The Design of Bankruptcy Law: A Case for Management Bias in Bankruptcy Reorganizations

Elazar Berkovitch; Ronen Israel; Jaime F. Zender

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Abstract

In an incomplete contracting environment, bankruptcy is considered to be a renegotiation of the firm's financial contracts. An optimal bankruptcy law is derived as optimal restrictions on the environment within which the claimants to a distressed firm bargain. The law is used as a commitment device to ensure actions that are ex ante optimal but not subgame perfect. We show that the bankruptcy court can use two types of mechanisms to implement the optimal bankruptcy outcome: direct restrictions on the bargaining game between the claimants, and the use of a "restricted auction." In both cases, the restrictions prevent the strategic use of bankruptcy by firms not in financial distress, provide for truthful revelation of information so that distress results in an ex post efficient allocation of resources, and establish a bias toward the manager in reorganizations that provides correct ex ante decision making incentives.

I. Introduction

Bankruptcy laws have an important impact on the financing and investment decisions of firms and have, therefore, drawn considerable attention. The bankruptcy debate has focused mainly on two issues: i) the adverse implications of the existing bankruptcy law for investment decisions of financially distressed firms, and ii) the characterization of the most efficient process for the resolution of financial distress, given that the firm is in financial distress. Thus, this debate has ignored an important aspect of the bankruptcy research agenda, namely, the characterization of an optimal bankruptcy law that accounts for both investment incentives and the efficient resolution of financial distress.

This article characterizes an optimal resolution of financial distress (bankruptcy outcome) and provides an implementation of this outcome (bankruptcy law) within a model that includes decision making both before and after the firm enters financial distress. The derived optimal bankruptcy law provides for efficient ex ante decision making and for the efficient allocation of resources ex post.

Bankruptcy is characterized as bargaining between the firm's claimants for the assets of the firm.[1] Financial distress or default on some provision in the debt contract triggers the renegotiation of the firm's financial contracts. Bankruptcy law dictates the environment within which the claimants to the firm bargain over its assets. By imposing a particular structure on the bargaining between the claimants, bankruptcy law has a powerful effect on the outcome of the renegotiations. Therefore, in designing bankruptcy law, we must consider how the structure of the bargaining environment affects the outcome of the renegotiations, and how this outcome affects incentives for decisions made before the firm enters distress.

To illustrate this idea, consider a firm that is capitalized (optimally) by selling debt to an investor. The need for outside capital results in agency problems between the entrepreneur and the investor. These agency problems are the basis for our results. We model the tensions between the claimants as a moral hazard problem in which the entrepreneur exerts unobservable effort.[2] In financial distress, the payoff to the entrepreneur is determined by bargaining with the investor. In the bargaining, the investor captures some, if not all, of the increase in firm value that is due to the entrepreneur's effort; in the extreme, the entrepreneur receives his wage from outside employment and the investor captures the entire increase in firm value. When the entrepreneur chooses his effort level, he anticipates both the possibility of the firm entering financial distress and the resolution of distress as governed by the existing bankruptcy law. If financial distress is resolved by an ex post efficient mechanism that takes into account only the bargaining positions of each party at the time contracts are renegotiated, the entrepreneur will have weak ex ante incentives to exert effort, resulting in too little effort.

The optimal bankruptcy law imposes a particular structure on the bargaining in bankruptcy. This structure results in an ex post efficient allocation of resources and provides the entrepreneur with optimal ex ante incentives by placing him in a superior bargaining position in the bankruptcy negotiations. The bankruptcy law serves as a commitment device and is required to enforce this "rebalancing" of the relative bargaining strengths of the claimants ex post. A law is required to achieve this commitment because it imposes an environment within which the claimants *must* bargain. If the claimants attempted to privately contract ex ante to establish this bargaining environment, they would find it beneficial to renegotiate the contract ex post.

We show that such a bargaining environment may be implemented in two ways. When all relevant information is possessed by the entrepreneur and the

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[1]Note, the generality of this definition can be easily seen if one considers that the set of possible outcomes includes either side receiving complete ownership of the firm's assets, and that the outcome of the negotiation might, in part, be specified contractually (if such contractual provisions are possible). Aghion, Hart, and Moore (1992) have noted the connection between bankruptcy and a renegotiation of the firm's financial contracts (see their note 26) as has Baird ((1993) p. 82) "...there is little doubt that the law and practice of Chapter 11 establishes a framework for negotiations."

[2]Our analysis applies to other decisions concerning firm-specific investments. See Section IX.

investor, the court may control the reorganization by directly affecting the relative strengths of the parties in a bilateral bargaining game. By mandating a first mover advantage for the entrepreneur and enforcing some minimum delay before counter offers may be considered, the court can increase the entrepreneur's bargaining power. When the information relevant to the restructuring decision is not possessed by the two claimants, the bankruptcy court may rely on the use of a "restricted auction" mechanism to resolve financial distress. Despite the fact that the bankruptcy court is uninformed, the restricted auction extracts the private information from the informed agents and uses this information in restructuring the securities to implement efficient decision making.

Many studies of bankruptcy have considered the impact of existing bankruptcy laws on firms' investment policies. The importance of this impact was first recognized by Bulow and Shoven (1978) and White (1980), (1983). Berkovitch and Israel (1998) show that firms facing over-investment incentives are more likely to file for Chapter 11 protection, while firms facing under-investment incentives are more likely to renegotiate in a workout. Gertner and Scharfstein (1991) argue that firms with many small creditors are more likely to reorganize in Chapter 11 to overcome free-rider problems. Bebchuk (1991) points to more acute incentives to over invest in the presence of deviations from absolute priority rules. Bebchuk and Picker (1992) discuss how the existing bankruptcy law affects the ex ante development of human capital and project choice.

The security design literature has identified two roles for bankruptcy. In Townsend (1979), bankruptcy is an enforcement device used to ensure the payment of the debt contract. In other work, bankruptcy is identified as a renegotiation (Aghion and Bolton (1992)) of financial claims or a redistribution of control rights and cash flows (Zender (1991), and Kalay and Zender (1997)) that is used to enhance productive efficiency. While these articles focus on the role of bankruptcy rules in enhancing ex post efficiency, this article adds to the literature by focusing on the role of optimal bankruptcy rules in enhancing ex ante decision making.

Our article contributes to the debate on the economic efficiency of deviations from absolute priority rules (APR) in bankruptcy. In Heinkel and Zechner (1993), Kalay and Zender (1997), and in Berkovitch and Israel (1995), (1998) deviations from absolute priority rules improve the bankruptcy outcome, as they give incentives to privately informed managers to share their adverse information with the less informed creditors. In contrast, in the current paper, deviation from APR protects the sunk investment by the entrepreneur in the bankruptcy restructuring, thereby increasing his incentive to exert effort in the first place.

Several criticisms have been leveled against the current U.S. bankruptcy code. Bebchuk (1988) and Jensen (1991) have suggested market-based alternatives to the current code in order to ensure the efficient allocation of resources. The essence of many of these proposals is that, upon entering bankruptcy, the firm is sold via a market mechanism that is designed to ensure that the assets of the firm are directed to their highest value use, and to uphold the absolute priority of the existing claims. In particular, neither the shareholders nor the current man-

agement receive any advantage in the resolution of distress.[3] The main difference between our restricted auction and these market-based proposals lies in the bias toward the incumbent management in reorganizations that the restrictions in our proposal provide. This advantage is important because it provides correct ex ante decision making incentives.

The rest of the paper is organized as follows. Section II presents the model. In Section III, the first-best solution to the entrepreneur's decision problem is provided as a benchmark. Section IV provides the results assuming that unrestricted bargaining resolves financial distress. Section V presents an analysis of the design of a bankruptcy law that provides efficient ex ante decision making incentives. Sections VI and VII describe mechanisms that implement the optimal outcome under different information structures. Section VIII compares an unrestricted auction to the restricted auction mechanism proposed here. Section IX generalizes the theory to include other relationship-specific decisions such as the manager's choice between developing firm-specific and general human capital or between short-term and long-term investment projects. Section X discusses relaxing some of the model's restrictive assumptions and the implications to debt capacity. Section XI compares the optimal bankruptcy law derived here to the existing law, and Section XII concludes.

II. The Model

Consider a model with three points in time, 0, 1, and 2. At time 0, an entrepreneur, who owns the rights to a project, contracts with an outside investor for start-up capital, I. After the financial contract is sold, the entrepreneur establishes the firm and makes an (unobservable) effort choice, e, where higher effort serves to increase the value of the firm.[4] Exerting effort is personally costly for the entrepreneur. The cost of effort, $\psi(e)$, is increasing and convex in e. The entrepreneur makes his effort choice knowing only the distribution of the possible future states of nature. At time 1, the entrepreneur and the outside investor observe a precise but nonverifiable signal concerning the final cash flow, $\tilde{y}$, whose characteristics are specified in equation (1) below. Based on this signal, the entrepreneur must decide whether to liquidate the firm (choose an alternative use for the assets), continue producing under the original contracts, or attempt to renegotiate the original contracts. If the firm is liquidated at time 1, the liquidating cash flow is received immediately and the claimants are paid as specified in the original contracts. At time 2, if production was continued between times 1 and 2, the final cash flow, y, is realized and the claimants are paid according to the prevailing contracts. The sequence of events and decisions is summarized in Figure 1.

In order to highlight the role of information revelation in bankruptcy, we assume that only the receipts from liquidation or sale of the firm at time 1 are

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[3]Jensen ((1991), p. 30), for example, states: "Current court practices—especially the failure to enforce absolute priority and to limit the period of management's monopoly rights to propose a restructuring to 120 days—are very difficult to justify on efficiency grounds. I can see no argument for violating the contractually agreed-upon priority of valid claims."

[4]Alternatively, we may think of the manager choosing between firm-specific and general human capital or short- and long-term investment projects, as illustrated in Section IX.

FIGURE 1

Sequence of Events and Decisions

Time 0   Time 1   Time 2

Contracts are   Manager Chooses   Signal Observed.   Cash Flow is
Signed.   Effort Level, e.   Renegotiation of   Realized.
                                          Contracts.   Claimants are
                                          Liquidation Decision.   paid.
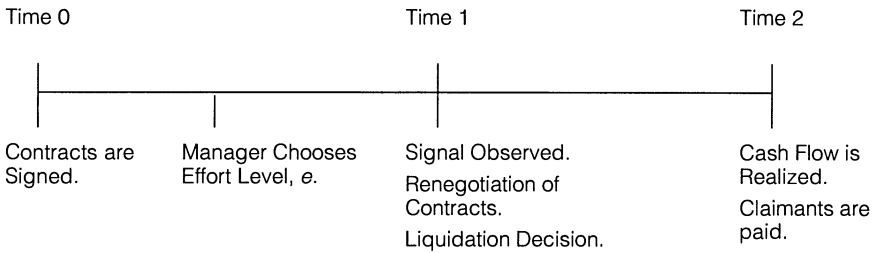
costlessly verifiable. Cash flows received at time 2 and the signal received at time 1 are assumed to be observable to the entrepreneur and the investor, but are verifiable to a third party (a court of law) only at cost K. Because the realized cash flow and the signal concerning this cash flow are not costlessly verifiable, the claimants will not, in general, write fully state contingent contracts.[5] We restrict attention to contracts that may be contingent on a report of the state of nature made by the entrepreneur. Our information structure implies that contracts may not be contingent on the firm's final cash flow unless the verification cost is incurred. Thus, without verification, the court can only enforce contracts dependent upon the report. Given such contracts, if the entrepreneur wishes to retain control, he reports the state(s) associated with the lowest payment for which the contract does not require verification and grants him control. Consequently, the only enforceable contract specifies a single payment such that if the payment is made, there is no verification and the entrepreneur retains control. Otherwise, the state is verified and control and the firm's cash flow at time 2 are transferred to the investor.[6] This contract is a simple debt contract.[7] Lemma 1 summarizes this discussion.

Lemma 1. Let $F(r)$ denote the possibly report contingent, time 2 payout required by the outside investor's financial contract. The only *feasible* contract is a debt contract that specifies a fixed payment, $F = \min\{F(r)\}$, to the outsider for all possible reports r. If the entrepreneur pays F to the creditor, he receives the residual cash flow. Otherwise, the creditor obtains control and the resulting cash flow.

Based on Lemma 1, we will refer to the outside investor's contract as a debt contract and will refer to F as the face value of the debt. Note that Lemma 1 also implies that if the original contract is renegotiated, the result must be a contract

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[5]The contractual incompleteness is derived from the fact that the state of nature is costly to describe in a contract, as in Hart and Moore (1988). It is this contractual incompleteness that provides the need for renegotiation of the financial contracts in bankruptcy.

[6]We assume that the controlling party obtains the cash flow at period 2. In particular, if the entrepreneur defaults on the debt, he cannot appropriate any cash flow before control is transferred.

[7]It should be noted because of the timing of the model and the symmetric information between the creditor and the debtor, that, despite the use of a debt (fixed payment) contract, in equilibrium, verification costs are never incurred when the optimal bankruptcy law is in place. In what follows, we will ignore verification costs for this reason.

with a different fixed payout requirement. In other words, renegotiations must result in a new (lower) face value for the debt.

At time 1, the entrepreneur must decide whether to continue production given the existence of debt with face value F. If the entrepreneur continues operations, the firm is assumed to generate a final cash flow at time 2 equal to

$$(1) \qquad\qquad \widetilde{y}(e) \;=\; \alpha e + \widetilde{\varepsilon},$$

where e is the effort level that the entrepreneur exerts and α is a positive technology parameter. The productivity shock $\widetilde{\varepsilon}$ has probability distribution $G(\varepsilon)$, density $g(\varepsilon)$, and support $[\underline{\varepsilon}, \overline{\varepsilon}]$; we allow for $\underline{\varepsilon} = -\infty$ and $\overline{\varepsilon} = \infty$.

If the firm is liquidated at time 1, either the highest valued alternative use for the assets of the firm is piecemeal liquidation or an alternative manager can generate the highest alternative value by continuing operations. We initially assume that piecemeal liquidation provides the highest alternative value, L, and that L is known to the entrepreneur and the investor. This assumption is relaxed in Section VII, where we consider multiple, privately known, alternative values for the firm. We assume that L is known to the claimants but not verifiable unless it is received for the assets of the firm. L also represents the value of the firm to an outside party (bidder). In addition, the entrepreneur will obtain his outside wages in alternative employment, denoted by w. We assume that all agents in the model have linear utility over time 2 wealth. For simplicity, we take the risk-free rate to be zero.

If the required investment, I, is larger than the liquidation value, L, the debt is risky, and $F > I$. We can divide the possible time 2 cash flow (and the time 1 signal) into three regions. We label the defining values for these three regions $\varepsilon_1(e){=}L{+}w{-}\alpha e$ and $\varepsilon_2(e,F){=}F{+}w{-}\alpha e$, and, for simplicity, we will assume that $\overline{\varepsilon} \geq \varepsilon_2(e,F)$ and $\underline{\varepsilon} \leq \varepsilon_1(e)$ for all possible levels of e. For values of $\varepsilon \leq \varepsilon_1(e)$, which we label region 1, the firm is not economically viable, and in financial distress. For values of $\varepsilon_2(e,F) \geq \varepsilon \geq \varepsilon_1(e)$, which we label region 2, the firm is economically viable but in financial distress. Note that, for a given level of F (as determined by I), the firm may enter distress either due to a poor realization of $\widetilde{\varepsilon}$ or due to a low choice of e by the entrepreneur. In other words, distress may be caused by bad luck or by bad management. Finally, for values of $\varepsilon \geq \varepsilon_2(e,F)$, which we label region 3, the firm is both economically and financially viable.

III.   The First-Best Solution

The first-best solution is the outcome that the entrepreneur would achieve if he had enough capital to finance the project. If he does not invest in the project, the entrepreneur's payoff at time 2 is equal to his outside wage, w. If the project is undertaken, the entrepreneur's expected payoff is

$$(2) \quad \Pi^*(e) \;=\; \int_{\underline{\varepsilon}}^{\varepsilon_1(e)} (L+w)g(\varepsilon)d\varepsilon + \int_{\varepsilon_1(e)}^{\overline{\varepsilon}} (\alpha e + \varepsilon)g(\varepsilon)d\varepsilon - \psi(e) - I.$$

In regions 2 and 3, when the firm is economically viable, the entrepreneur receives the cash flow $\alpha e + \varepsilon$. In region 1, the firm will be liquidated and the entrepreneur

receives L from selling the firm's assets and compensation equal to w from alternative employment.

If the entrepreneur undertakes the project, he chooses e to maximize $\Pi^*(e)$. We assume that the project is worth taking, i.e., $\Pi^*(e^*) > w$ where e^* maximizes $\Pi^*(e)$. Thus, e^* is the solution to

(3) $$(1 - G(\varepsilon_1(e^*)))\,\alpha - \psi_e(e^*) \;=\; 0.$$

The first term in equation (3) is the marginal increase in firm value from exerting effort and the second term is the entrepreneur's marginal cost of effort.

IV. The Unrestricted Bargaining Outcome

When the firm is financed with debt, the first-best outcome is not always obtained.[8] The departure from the first-best outcome is caused by the outcome of the negotiations when the firm is in financial distress. We first describe a bargaining game between the outside investor and the entrepreneur. We assume that, without institutional or legal restrictions, the "unrestricted bargaining game" to be described below characterizes the negotiations between these two claimants when the firm enters financial distress.[9] We then consider the effect that this type of renegotiation has on the entrepreneur's choice of effort.

The entrepreneur approaches the outside investor to initiate negotiations.[10] If the investor declines to negotiate, the entrepreneur either liquidates the firm or continues under the original contracts. If the investor agrees to negotiations, a Rubinstein (1982) alternating offer bargaining game, with outside options, ensues. In each round of the negotiation game, one party (the entrepreneur makes the first offer) offers a new face value for the debt contract. The other party accepts or rejects the offer. If accepted, the offer defines a new debt contract. If the offer is rejected, the game moves with costly delay to the next round unless the negotiations are terminated by either party. The per round cost of delay is denoted δ, a discount factor less than 1. The cost of delay may be thought of as a loss of market share, strategic disadvantages when the firm faces competition in the product market, or other costs of delayed production. If negotiations are terminated, the original debt contract remains as the investor's claim. The termination of negotiations represents the outside option for each agent.

We now describe the region by region outcome of the negotiations. In region 1, the firm is not economically viable and will, therefore, be liquidated. In region 3, the firm is financially and economically viable and so the outside investor would reject any negotiation attempt made by the entrepreneur. Thus, the

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[8] We assume that the project's net present value is large enough that it can be financed with a debt contract (i.e., there exists an F such that the investor is willing to pay I for the debt) that cannot be renegotiated. That is, if the firm enters distress, it is liquidated and the outside investor receives the liquidation value. In Section X, we discuss relaxing this assumption.

[9] Our results are robust to changes in the specification of the unrestricted bargaining game, as long as the entrepreneur's bargaining power is limited.

[10] In equilibrium, there is agreement over when the firm should enter bankruptcy and, therefore, all bankruptcies may be thought of as management or investor initiated. For clarity, we will present the analysis in terms of management initiated bankruptcy.

firm will continue under the original contracts. In region 2, the firm is in financial distress and, under the original contracts, the entrepreneur prefers to liquidate it in order to receive his outside wages. This results in payoffs L to the outside investor and w to the entrepreneur. If contracts are renegotiated and the firm continues, the total cash flow is $y = \alpha e + \varepsilon$, where $\varepsilon_1(e) < \varepsilon < \varepsilon_2(e, F)$. Since the total cash flow with negotiations is higher than the total payoffs without negotiations, negotiations will take place in region 2.

   We now provide a two-step solution for the unrestricted bargaining in region 2. We first describe the outcome ignoring the outside options. Then, to complete the description of the solution, we incorporate the outside options. Let V_E be the value that the entrepreneur demands when it is his turn to propose a division of the cash flows and V_d be the value that the outside investor demands when it is his turn to propose.[11] Ignoring the outside options, the following equations, which are standard in solving the Rubinstein bargaining game, provide the solution for the unrestricted bargaining game,

$$(4) \qquad\qquad V_E \;=\; y - \delta V_d,$$

$$(5) \qquad\qquad \text{and} \quad V_d \;=\; y - \delta V_E.$$

Equation (4) describes the value, V_E, that the entrepreneur demands when it is his turn to submit an offer. The entrepreneur offers the investor the value the investor could receive from delay, δV_d, and retains the residual. Similarly, equation (5) provides the value, V_d, that the outside investor demands when it is his turn to propose. Solving equations (4) and (5) for the equilibrium payoffs, we obtain

$$(6) \qquad\qquad V_E \;=\; \gamma y,$$

$$(7) \qquad\qquad \text{and} \quad \delta V_d \;=\; (1 - \gamma) y,$$

where $\gamma = 1/(1 + \delta)$ represents the relative bargaining power of the entrepreneur.

   When the outside options are considered, each party receives at least the value of its outside option in the negotiations. Therefore, the payoff to the entrepreneur, V_E, which depends upon y and γ, is

$$(8) \qquad\qquad V_E \;=\; \max\{\min\{y - L, \gamma y\}, w\},$$

and the outside investor receives

$$(9) \qquad\qquad \delta V_d \;=\; \max\{\min\{y - w, (1 - \gamma) y\}, L\}.$$

Equation (8) can be explained as follows. The last term inside the maximum, w, represents the outside option of the entrepreneur. The entrepreneur can always secure this amount and will obtain more if his bargaining power, γ, is large enough. When γ is large, the entrepreneur's value is determined by the expressions inside the minimum. The entrepreneur obtains γy, unless this leaves the investor with less than his outside option, L. In this case, when γ is very large, the entrepreneur effectively has all the bargaining power and he obtains $y - L$. Equation (8) defines

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[11]Note that the fact that the entrepreneur makes the bid before the outside investor, the sum of V_d and V_E is different than the total cash flow y, as can be seen in equation (4).

the three possible outcomes of the bargaining. Equation (9) is explained similarly. The negotiations result in a new face value for the debt $F_n = \delta V_d$ and continued production. Note that this arrangement achieves an ex post efficient distribution of resources. See Figures 2 and 3 for a graphical representation of the resulting payoff to the entrepreneur.

FIGURE 2

The Bargaining Outcome: $w > \gamma L/(1 - \gamma)$
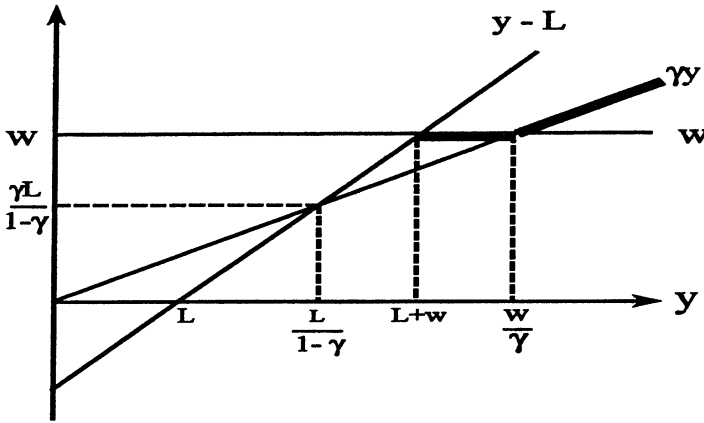
The heavy line represents the bargaining payoff to the entrepreneur, V_E. Bargaining occurs for values of y between $L + w$ and $F + w$. For realizations of y between $L + w$ and w/γ, the payoff to the entrepreneur is w, because, as per equation (8), w exceeds both $y - L$ and γy. Similarly, for realizations of y between w/γ and $F + w$, the entrepreneur's payoff is γy. Note that if $F + w$ is less than w/γ, the entrepreneur's bargaining payoff is always w.

A. Firm-Specific Investment

At time 0, anticipating the outcome of the unrestricted bargaining, the entrepreneur chooses e to maximize

$$(10) \qquad \Pi^U(e) \;=\; \int_{\underline{\varepsilon}}^{\varepsilon_1(e)} wg(\varepsilon)d\varepsilon + \int_{\varepsilon_1(e)}^{\varepsilon_2(e,F)} V_E g(\varepsilon)d\varepsilon$$

$$+ \int_{\varepsilon_2(e,F)}^{\overline{\varepsilon}} (y - F)g(\varepsilon)d\varepsilon - \psi(e).$$

The following proposition compares the incentives of the entrepreneur with the first-best.

Proposition 1. Let $\gamma^c = (w + F - L)/(w + F)$. Then, i) for all $\gamma < \gamma^c$, the entrepreneur chooses strictly less than the first-best level of effort, and ii) if $g(\varepsilon_2)=0$, then for all $\gamma \geq \gamma_c$, the entrepreneur exerts the optimal level of effort.

Proof. See the Appendix.

Assuming that $g(\varepsilon_2) = 0$ simplifies the presentation and guarantees that the first-best solution is feasible. While this is a restrictive assumption, we make

FIGURE 3

The Bargaining Outcome: $w < \gamma L / (1 - \gamma)$
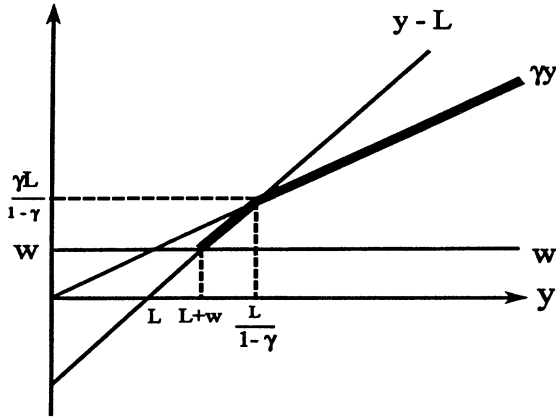
The heavy line represents the bargaining payoff to the entrepreneur, V_E. Bargaining occurs for values of y between $L + w$ and $F + w$. For realizations of y between $L + w$ and $L/(1 - \gamma)$, the payoff to the entrepreneur is $y - L$, because, as per equation (7), $y - L$ is below γy. Similarly, for realizations of y between $L/(1 - \gamma)$ and $F + w$, the entrepreneur's payoff is γy. Note that if $F + w$ is less than $L/(1 - \gamma)$, the entrepreneur's bargaining payoff is always $y - L$.

two notes about relaxing it. First, the complication introduced is a second order effect. Second, only a "second-best" outcome would be feasible. While we could consider the second-best outcome, at some cost in added notation, the result that, for larger γ, managerial incentives are improved remains true (see the discussion in Section X). Therefore, this assumption simplifies the presentation with no loss in intuition. For clarity of presentation, we will maintain this assumption in the balance of the paper.[12]

As Figures 2 and 3 show, if there is a positive probability that the entrepreneur's payoff in financial distress will be either γy or w, then he will receive either a fraction γ or none of the marginal product of his effort. The convexity of $\psi(e)$ causes the entrepreneur to exert less than the first-best level of effort, e^*.[13]

To make the bankruptcy design problem non-trivial, we assume that $\gamma < \gamma^c$. Therefore, the use of unrestricted bargaining in the renegotiation of the claims leads to suboptimal incentives for the entrepreneur. The resulting lower effort decreases firm value and makes financial distress ($y \leq F + w$) more likely.

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[12]It is straightforward to develop the result that the first-best is achieved when the entrepreneur has sufficiently high bargaining power in a model where the effort choice is discrete.

[13]The effort that the entrepreneur exerts creates a quasi-rent for the entrepreneur that may be appropriated in a renegotiation. Bankruptcy law can be designed so that the investor can commit not to appropriate this rent and so provide correct incentives for the entrepreneur. In this way, our results are related to Williamson's (1975) work on long-term contracting. Also, as discussed in Section IX, consideration of other decision problems that create appropriable quasi-rents would yield similar results.

V.   The Optimal Bankruptcy Outcome

Unrestricted bargaining between the claimants provides for ex post efficiency but distorts the entrepreneur's ex ante incentives. The objective in designing bankruptcy law should be to achieve ex ante efficiency. Bankruptcy law can achieve an ex ante efficient outcome by placing restrictions on the bargaining that occurs between the entrepreneur and the investor when the firm is in financial distress. Consistent with our view of bankruptcy and our modeling of the unrestricted bargaining game, we consider the choice between alternative structures for the bankruptcy law as the choice between different Rubinstein alternating offer bargaining games. The choice over bargaining games can be reduced to the choice of the entrepreneur's bargaining power, γ, and the choice of the investor's outside option, λ. The variables λ and γ are selected to align the entrepreneur's incentives with the first-best.

Consider the effect of altering γ for a given λ. As discussed above, the entrepreneur's incentives are optimal whenever his renegotiated payoff is $V_E = y - L$. Efficiency follows from the fact that the entrepreneur, in region 2, captures, at the margin, the entire increase in firm value that follows from his effort. Bankruptcy law can implement the ex ante efficient outcome if it can both raise the entrepreneur's bargaining power enough to ensure that the investor faces a non-contingent payoff in bankruptcy reorganization (under existing management) and remove the entrepreneur when it is efficient to do so. Proposition 2 identifies a pair (γ, λ) that provides first-best incentives for the entrepreneur.

Proposition 2. Suppose the bankruptcy rule is as follows:
   1) it sets $\gamma^* \geq \gamma^c$ and $\lambda^* = L$, and
   2) if one party commences bankruptcy and the other refuses, the bankruptcy court implements the original debt contract.

Then, the following strategies and beliefs constitute a sequential equilibrium that implements the first-best effort level, e^*.

   i) *The manager's strategy.* The manager exerts effort level e^*. If y is in region 1, the manager quits. If y is in region 2, the manager files for bankruptcy. If y is in region 3, the manager continues.

   ii) *The outside investor's strategy.* If y is in region 3, the outside investor refuses negotiations if attempted by the manager. If y is in region 2, the outside investor renegotiates the debt contract. If y is in region 1 and the manager initiates renegotiations, the outside investor refuses to negotiate unless offered more than L.

   iii) *Beliefs.* The outside investor believes that the entrepreneur chooses e^* with probability 1.

Proof. Given the manager's strategy in i and beliefs in iii, the outside investor's strategy to negotiate only in region 2 is optimal. We now show that the manager's choices specified in i are optimal, given the outside investor's strategy in ii and the beliefs in iii. Suppose the manager chooses e^*. If y is in region 1, the highest payoff the entrepreneur can secure is w by liquidating the firm. If y is in region 3, the entrepreneur cannot renegotiate because the outside investor refuses, the entrepreneur does not want to quit because $y - F > w$ and, therefore, he continues.

If y is in region 2, negotiations yield the highest payoff to him. It remains to show that the entrepreneur optimally chooses e^*. Given these strategies and beliefs, the entrepreneur chooses e to maximize

$$(11) \qquad \Pi^B(e) = \int_{\underline{\varepsilon}}^{\varepsilon_1(e)} wg(\varepsilon)d\varepsilon + \int_{\varepsilon_1(e)}^{\varepsilon_2(e,F)} (y - L)g(\varepsilon)d\varepsilon$$

$$+ \int_{\varepsilon_2(e,F)}^{\overline{\varepsilon}} (y - F)g(\varepsilon)d\varepsilon - \psi(e).$$

This objective function is identical to that in Proposition 1 when the entrepreneur's bargaining power $\gamma > \gamma^c$, which implies that the manager chooses the first-best effort level, e^*. Finally, the beliefs in iii are consistent, given the manager's strategy in i. □

Choosing $\lambda^* = L$ implements the first-best choice of e and ensures that all economically viable firms continue after being reorganized in bankruptcy. Likewise, $\gamma^* \geq \gamma^c$ guarantees the first-best outcome.

VI.   The Optimal Bankruptcy Law (Implementation)

In this version of the model, with one known alternative value for the assets of the firm, there are many implementations of the prescription of Proposition 2. In this section, we present two of them. The first features the use of a "take-it-or-leave-it" offer by the entrepreneur, highlighting the importance of the entrepreneur's bargaining power. It also illustrates the fact that, with this information structure, bilateral bargaining between the claimants can achieve the optimal outcome. The second mechanism utilizes a "restricted auction" and is discussed because it extends to the more general setting presented in Section VII, where the information required for the efficient allocation of resources is not possessed by the claimants and so bilateral bargaining cannot achieve the optimal outcome.

A.   The Take-It-or-Leave-It Mechanism

The bankruptcy court can implement the optimal bargaining power, γ^*, by dictating the sequence of moves in the negotiations. For example, if the court gives the manager the right to propose first and mandates a specific period before a counter offer may be made, the manager's bargaining power is increased. In the extreme, the bargaining is reduced to the entrepreneur making a take-it-or-leave-it offer to the investor.

The take-it-or-leave-it scheme is as follows. When the entrepreneur petitions for bankruptcy, the investor has the right to refuse. If the investor refuses, the original contracts prevail and no private restructuring of the claims is recognized by the court.[14] When the firm enters bankruptcy, the law provides the entrepreneur with the right to make a take-it-or-leave-it offer to the investor, specifying a new

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[14]Because the bankruptcy law is designed to control the bargaining, this provision must be included to prevent the investor from refusing to bargain within the structured environment and seeking a private, more favorable, agreement. This mirrors the notion of "protection" in Chapter 11 for the debtor from the creditor.

face value for the debt contract. If the investor accepts the offer, the new contract replaces the original. If the investor rejects the offer, the law requires that the court liquidate the firm and that the proceeds be paid out according to the original contracts.

The outcome of this procedure is as follows. In region 1, the firm will be liquidated (in or outside bankruptcy) because the entrepreneur cannot make an acceptable offer to the investor that provides an incentive for the entrepreneur to continue with the firm. In region 3, the entrepreneur would like to take the firm into bankruptcy, but the investor will refuse any such attempt. In region 2, the entrepreneur petitions for bankruptcy with the consent of the investor. The payoffs in bankruptcy are L to the investor and any positive residual cash flow belongs to the entrepreneur.

The above mechanism implements the first-best outcome because the entrepreneur receives, in regions 2 and 3, the entire increase in firm value resulting from his effort (none of the entrepreneur's quasi-rents are appropriated). An appealing property of this mechanism is that it does not require the court to place a value on the firm. The bankruptcy process elicits this information from the informed parties. Therefore, it can be implemented when firm value is not verifiable, as in the current model.[15]

The role of the bankruptcy law in providing the entrepreneur with an artificially high bargaining power is that of a commitment device.[16] Consider, for example, attempting to contractually specify the take-it- or-leave-it scheme described above. The problem with this contract is that, if the creditor rejects the entrepreneur's offer in region 2, the threat of liquidation is not credible. At this point, both parties prefer to break the contract rather than liquidate the firm. In fact, the only acceptable offer the entrepreneur could make is his initial offer in the unrestricted bargaining game.

B.   The Restricted Auction Mechanism

We now show that, when there is one known liquidation value, a restricted auction mechanism yields the first-best outcome. We assume that there is always at least one outside bidder, other than the investor, who is willing to bid the known value from piecemeal liquidation.

Proposition 3. The following restricted auction mechanism implements the first-best outcome.

1) If the entrepreneur petitions for bankruptcy, the investor has the right to refuse. If the investor refuses, the court recognizes the original contracts, regardless of any private agreements the parties may reach.

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[15]Alternatively, if the liquidation value is verifiable, the court could specify that, in bankruptcy, the entrepreneur pays the investor L. This is a solution to a one-sided firm-specific investment problem noted by Hart and Holmstrom (1987). When we enrich the model to allow for multiple liquidation values (so value discovery plays a significant role), this solution will not work.

[16]The view of bankruptcy law as a commitment device is different from the legal system considered in Giammarino and Nosal (1993) where the court can implement only ex post efficient outcomes.

2) If the investor does not refuse bankruptcy, the entrepreneur and any out-side bidder, other than the investor, participate in a second-price sealed-bid auction for the firm.

3) The proceeds from the auction are paid out according to the original contracts.

Proof. In region 3, the investor refuses bankruptcy because, under the existing debt contract, the entrepreneur prefers to continue rather than leave the firm. When the firm is in distress, in regions 1 and 2, the investor allows the use of the bankruptcy procedure. Bankruptcy is allowed in region 1 because he cannot receive more in piecemeal liquidation. In region 2, the investor cannot benefit from refusing bankruptcy. If, in region 2, the investor refuses bankruptcy, the court will recognize the original contracts as binding. Attempts by the investor to bargain privately will be rejected by the entrepreneur, because the entrepreneur understands that the investor will demand a payout equal to the original face value of the debt contract at time 2. The investor's refusal of bankruptcy in region 2 leads to liquidation of the firm.

A dominant strategy for the entrepreneur is to bid his value for the firm $y - w$ when region 2 occurs, and bid L in region 1. Bankruptcy signals to outside bidders that region 1 or 2 has occurred. If outside bidders knew region 1 had occurred, none would bid more than L for the firm. If they knew region 2 had occurred, with the investor restricted from bidding, no bidder could profitably win the auction, and so none has incentive to bid more than L. Therefore, in bankruptcy, it is a dominant strategy for outside bidders to bid L. Given these bids, in region 1, the firm is liquidated and, in region 2, the entrepreneur wins and pays L for the firm. The resulting payoffs are identical to those of Case 3 so the first-best outcome is achieved. □

The investor's right to refuse bankruptcy eliminates the strategic use of bankruptcy by the entrepreneur in region 3. The inclusion of this option does not affect ex post efficiency or managerial incentives. Without this option, however, the entrepreneur may not be able to finance the project (when $I > L$). The most investors would pay for the firm's debt would be L, the amount the investor would recover in each state. Enforcing the original debt contract if the investor rejects bankruptcy prevents the strategic use of the refusal option. Without this restriction, the investor could achieve the unrestricted bargaining outcome by always refusing bankruptcy.

The investor is prevented from participating in the auction because he has an interest in bidding above the value of the assets in an alternative use (liquidation) in order to force the entrepreneur to pay out more than L in region 2. This incentive exists because the investor has a claim to the proceeds of the auction.[17] As will be demonstrated in Section VIII, the investor's participation in the auction would cause an inefficient outcome.

When the entrepreneur wins the auction, he must "pay" L to the investor for the original debt claim. This may be accomplished in two ways. The entrepreneur

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[17]In a different context, Singh (1993) and Burkart (1995) show how a large shareholder with toe-holds may have the incentive to overbid, because only part of the bid goes to outside shareholders. Note also that the problem is the "uneven playing field" discussed by Aghion, Hart, and Moore (1992).

may sell a new debt claim. Alternatively, the investor is indifferent between receiving the liquidation value at time 1 raised from new contributors of capital or simply reducing the face value of the existing claim. As Aghion, Hart, and Moore (1992) have suggested, there may be advantages to using the original claimants as risk bearers for the newly reorganized firm.

The essence of both the take-it-or-leave-it and the restricted auction mechanisms is that they effectively increase the bargaining power of the entrepreneur when efficiency requires the firm be reorganized under his control and direct the assets of the firm to their highest valued alternative use (remove the entrepreneur) otherwise. This bias in favor of an entrepreneur who continues with the firm prevents the investor from appropriating any of the entrepreneur's quasi-rents and so provides first-best incentives for exerting effort.

VII. Value Discovery in Bankruptcy

Consider now the more realistic case of multiple alternative uses for the firm's assets with asymmetric information concerning the value of the assets in these alternative uses. This complicates the analysis because information not possessed by the claimants must be revealed to achieve an efficient allocation of resources. Consequently, structured bilateral bargaining cannot achieve the optimal outcome. Despite this change, the optimal bankruptcy procedure must ensure that the entrepreneur receives all the marginal benefits from exerting effort. It is still important that the entrepreneur not suffer from the disadvantageous bargaining position in which he receives either his outside wage w or a fraction γ of the cash flow.

Multiple alternative uses for the firm's assets imply that the bankruptcy process must allow the court to learn whether the assets of the firm are more valuable under current management or in some alternative use, and to identify this value. In other words, the bankruptcy law must provide a process by which resources are allocated efficiently. Value discovery is an important role of the bankruptcy process that has been discussed widely in the literature. Until now our model has had little of interest to say on this issue because the liquidation value was fixed and known to the claimants. It was an equilibrium, therefore, for the firm to enter bankruptcy only in region 2. We now extend the model to show that the restricted auction mechanism of Proposition 3 also results in value discovery and so leads to the efficient allocation of resources when there is asymmetric information over the alternative values of the firm.

Suppose now that there are $N > 1$ potential bidders, and the value of the firm under the management of each is denoted by L_j, $j = 0, \ldots, N$.[18] Each L_j is independently drawn from the interval $[L_{min}, L_{max}]$ according to some probability distribution. For simplicity, we assume that $L_{max} < F$.[19] Each bidder j learns only

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[18]We envision not multiple values for piecemeal liquidation, rather multiple values for the firm's assets in different alternative uses. Also, note that it is natural to assume that these values are independent of the entrepreneur's effort choice.

[19]If $L_{max} > F$ so that there may be realizations of the L_j for which the entrepreneur should be replaced outside of distress, an efficient market for corporate control, in addition to the optimal bankruptcy law, will insure an efficient outcome.

his own valuation at time 1, after the entrepreneur has made his effort decision. For consistency, the investor and the entrepreneur learn L_0, the piecemeal liquidation value. We maintain the definition of $\varepsilon_1(e)$ with L_{max} replacing L. Under these assumptions, the entrepreneur should run the firm in regions 2 and 3. In region 1, the entrepreneur should run the firm if the highest *realized* alternative value, denoted L_H, satisfies $y > L_H + w$, and should be replaced otherwise. The firm must now enter bankruptcy in region 1 (as well as region 2) to determine whether the firm should continue under existing management. The following proposition characterizes an optimal bankruptcy law for the case of multiple, privately known, alternative values.

Proposition 4. The restricted auction mechanism of Proposition 3 implements the first-best outcome when there are multiple, privately known, liquidation values.

Proof. In region 3, the entrepreneur continues to control the firm and the original contracts are unchanged. In regions 1 and 2, the entrepreneur commences bankruptcy with the investor's consent. In the ensuing auction, with the restriction against the investor's participation, it is a dominant strategy for each outside bidder to bid his own value, L_j, and for the entrepreneur to bid the larger of L_0 or $y - w$. If the entrepreneur submits the winning bid, he retains control of the firm and "pays" the value of the highest of the outside bids, L_H. When the entrepreneur does not submit the highest bid, which occurs in region 1, the outside bidder with the highest valuation wins and pays the value of the second highest bidder (possibly the entrepreneur). The entrepreneur is dismissed, obtains his alternative wage, and the proceeds of the auction are distributed according to the original contracts. □

It is important to note that the correct ex ante managerial effort incentives were provided by the restriction against the investor's participation in the auction. This restriction prevents the investor from taking control of the firm (by bidding more than his value for the firm) when it is most valuable under the entrepreneur's control and employing the entrepreneur to manage the firm at a lower wage, thereby capturing some of the value created by the entrepreneur's effort.

Using an auction to renegotiate the financial claims may seem largely divorced from a bargaining game; however, consider the auction outcome. When the entrepreneur does not possess a comparative advantage in running the firm, he is removed. In the event the entrepreneur possesses such a comparative advantage, he retains control and must pay out only the value of the next highest alternative use of the assets. Therefore, the use of the restricted auction in renegotiating the financial claims in distress is a method by which the benefit for the entrepreneur from exerting effort may be protected. The use of the restricted auction can, therefore, be seen as a way to inflate the entrepreneur's bargaining power and so increase his payoff in distress when bilateral bargaining cannot provide an efficient solution.

VIII. The Unrestricted Auction Outcome

In Section IV, we saw that unrestricted bargaining leads to an inefficient outcome. In this section, we analyze the recommendation, promoted by Jensen (1991), that the bankruptcy law requires firms in distress to be auctioned off, and compare it with our restricted auction mechanism. We interpret this proposal as an "unrestricted" auction in the following sense. When the firm enters bankruptcy, a sealed-bid auction for the firm is announced by the bankruptcy court. The bankruptcy court collects the bids, announces the winner, and distributes the proceeds to the existing claimants according to the absolute priority of the original claims. We assume that this proposal prevents the strategic use of bankruptcy. We will, however, consider this possibility for completeness and to highlight the role of such a restriction.

To simplify the comparison, we again analyze the case of a single alternative value for the assets of the firm (a piecemeal liquidation with value L) and then discuss the complications introduced by the existence of multiple alternative uses. The winner of the unrestricted auction can either liquidate the firm, run the firm himself, or employ an alternative manager (perhaps the entrepreneur) to continue production. If the entrepreneur is employed, his compensation is determined by the unrestricted bargaining process described in Section IV. The only difference is that after the auction, there is no debt outstanding and, if bargaining breaks down, the firm is liquidated and the winner of the auction receives L.

Our information structure implies that the investor and the entrepreneur know the realization of y and the liquidation value and, therefore, which region has occurred. Outside bidders know only the liquidation value, L. Consequently, outside bidders can only distinguish between region 3 (when the firm continues), and regions 1 and 2 (when an auction is held).

The investor will refuse to auction off the firm in region 3. In region 2, the investor bids at least his value from the unrestricted bargaining, δV_d. The investor is willing to bid at least that high because, if he wins, he can rehire the entrepreneur and obtain this value after (unrestricted) bargaining for the entrepreneur's wage. Also, the investor does not face the cost of this bid because he receives the proceeds of the auction. In fact, if the entrepreneur bids above δV_d, the investor will bid just below the entrepreneur's bid, to lose the auction and to force the entrepreneur to pay a higher amount for the firm. Therefore, in region 2, the entrepreneur's equilibrium bid is δV_d, and so is the investor's bid. In region 1, the entrepreneur and the investor bid L. As argued in the proof of Proposition 4, the outside bidders always bid L in the auction. Proposition 5 provides the equilibrium payoff of the unrestricted auction.

Proposition 5. In any equilibrium of the unrestricted auction, the firm is sold for $\delta V_d = y - V_E$.

The outcome of the unrestricted auction, in region 2, is equivalent to the unrestricted bargaining outcome (described in Section IV) and results in the same distortions of the incentives for the entrepreneur to exert effort. Therefore, while the suggested auction solution to financial distress appears to promote the efficient allocation of resources, it distorts incentives for ex ante decision making (see

Proposition 1). The distortion in ex ante decision making would be even larger than what occurs under unrestricted bargaining if no provision in the bankruptcy procedures prevents the strategic use of bankruptcy by the entrepreneur in region 3. Once again, the distortion appears because, in the negotiation for the entrepreneur's wage, the entrepreneur may capture at most a fraction γ of the increase in firm value that results from his effort.

When there are multiple, privately known alternative values for the assets of the firm, the resulting unrestricted bargaining between the winner of the auction and the entrepreneur takes place under asymmetric information. In general, such bargaining may result in an inefficient outcome in which the firm's assets are not directed to their highest valued use. This exacerbates the inefficiency of the bargaining outcome with a single known liquidation value.

There are similarities and differences between our restricted auction proposal and earlier market-based proposals. The most important similarity is that the valuation of the firm is done via a market mechanism and not left up to a bankruptcy court. This is largely the perceived strength of the earlier proposals and is clearly an important aspect of ours. It ensures an ex post efficient allocation of the assets. The most important difference lies in the bias toward the incumbent management of the firm (when the incumbent management continues running the firm after reorganization) that the additional restrictions in our proposal provide. In other words, the distribution of value ex post plays an important role. This bias is important for providing correct ex ante decision making incentives. Providing this bias requires that the court play a more active role in the bankruptcy process than is required by earlier proposals.

IX.   General Investment Projects

We have considered a model of managerial effort exertion. While this specific modeling is tractable, the scope of the theory is considerably more general and is extendable to many other types of relationship-specific investments. In this section, we present four scenarios that demonstrate the importance of ex ante decision making to the design of bankruptcy law. Maintaining the assumptions regarding the verifiability of the final cash flow as in Section II, Lemma 1 implies that the entrepreneur must issue debt with face value F. The four scenarios below are concerned with decision making after the debt is raised.

Consider the first scenario where an entrepreneur allocates effort to two activities, a firm-specific activity and a general activity. For example, the entrepreneur may develop firm-specific human capital that increases firm value but does not increase his own outside wage, or general human capital that increases his wages in outside employment but does not affect firm value. Let e_s and e_g be the effort the entrepreneur exerts in developing firm-specific human capital and general human capital, respectively. Consequently, we can modify the model by replacing e with e_s in equation (1), w with $w(e_g)$ and $\psi(e)$ with $\psi(e_g, e_s)$ in equation (2). We assume that the entrepreneur's outside wage $w(e_g)$ is non-decreasing in e_g and maintain the regularity assumptions about ψ with respect to e_g and e_s. The analysis and economic forces are similar to those discussed above. Now, however, because the entrepreneur's outside wage is increasing in the amount of

general human capital that he develops, the entrepreneur may have a stronger incentive to shirk and develop general human capital at the expense of firm-specific human capital.[20] The inefficiency, in this case, is that the entrepreneur develops too little firm-specific human capital and too much general human capital. Our proposed bankruptcy mechanisms restore the first-best decision making exactly as discussed above.

Consider a second scenario in which an entrepreneur raises I from an outside investor. The entrepreneur then decides what portion of I, denoted by I_l, to invest in the initial stages of a long-term project, and what portion of I, denoted by I_s (where $I_s = I - I_l$), to invest in the initial stages of a short-term project. The initial investment determines the scale of the projects. We assume that the two projects are mutually exclusive in the sense that in the next period, period 1, the entrepreneur can complete only one of them. The cash flow of the long-term project is realized in period 2, at the time the debt matures. The short-term project yields its cash flow at the end of period 1, before the debt matures. Depending on the amount of debt, F, the choice of the initial investment in each project, I_l and I_s, and the state of nature, ε, the entrepreneur decides at time 1 which project to abandon and which project to continue.

The final cash flow in period 2, if the entrepreneur chooses to continue with the long-term project is given by equation (1) with I_l, replacing e. Since the cash flow of this project is realized when the debt matures, the entrepreneur cannot appropriate any of it before the outside investor is paid off. In contrast, with the short-term project, the cash flow is realized before the debt matures, and the outside investor cannot prevent the entrepreneur from appropriating some of the cash flow. Suppose further that the cash flow consists of a fixed part, L, which can be viewed as liquidation value that the entrepreneur cannot appropriate, and a variable part, $w(I_s)$, which increases with the manager's short-term investment and can be completely appropriated.[21]

Absent bankruptcy law, the entrepreneur has the incentive to invest too much in the initial stages of the short-term project, because he foresees negotiations in financial distress with the creditor regarding project choice. Interpreting the short-term project as liquidation, the entrepreneur anticipates negotiations in financial distress regarding the liquidation decision. The remainder of the analysis, including the resulting optimal bankruptcy law, is identical to that presented above.

Consider as a third scenario the theory proposed by Shleifer and Vishny (1989) of manager-specific investments. Their argument is that managers are motivated to invest in projects that are most valuable under their own management rather than making investments that maximize firm value. The result of such "entrenching investments" is that replacing existing management becomes costlier. As Novaes and Zingales (1995) argue, the possibility of financial distress and renegotiation of the firm's contracts exacerbates this problem. By making

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[20]Berkovitch, Israel, and Zender (1997) prove this result, assuming a fixed quantity of human capital that the entrepreneur allocates between the two activities and $\psi(e_g, e_s) \equiv 0$. In this case, the entrepreneur trades off the benefit of increasing his outside wages in the bankruptcy states against the increase in firm value in the non-bankruptcy states.

[21]Under this formulation, because the manager allocates a fixed I between the two projects, it is natural to omit the function ψ from equation (2).

manager-specific investments, the incumbent manager strengthens his own bargaining position. By allowing an ex ante commitment to ignore the relatively disadvantageous bargaining position into which firm value maximizing investment places the manager, bankruptcy law can improve investment decisions.

As a final scenario, consider the underinvestment discussed by Myers (1977). When a firm has risky debt outstanding, the shareholders' investment decision is similar to the relationship-specific investment considered in our model, because bondholders share in the value of the investment made by shareholders. Specifically, equityholders face an investment vs. dividend decision. Investment benefits the firm as a whole while dividend payments benefit only equityholders. By increasing the equityholders' bargaining power in distress, the bankruptcy law allows them to capture the gains from the investment and so provides for more efficient ex ante investment incentives.

X. Debt Capacity

Throughout the paper, we have assumed that the value of any profitable project was large enough that the project could be financed using a debt contract that could not be renegotiated (see footnote 9). The assumption is essentially that the net present value of any project worth undertaking was large enough so that the required initial capital could be raised by selling a debt contract with some face value, F, where the investor receives only the liquidation value, L, in financial distress. This assumption allowed that all valuable projects could be undertaken.

If the debt capacity is binding, in that a standard debt contract with a value in distress equal to L is not sufficient to finance the project, the investor must be provided with a higher expected cash flow and the analysis must consider a second-best bankruptcy law. This can be done by either increasing λ (the level of the investor's claim in reorganization) above L, or increasing the investor's bargaining power in financial distress.[22] Both approaches create inefficiencies. By setting λ above L, the law forces some economically viable firms to liquidate (those whose realized value is between $L + w$ and $\lambda + w$). Inefficient liquidation causes the entrepreneur to exert too little effort. Reducing the entrepreneur's bargaining power, γ, below γ^c creates inefficient incentives because, in some states, he does not receive the entire marginal gain from exerting effort.

A second-best bankruptcy law will include an increased claim in reorganization for the investor and possibly a lower bargaining power for the entrepreneur. The exact deviation from the first-best law will trade off the benefit of financing marginal positive NPV projects against the costs of inefficient liquidation (ex post) and/or the lower than optimal managerial effort choice (ex ante) for all projects that are undertaken. The difficulty in solving for the second-best bankruptcy law is that the characteristics of all possible projects must be specified along with the probabilities with which each will be discovered. Clearly, the

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[22]It is interesting to note that Section 1129(a) of the U.S. bankruptcy code requires the debtor to demonstrate that the payoffs to creditors in any proposed reorganization are at least equal to the value available in liquidation. As in the model, this feature of the law ensures that only economically viable firms continue. In Propositions 3 and 4, the creditor is held to this minimum: in Proposition 5, this minimum may be exceeded.

way in which this set is specified will have a large impact on the second-best optimal law. Qualitatively, the changes from the first-best world will be as discussed above. It is clear that the second-best law would include provisions increasing the manager's bargaining power above the level that would be provided by unrestricted bargaining.[23]

XI. Comparison to Existing Law

While our intention is not to explain existing bankruptcy laws, it is interesting to compare our proposal with the U.S. bankruptcy code. The most striking similarity between our proposal and the existing law is the bias toward incumbent management and the way it is achieved. In the bilateral bargaining situation, our bankruptcy law affects the bargaining power of the entrepreneur by providing him a first mover advantage and mandating the initial period of delay. This is similar to the rules governing Chapter 11 of the U.S. bankruptcy code. Chapter 11 provides the bias toward managers via the concept of "debtor in possession," and the initial period during which management has an exclusive right to propose reorganization plans. Our proposed bankruptcy law illustrates the importance of such a bias and offers an explanation for its inclusion in the existing law.

Another similarity with existing practices is that, in our model, firms may enter bankruptcy not knowing whether they will emerge as a reorganized firm or be liquidated. This is the result of the value discovery that occurs in formal bankruptcy. Value discovery is a very important (and controversial) part of the existing law. These similarities suggest that our model may capture some of the important components of actual bankruptcies.

XII. Conclusion

The main contribution of this article is the characterization of an optimal bankruptcy law. We show that modifying the bargaining game between the entrepreneur and the creditor, or conducting a "restricted auction" for firms in financial distress implement the optimal bankruptcy outcome. By providing a way for the claimants to commit to ignoring the entrepreneur's true bargaining position, the derived bankruptcy law both provides a way in which the superior information of the claimants may be used to ensure an ex post efficient allocation of resources, and structures the post bankruptcy payoffs to provide incentives for efficient ex ante investment.

The important difference between our restricted auction and earlier market-based proposals lies in the bias toward the incumbent management that our proposal provides in reorganizations. This bias exists in the optimal scheme only when the firm is reorganized under the incumbent's control. This feature of the optimal law provides correct ex ante decision making incentives and justifies a bias toward incumbent management "on efficiency grounds."

Our model is presented in terms of an entrepreneurial firm with a single class of debt. An important question concerns how these results extend to firms with

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[23] See Berkovitch and Israel (1995) for an analysis of optimal bankruptcy law that is driven by the inefficiencies associated with reduced debt capacity.

multiple classes of debt or to non-entrepreneurial firms. In the present model, with costless bankruptcy, the presence of distinct classes of debt does not alter our results. As long as priority is upheld *among* the debt classes, the results need simply be changed to read "the proceeds are distributed to debtholders according to the priority of their claims." If bankruptcy is assumed to be costly, and there is a value to private workouts, the presence of multiple classes of debt may change our results (see, for example, Green and Juster (1993)).

Our analysis extends to non-entrepreneurial firms. As discussed above, the underinvestment problem makes all of a firm's investments relationship-specific from the shareholders' point of view. In fact, Franks and Torous (1989) have pointed out that the stockholder bias present in the U.S. Bankruptcy Code offers at least a partial solution to the underinvestment problem. Alternatively, consider the argument that shareholders provide an important input into the production process in the form of monitoring management. Monitoring is a relationship-specific asset, and if the financial claims must be renegotiated, the incentives for investment in monitoring by shareholders can be improved by placing restrictions on the negotiations in bankruptcy, as developed in our model. It should be noted that when more than one party invest in relationship-specific assets, the optimal bankruptcy outcome is for each party to be compensated for its marginal contribution to the firm. Implementing this optimal bankruptcy outcome is more involved and is beyond the scope of this paper.

A debate in the legal literature on bankruptcy focuses on whether bankruptcies are primarily caused by exogenous factors or by mismanagement. If the main cause of bankruptcy is mismanagement, it is argued that bankruptcy law should be used as a disciplinary device to deter poor managerial performance. Our model allows for both poor management and bad luck. Yet the optimal bankruptcy law is "friendly" to the entrepreneur when the entrepreneur is found to posses a comparative advantage in running the firm and provides no penalty when the entrepreneur possesses no such advantage. The results point out that it is most important for the bankruptcy process to reveal whether the entrepreneur should remain with the firm. In our model, identifying any existing advantage in running the firm is the role of the bankruptcy law rather than assigning blame or assessing penalties. To argue for the assessment of penalties by the bankruptcy law, two issues must be considered. First, an argument must be made for why the penalty must be assessed by the bankruptcy law rather than via the managerial contract or the labor market. Second, such an arrangement would distort the entrepreneur's incentives to reveal the true value of the firm under his direction, perhaps destroying important benefits of the bankruptcy process. This is an interesting topic for future research.

Appendix

Proof of Proposition 1. From equation (8) and Figures 2 and 3, it can be seen that the payoff to the entrepreneur depends on γ in the following way,

$$V_E = w \quad \text{for } 0 < \gamma < w/y$$
$$V_E = \gamma y \quad \text{for } w/y < \gamma < 1 - L/y$$

$$V_E = y - L \quad \text{for}(1 - L/y) < \gamma < 1.$$

Suppose first that $\gamma < \gamma^c$. Further consider the case where $\gamma < w/(L + w)$. Since in region 2, $L + w < y$, then $w/(L+w) < 1 - L/y$. Therefore, in this range, either $V_E = w$, or $V_E = \gamma y$. Let ε_w be the critical realization of ε, such that $w = \gamma y$. It is given by $\epsilon_w = w/\gamma - \alpha e$. The second term of the entrepreneur's problem in equation (10) can be rewritten as

$$(12) \qquad \int_{\varepsilon_1}^{\varepsilon_w} wg(\varepsilon)d\varepsilon + \int_{\varepsilon_w}^{\varepsilon_2} \gamma y g(\varepsilon)d\varepsilon.$$

Thus, the first order condition for the entrepreneur's problem is given by

$$(13) \qquad [G(\varepsilon_2) - G(\varepsilon_w)]\gamma\alpha + (1 - G(\varepsilon_2))\alpha$$
$$+ \alpha g(\varepsilon_2)[w - \gamma(F + w)] - \psi_e = 0.$$

Since $\varepsilon_w < \varepsilon_2$, $w - \gamma(F + w) < 0$, so the third expression in equation (13) is negative. Comparing the left side of equation (13) to that of equation (3) reveals that the first three expressions of equation (13) are smaller than the first expression of equation (3). The convexity of ψ implies that the effort level is less than e^*.

Now consider the case where $w/(L + w) < \gamma < \gamma^c$. The second term of the entrepreneur's problem in equation (10) can be rewritten as

$$(14) \qquad \int_{\varepsilon_1}^{\varepsilon^s} (y - L)g(\varepsilon)d\varepsilon + \int_{\varepsilon^s}^{\varepsilon_2} \gamma y g(\varepsilon)d\varepsilon,$$

where ε^s is the critical value of ε such that $y - L = \gamma y$. It is given by $\varepsilon^s = L/(1 - \gamma) - \alpha e$. Thus, the first order condition for the entrepreneur's problem is given by

$$(15) \quad [G(\varepsilon_2) - G(\varepsilon^s)]\gamma\alpha + (1 - G(\varepsilon_2))\alpha + \alpha g(\varepsilon_2)[w - \gamma(F + w)] - \psi_e = 0.$$

Noting that $\varepsilon^s < \varepsilon_2$, the rest of the proof is identical to the previous case. This completes the proof that, for $\gamma < \gamma^c$, the effort is less than the first-best level of effort.

Suppose $\gamma \geq \gamma^c$. Then $V_E = y - L$. In this case, the first order condition for the entrepreneur's problem is given by

$$(16) \qquad [1 - G(\varepsilon_1)]\alpha + \alpha g(\varepsilon_2)(L - F) - \psi_e(e) = 0.$$

When $g(\varepsilon_2) = 0$, the left sides of equation (16) and equation (3) are identical, so the entrepreneur exerts the optimal effort level, e^*. □

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