \alpha_S$, then financing does not occur under any debt structure. For $\alpha_S \leq \alpha \leq \alpha_C$, only *SD* ensures feasibility under a single creditor. By analogy, under multiple creditors break even requires that the asset is liquidated in both U and B. Thus, E cannot do better than under a single creditor *SD*. In U and B, the optimal straight debt contracts may allow for liquidation of only fraction $f < 1$, where $\pi(\overline{y}_2 + \alpha y_1) + (1/2)(1-\pi)\left[fL + (1-f)\alpha(\underline{y}_2 + \overline{y}_2)\right] = K$. However, setting $f < 1$ is only efficient for E if $L < (\overline{y}_2 + \underline{y}_2)/2$, otherwise the gain in welfare in U is more than compensated by the loss in B. Thus, if $L \geq (\overline{y}_2 + \underline{y}_2)/2$, $f = 1$ is optimal. For $\alpha \geq \alpha_C$, the debt structure of Proposition 4 yields the first best for the following reasons. First, it does not induce over continuation in B because the strike price $L - \alpha\underline{y}_2$ implies that the option holder weakly prefers continuation to liquidation in that state. In B, there is no renegotiation because all creditors prefer liquidation over continuation. To see what happens in U, suppose there are $n-1$ unsecured creditors. Then, as indicated in the text, a coalition with $\widetilde{m}(n) = n\frac{\alpha(\overline{y}_2 - \underline{y}_2)}{L - \alpha\underline{y}_2} = nv \leq n-1$ unsecured bribes the option holder to liquidate. Thus, with n creditors, liquidation in U occurs with probability $\Pr(m \geq \widetilde{m}(n)\,|n-1) = \sum_{s=nv}^{n-1}\left[(n-1)!/(n-1-s)!s!\right]/2^{n-1}$. For $n \to +\infty$, this probability tends to $\lim_{n\to\infty}\left[(n-1)!/(n-1-nv)!nv!\right]/2^{n-1}$, which is equal, by Stirling's approximation $\ln n! \approx n\ln n - n$, to $\lim_{n\to\infty}\exp\left\{(n-1)\ln(n-1) - (n(1-v)-1)\ln(n(1-v)-1) - nv\ln nv - 1\right\}/2^{n-1}$. The numerator of the limit tends to $\exp(-1)$, the denominator to $+\infty$. As a result, for $n \to +\infty$, $\Pr(m \geq \widetilde{m}(n)\,|n-1) \to 0$ and the first best is attained. ■

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