



American Finance Association

The Effect of Bankruptcy Protection on Investment: Chapter 11 as a Screening Device

Author(s): Robert M. Mooradian

Source: *The Journal of Finance*, Vol. 49, No. 4 (Sep., 1994), pp. 1403-1430

Published by: Blackwell Publishing for the American Finance Association

Stable URL: <http://www.jstor.org/stable/2329191>

Accessed: 25/11/2009 11:22

Your use of the JSTOR archive indicates your acceptance of JSTOR's Terms and Conditions of Use, available at <http://www.jstor.org/page/info/about/policies/terms.jsp>. JSTOR's Terms and Conditions of Use provides, in part, that unless you have obtained prior permission, you may not download an entire issue of a journal or multiple copies of articles, and you may use content in the JSTOR archive only for your personal, non-commercial use.

Please contact the publisher regarding any further use of this work. Publisher contact information may be obtained at <http://www.jstor.org/action/showPublisher?publisherCode=black>.

Each copy of any part of a JSTOR transmission must contain the same copyright notice that appears on the screen or printed page of such transmission.

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.



Blackwell Publishing and American Finance Association are collaborating with JSTOR to digitize, preserve and extend access to *The Journal of Finance*.

<http://www.jstor.org>

The Effect of Bankruptcy Protection on Investment: Chapter 11 as a Screening Device

ROBERT M. MOORADIAN*

ABSTRACT

Asymmetric information and conflicts of interest between equity and debt holders can force a distressed but efficient firm to liquidate and may enable a distressed inefficient firm to continue. In the extreme, if it is costless for an inefficient firm to mimic an efficient firm in a debt restructuring, efficient and inefficient firms are equally likely to continue or liquidate. This article shows that Chapter 11 procedures impose costs on inefficient firms that would otherwise mimic efficient firms. This separation induces voluntary filing for bankruptcy by inefficient firms and consequently enables efficient firms to continue when they would otherwise be liquidated.

FINANCIALLY DISTRESSED FIRMS OFTEN seek court protection under Chapter 11 of the U.S. Bankruptcy Code. Chapter 11 is both the most prominent and controversial feature of the corporate bankruptcy law. Considerable debate over Chapter 11 appears in both the law and financial economics literature. Some authors even advocate the repeal of Chapter 11.¹

The fundamental question in the debate over Chapter 11 is one of efficiency: what is the effect of Chapter 11 bankruptcy reorganization on the restructuring and investment of financially distressed firms? There are two competing views. The first view is that bankruptcy laws exacerbate the incentive to overinvest.² In the model of Gertner and Scharfstein (1991), Chapter 11 increases investment, which reduces the incentive to underinvest but exacerbates the incentive to overinvest. In the extreme, Chapter 11 encourages corporate managers to reorganize when liquidation is efficient.³

The second view, espoused by Baird (1991), Bebchuk and Picker (1992), Berkovich and Israel (1991), and Harris and Raviv (1993), is that Chapter 11 enhances efficiency. Harris and Raviv (1993) suggest that Chapter 11 inhibits the inefficient liquidation of firms in default. Baird (1991) argues that Chapter 11 provides shareholders with the incentive to seek bankruptcy

*College of Business Administration, Northeastern University. Thanks to David T. Brown, Stephen Buser, Mark Flannery, Joel Houston, Christopher James, René Stulz, and an anonymous referee for helpful comments.

¹See Aghion, Hart, and Moore (1992), Bebchuk (1988), and Bradley and Rosenzweig (1992).

²Bebchuk (1994) argues that the availability of Chapter 11 has adverse effects on investment decisions made prior to the period of financial distress, although Chapter 11 has beneficial effects on investment decisions made during the period of financial distress.

³See Bradley and Rosenzweig (1992) and White (1994).

proceedings rather than delay the resolution of financial distress. Finally, in Berkovich and Israel's (1991) model, firms seek Chapter 11 rather than overinvest.

This article analyzes the effect of Chapter 11 bankruptcy reorganization on the restructuring and investment of financially distressed firms. In contrast to Bradley and Rosenzweig (1992), this article is not limited to the investigation of financially distressed firms that file for Chapter 11. I consider the impact of Chapter 11 reorganization law on not only a distressed firm's bankruptcy decision but also on out-of-court debt restructurings. Furthermore, I analyze the effect of Chapter 11 on the investment of all financially distressed firms, those that file for Chapter 11 and those that renegotiate outside bankruptcy. When all distressed firms are considered, in contrast to Bradley and Rosenzweig (1992), reorganization law does not diminish economic efficiency.

There are two primary contributions of this article. First, it introduces asymmetric information into a model of public debt restructurings; debt holders do not observe whether a firm is economically efficient or inefficient. The starting point for the analysis is the model of Gertner and Scharfstein (1991). Firms have outstanding public debt that they have to restructure via an exchange offer; direct renegotiation is essentially prohibited by the Trust Indenture Act. The inability of public debt holders to coordinate their exchange offer tender decisions can result in investment inefficiencies. This article begins with the coordination problem among debt holders, introduces asymmetric information, and shows that without a collective reorganization mechanism like Chapter 11, economically efficient and inefficient firms are equally likely to continue or liquidate. Although debt holders would agree to renegotiate with efficient firms, they are unwilling to renegotiate with inefficient firms. Inefficient firms pool with efficient firms, because otherwise inefficient firms are liquidated and equity holders receive nothing. Hence, one of two investment inefficiencies occurs: inefficient firms continue when they should be liquidated or efficient firms are liquidated when they should continue.

The second and principal contribution of the article is to introduce Chapter 11 bankruptcy reorganization into the model. The existing models of debt renegotiation assume that firms are liquidated when bankrupt (a Chapter 7 outcome) and equity holders receive nothing. In fact, in Chapter 11 firms are often reorganized and shareholders retain some valuable equity in the firm.⁴ The shareholders of an inefficient firm forego the equity in the firm that they can extract in Chapter 11 if the firm mimics an efficient firm's offer to debt holders in a debt restructuring because the offer determines the shareholders' residual value.

The result is that inefficient firms no longer have such a strong incentive to pool with efficient firms. Inefficient firms can file for Chapter 11 and share-

⁴See Franks and Torous (1989), Eberhart, Moore, and Roenfeldt (1990), Weiss (1990), and LoPucki and Whitford (1992).

holders retain some valuable equity in the firm because of the nature of the Chapter 11 process. As a result of Chapter 11, inefficient firms still continue when they should be liquidated, although inefficient firms may only get to continue in Chapter 11. However, efficient firms, instead of being liquidated, renegotiate and continue outside Chapter 11.⁵ Chapter 11 increases efficiency to the extent that it allows efficient firms to renegotiate and continue, but decreases efficiency to the extent that economically inefficient firms file for bankruptcy under Chapter 11 rather than liquidate.

A number of economists have argued that Chapter 11 is inefficient because it allows bad or inefficient firms to continue in operation. And, indeed many of the firms in Chapter 11 look like very bad firms.⁶ But, a key point of this article is that one cannot assess the welfare effects of Chapter 11 simply by looking at what happens in Chapter 11; Chapter 11 has consequences for out-of-court restructuring as well. Allowing shareholders to retain some valuable equity in firms in Chapter 11 has some value for firms restructuring outside of Chapter 11.⁷ In the model, Chapter 11 is beneficial in that it separates inefficient firms from efficient firms, enabling efficient firms to renegotiate and continue where they would otherwise be liquidated. In effect, Chapter 11 serves as a mechanism for screening inefficient firms.

A contemporaneous paper, White (1994), also examines bankruptcy as a screening mechanism. In an investigation limited to financially distressed firms that file for bankruptcy, White (1994) develops a model of the interaction between the two corporate bankruptcy procedures, Chapter 7 (liquidation) and Chapter 11, where creditors act collectively. In contrast to White (1994), this article provides a model of the Chapter 11 process in the context of out-of-court debt restructurings where debt holders are subject to a coordination problem. This article focuses not only on the impact of Chapter 11 reorganization law on a distressed firm in bankruptcy, but also on the consequences of Chapter 11 for out-of-court debt restructurings.

The existing literature makes inferences concerning the welfare implications of Chapter 11 largely through the examination of firms experiencing Chapter 11. In particular, in interpreting their empirical findings, Bradley and Rosenzweig (1992) argue that Chapter 11 rewards self-interested management to the detriment of all security holders. This article suggests an alternative interpretation of Bradley and Rosenzweig's empirical evidence; managers of economically inefficient firms, acting in the interest of equity

⁵In a Townsend (1979) costly state verification framework, Heinkel and Zechner (1991) demonstrate that deviations from the absolute priority rule, as in Chapter 11, can lead to value-increasing capital structure renegotiations. The basic problem in Heinkel and Zechner (1991) is that high-cash-flow firms have the incentive to mimic low-cash-flow firms in order to obtain debt forgiveness. However, in this article, the basic problem is that inefficient firms have the incentive to mimic efficient firms.

⁶See Bradley and Rosenzweig (1992) and Hotchkiss (1992).

⁷This point seems to have been missed by authors such as Bebchuk (1988), Bradley and Rosenzweig (1992), and Aghion, Hart, and Moore (1992) who seem to think that preserving absolute priority should be an inherently valued objective.

holders, choose the best of a set of bad alternatives, reorganization under Chapter 11.

The article is organized as follows: Section I presents the basic model of distressed firms when debt restructurings are not possible and bankrupt firms are liquidated, not reorganized. Section II permits public debt restructurings through exchange offers, which, given symmetric information, will always take the form of a senior debt for debt exchange offer. Section III models the public debt restructurings of distressed firms with asymmetric information. Debt holders are uninformed about whether the firm is economically efficient or inefficient. Bankrupt firms are liquidated. I find that economically efficient and inefficient firms are equally likely to continue or liquidate. In Section III, there is no separation of economically efficient firms from inefficient firms. In Sections IV and V, I review some important features of Chapter 11 bankruptcy reorganization law and analyze their effects on investment. Chapter 11 reorganization reduces the incentive for economically inefficient firms to mimic efficient firms in out-of-court debt restructurings. Section VI concludes and provides a discussion of the limitations of Chapter 11.

I. A Simple Model of a Distressed Firm

This section presents a simple model of a financially distressed firm with unsecured public debt. For now I assume that a firm cannot renegotiate its public debt. Because the firm cannot renegotiate its debt, debt holders have no avenue through which to influence liquidation and investment decisions. The remainder of the article allows for debt restructurings by means of exchange offers for public debt. However, I show in the next section that even allowing for exchange offers for public debt, public debt holders have very little, if any, influence over liquidation and investment decisions.

A firm has two assets at time 1: cash and/or liquid assets of value Y and a growth option or investment project which requires an investment of I at time 1. The liquid assets at time 1 can be used to meet current obligations to debt holders and/or to take advantage of the growth opportunity. The firm may or may not have sufficient liquid assets to do both at time 1. If the firm does not invest at time 1, the firm is liquidated. A proportion q , $q \in (0, 1)$, of the face value of the public debt, D , is due at time 1, and proportion $(1 - q)$ is due at time 2.

There are two types of firms, good and bad. The fraction λ are good firms and the fraction $1 - \lambda$ are bad firms, where $0 < \lambda < 1$. For a good firm the investment project returns cash flow of $X|g$ at time 2, and for a bad firm the project returns $X|b$ at time 2. The stochastic cash flow of $X|i$, $i \in \{b, g\}$, is distributed over the interval $[0, \infty)$. The density of $X|g$ is $f(X|g)$, and the density of $X|b$ is $f(X|b)$. Let $F(X|i)$ be the cumulative distribution function corresponding to the density $f(X|i)$. Cumulative distribution functions are ordered by the following first-order stochastic dominance (FOSD) relation-

ship: g FOSD b . The mean of $X|i$ is $E(X|i)$, where $E(X|b) < I < E(X|g)$. Thus, it is efficient for good firms to invest at time 1, and efficient for bad firms to liquidate at time 1. I assume that if all firms invest, aggregate investment is zero net present value (NPV), i.e., $(1 - \lambda)E(X|b) + \lambda E(X|g) = I$. I assume the firm has no other assets such as plant or equipment, the riskless interest rate is zero, and all agents are risk neutral.

I assume the firm is in financial distress at time 1; as in Gertner and Scharfstein (1991), this is defined by liquid assets (representing all assets in place) that are worth less than the face value of the firm's total debt obligations, i.e., $Y < D$. If the firm is liquidated and if the absolute priority rules are observed, then public debt holders receive Y and equity holders receive nothing. In this section bankruptcy and liquidation are equivalent; there is no reorganization in bankruptcy.

The principal question of this article is whether a distressed firm, good or bad, invests in the project at time 1. Since the public debt cannot be restructured, the firm can only invest at time 1 if the firm has sufficient cash flow at time 1 to cover the cost of the investment and meet current obligations to creditors. Consequently, if $Y \geq I + qD$, the firm has sufficient cash flow to invest and meet current obligations at time 1. Equity has positive (option) value if the firm invests, but equity holders receive nothing if the firm is liquidated at time 1. Therefore, whether investment is efficient or inefficient, i.e., whether firm type is good or bad, the firm invests at time 1 given the conflict between debt and equity. Alternatively, if $Y < I + qD$, the firm has insufficient cash flow to invest and meet current obligations at time 1, and, by assumption, its debt cannot be restructured. Therefore, whether investment is efficient or inefficient, i.e., firm type is good or bad, the firm is liquidated at time 1. Liquidation and investment decisions depend on cash flow but are unrelated to investment efficiency.

II. Public Debt Restructurings with Symmetric Information

The remainder of this article allows the firm to renegotiate with public debt holders under the restrictions imposed by the Trust Indenture Act of 1939. The Trust Indenture Act requires that each public debt holder must agree to any change in the timing or amount of public debt payments made to him. A public debt holder may not be bound to a vote of public debt holders authorizing a change in the timing or amount of public debt payments. Therefore, public debt restructurings are modeled as, and do in practice take the form of, exchange offers. Firms may offer any combination of cash, debt, or equity in exchange for public debt.

The article now examines the effect of debt renegotiation on the investment inefficiencies described in Section I that occur when renegotiation is impossible. Each public debt holder's claim on the firm is assumed to be sufficiently small that he disregards the effect of his tender decision on both the firm's investment decision and on the value of the firm's securities. In making a

tender decision, debt holders consider only the value of the claims offered relative to the value of the existing claims if all debt holders tender. Debt holders do not consider the value of the existing claims if no debt holders tender. Clearly this assumption may not apply to firms whose public debt is held by a small number of investors. However, this assumption allows for a simple exposition of the problems that arise when creditors cannot fully coordinate their actions.

I now address the principal question of this article, whether a distressed firm, good or bad, invests in the project at time 1. In Section I, a firm with a cash flow shortage at time 1 (i.e., a firm with insufficient cash flow to cover the cost of the investment and meet current obligations to creditors) must liquidate. In contrast, a firm with a cash flow shortage can now invest at time 1 if the firm can restructure its public debt.

Public debt holders decide whether to tender or reject the offer and retain the original claim on the firm based on the value of the claim offered relative to the value of the claim currently held conditional on the creditors' beliefs about the success of the offer. If other public debt holders are offered and accept *pari passu* or junior claims, holdouts benefit.⁸ Suppose each public debt holder has a claim with a face value of \$1, which is small relative to the total public debt outstanding. If other public debt holders tender, the holdout is paid \$ q at time 1 and has a claim of equal priority or senior to the claim of the tendering public debt holders at time 2. On the other hand, suppose the firm offers senior debt.⁹ The payment of \$ q at time 1 is still effectively senior to all other claims; however, the holdouts have a junior claim at time 2.

If the firm makes a senior debt offer, the firm must offer senior claims worth at least qD to public debt holders in order for the offer to succeed. Therefore, as long as the firm value is greater than the firm's current obligations to debt holders, i.e., $Y + E(X|i) - I > qD$, $i \in \{b, g\}$, the firm can make a senior debt offer that public debt holders will accept. In fact, it follows from Gertner and Scharfstein (1991) that if $Y + E(X|i) - I > qD$, $i \in \{b, g\}$, the firm will offer to exchange senior debt for the public debt outstanding. The exchange is accepted by all debt holders and transfers wealth from debt holders to equity holders. Gertner and Scharfstein (1991) show that an offer of senior claims (as opposed to an offer of *pari passu* or junior claims) maximizes the wealth transfer from debt holders to equity holders.

With symmetric information, investment efficiency has some impact on the success of a debt restructuring. Investment efficiency affects firm value, which determines the success of an exchange offer. Since a successful exchange offer allows a firm to invest, investment bears some relationship to investment efficiency. However, inefficient firms, for which firm value is

⁸For earlier discussions of this holdout problem see Bulow and Shoven (1978), Allen (1985, 1986), Roe (1987), Coffee (1990), and Gertner and Scharfstein (1991).

⁹Even if the public debt indenture contains a seniority covenant, the covenant can be stripped through the use of an exit consent. For a discussion of exit consents see Roe (1987), Coffee (1990), or Gertner and Scharfstein (1991).

greater than current obligations to debt holders, successfully restructure their debt and invest, and efficient firms for which firm value is less than current obligations to debt holders cannot restructure their debt and liquidate.

III. Public Debt Restructurings with Uninformed Debt Holders

In this section I allow both the collective action problem discussed above and an information asymmetry to affect investment efficiency. I assume that public debt holders do not know a priori firm type and hence whether investment at time 1 is efficient. While management knows its own firm type, public debt holders know only the distribution of firm types. Debt holders' (common) prior belief is that fraction λ are good firms and $(1 - \lambda)$ are bad firms, and $(1 - \lambda)E(X|b) + \lambda E(X|g) = I$. Given public debt holders' prior beliefs, firm value is Y . Since investment efficiency is independent of public debt holders' prior beliefs about firm value, the success of a debt restructuring is unrelated to investment efficiency unless efficient firms can separate from inefficient firms. Therefore, without separation, a firm's liquidation and investment decisions are unrelated to investment efficiency.

A perfect Bayesian equilibrium (PBE) of this game consists of strategies (offers to renegotiate with debt holders) for a firm as a function of firm type, a strategy for public debt (accept or reject the offer as a function of its beliefs), and a specification of public debt holders' beliefs (as a function of any possible exchange offer). I also use the refinement of PBE developed by Farrell (1983) and Grossman and Perry (1986), which restricts public debt holders' beliefs should they receive an out-of-equilibrium offer.¹⁰ The refinement requires that there are no deviations with consistent interpretations.

I assume that the firm has sufficient cash flow at time 1 to invest, i.e., $Y > I$. Hence, a firm that renegotiates with debt holders at time 1 has sufficient cash flow to invest at time 1. In this section, I maintain the assumption that if the firm does not invest at time 1, the firm is liquidated at time 1. The firm always prefers to invest at time 1 rather than liquidate, since equity has option value if the firm invests. In a liquidation, public debt holders have claims of D regardless of any negotiation with debt holders the firm may attempt just before the firm liquidates at time 1.¹¹ Since $Y < D$, equity holders receive nothing in a liquidation.

Firms that have cash flow, Y , greater than current obligations, qD , at time 1 and those that have cash flow less than current obligations at time 1 are

¹⁰See Gertner (1991) and Gertner, Gibbons, and Scharfstein (1988) for a discussion of this refinement.

¹¹See "Financially Troubled Firms Get More Freedom to Restructure Debts," *Wall Street Journal* p. B11, April 16, 1992, which reports the reversal of the LTV decision. If a firm undertakes a debt restructuring and subsequently files for bankruptcy, creditors may make a claim for the face value of the debt before the restructuring.

examined in turn. Unless the firm can signal its true type to the public debt holders, the debt holders believe expected firm value is identical to cash flow Y since by assumption $\lambda E(X|g) + (1 - \lambda)E(X|b) = I$. Therefore, for $Y > qD$, public debt holders believe (a priori) firm value is greater than the firm's current obligations at time 1; and for $Y < qD$, public debt holders believe (a priori) firm value is less than the firm's current obligations.

A. Current Obligations Exceed Cash Flow

Suppose that current obligations, qD , exceed cash flow, Y , at time 1. If the firm invests at time 1, the value of a good firm is $Y - I + E(X|g)$ and the value of a bad firm is $Y - I + E(X|b)$. Since $Y < qD$ and $E(X|b) < I$, $Y - I + E(X|b) < qD$. Whether the firm renegotiates with public debt holders at time 1 depends on the debt holders' beliefs about firm type and therefore their beliefs about firm value.

Unless debt holders believe firm value is at least qD , the firm cannot renegotiate with public debt holders. To see that this is a necessary condition, suppose debt holders believe firm value is less than qD at time 1, and each debt holder has a claim with face value \$1. For any offer the firm makes to public debt holders, holdouts receive at least \$ q at time 1, which is greater than the value of any security that the firm could offer with a payoff at time 2. Debt holders will hold out, since each debt holder is better off with \$ q at time 1 rather than a claim on cash flow at time 2 that is worth less than \$ q regardless of the tendering decisions of other debt holders.¹²

If $Y - I + E(X|g) < qD$, then even if the public debt holders believe the firm is good with probability 1, the firm is liquidated at time 1. Since debt holders know firm value is less than qD for all firms, debt holders will not accept any offer from the firm to renegotiate.

If $Y - I + E(X|g) > qD$, there is no pooling equilibrium in which both types of firms renegotiate and invest and no separating equilibrium in which at least one type of firm renegotiates and invests at time 1. To see that there is no pooling equilibrium in which both types of firms renegotiate and invest, suppose bad firms are pooled with good firms. Since $Y < qD$, public debt holders will not accept any offer from the firm to renegotiate unless the offer reveals the firm is a good firm. Furthermore, there cannot be a separating equilibrium in which a good firm renegotiates with debt holders and a bad firm liquidates, since bad firms would always mimic good firms. Since $Y - I + E(X|b) < qD$, bad firms are liquidated in any separating equilibrium and equity value is zero. Good firms for which $Y - I + E(X|g) > qD$ cannot credibly convey their firm type, because bad firms always have the incentive to mimic any offer the good firms make.¹³

¹²Since firm value is less than qD , each debt holder who tenders has a claim worth less than $qD/D = q$.

¹³This is in contrast with models presented in Brown, James, and Mooradian (1993) or Gertner (1991). In these models bad firms have an incentive to signal their type in order to reduce the uninformed debt holder's reservation value in a debt renegotiation. These models assume no coordination problem among debt holders.

For $Y < qD$, the only equilibrium that exists is one in which all firms liquidate at time 1.

PROPOSITION 1: *When current obligations exceed cash flow, both good and bad firms liquidate at time 1.*

Proof: See Appendix.

For $Y < qD$, where $Y - I + E(X|g) > qD$ or $Y - I + E(X|g) < qD$, the firm cannot renegotiate with debt holders. Debt holders receive Y and equity holders receive nothing. This outcome is efficient for a bad firm but inefficient for a good firm.

First-best investment implies that all good firms invest and all bad firms liquidate at time 1. Aggregating over all firms, first-best investment at time 1 implies a NPV of $(E(X|g) - I)\lambda N$, where N is the total number of firms and λ is the proportion of good firms. Therefore, the social opportunity loss from the outcome that all firms liquidate at time 1 is $(E(X|g) - I)\lambda N$, where $E(X|g) - I > 0$. The social opportunity loss results from the fact that all good firms forego an economically efficient investment opportunity.

The result that all firms for which $Y < qD$ are liquidated depends on both the imperfect coordination among debt holders and the information asymmetry. Without the information asymmetry good firms could successfully renegotiate with public debt and invest at time 1 if $Y - I + E(X|g) > qD$. However, if $Y - I + E(X|g) < qD$, without the information asymmetry but because of the imperfect coordination among debt holders, good firms could not renegotiate with public debt and would be liquidated even though a liquidation is inefficient.

B. Current Obligations Less than Cash Flow

Now suppose that current obligations, qD , are less than cash flow, Y , at time 1. If the firm invests at time 1, the value of a good firm is $Y - I + E(X|g)$ and the value of a bad firm is $Y - I + E(X|b)$. Since $Y > qD$ and $E(X|g) > I$, $Y - I + E(X|g) > qD$. Whether the firm renegotiates with public debt holders at time 1 depends on the debt holders' beliefs about firm type and therefore their beliefs about firm value. If the public debt holders believe the firm is worth $Y > qD$, the firm can make an offer that public debt holders accept, which allows the firm to invest at time 1. The firm can offer senior claims that debt holders believe to be worth at least qD , and therefore the firm can offer senior claims that public debt holders prefer to their existing claims.

If $Y - I + E(X|b) > qD$, then even if the public debt holders believe the firm is bad with probability 1, the debt is renegotiated and the firm invests at time 1. Since debt holders know firm value is greater than qD for all firms, the firm can renegotiate with debt holders.

If $Y - I + E(X|b) < qD$, there cannot be a separating equilibrium in which a good firm renegotiates with debt holders and a bad firm liquidates. Since $Y - I + E(X|b) < qD$, bad firms are liquidated in any separating equilibrium

and equity value is zero. Good firms for which $Y - I + E(X|g) > qD$ cannot credibly convey their firm type, because bad firms always have the incentive to mimic any offer good firms make.

If $Y - I + E(X|b) < qD$, there does not exist an equilibrium in which both good and bad firms are liquidated. To see that this would not satisfy the refinement because there is a pooling-consistent deviation, consider public debt holder beliefs that a firm that deviates (a firm that makes an offer) is good with probability λ and bad with probability $1 - \lambda$. Given debt holder beliefs and the assumption that $(1 - \lambda)E(X|b) + \lambda E(X|g) = I$, debt holders believe that a firm making an offer has value Y . Because $Y > qD$, all firms can make an offer that debt holders will accept. Since the firms are not liquidated, equity value is positive rather than zero, i.e., equity holders of either firm type are better off. Therefore, there is a deviation with a consistent interpretation.

For firms in which $Y > qD$ and $Y - I + E(X|b) < qD$, there are no separating equilibria and no equilibria in which both good and bad firms liquidate. However, there exists a pooling equilibrium in which firms of either type renegotiate and invest. To see this, suppose bad firms are pooled with good firms. Since $Y > qD$, given debt holder beliefs that the firm is good with probability λ , the firm is able to renegotiate with public debt holders. The debt will be renegotiated and the firm will invest at time 1.

PROPOSITION 2: *When current obligations are less than cash flow, both good and bad firms renegotiate and invest at time 1.*

Proof: See Appendix.

For $Y > qD$, whether $Y - I + E(X|b) > qD$ or $Y - I + E(X|b) < qD$, all firms regardless of firm type renegotiate with debt holders and invest at time 1. For good firms, investment is efficient. But for bad firms, liquidation is efficient. Bad firms overinvest. Therefore, the social opportunity loss from the outcome that all firms invest at time 1 is $(I - E(X|b))(1 - \lambda)N$, where $I - E(X|b) > 0$. The social opportunity loss results from the fact that all bad firms make an inefficient investment.

Both types of firms invest because of the imperfect coordination among debt holders and because of the information asymmetry. Without the information asymmetry bad firms could not successfully renegotiate with public debt and invest at time 1 if $Y - I + E(X|b) < qD$. However, if $Y - I + E(X|b) > qD$, without the information asymmetry but because of the imperfect coordination among debt holders, the bad firms could still renegotiate with public debt and invest even though investment is inefficient.

C. Discussion

Bad firms can either liquidate or mimic good firms. Since equity value is zero in a liquidation, the reservation value of a bad firm is zero. Bad firms forego nothing to mimic good firms.

The relationship between cash flow and current obligations determines whether the firm liquidates or renegotiates and invests. Since bad firms will always mimic the good firms whenever liquidation is the alternative, good firms cannot credibly signal their type. Debt holders learn nothing about firm type or firm value from offers to renegotiate. Moreover, debt holders' a priori belief about firm value is equivalent to cash flow. Since debt holders will accept an offer to renegotiate if they believe firm value is greater than current obligations, the firm can renegotiate if cash flow is greater than current obligations. Firms that are insolvent on a flow basis are liquidated.

First-best investment requires that good firms invest and bad firms liquidate at time 1. However, firms liquidate if and only if they are insolvent on a flow basis. Therefore, the social opportunity loss is $(E(X|g) - I)\lambda N$ if $Y < qD$, and $(I - E(X|b))(1 - \lambda)N$ if $Y > qD$. Insolvent good firms forego efficient investment, and solvent bad firms undertake inefficient investment.

Even though I permit debt restructurings by means of exchange offers for public debt, given asymmetric information, liquidation and investment decisions are unrelated to investment efficiency. In fact, the investment inefficiencies in this section are the same kind of inefficiencies described in Section I that occur when renegotiation is impossible.

IV. Chapter 11 Reorganization and Investment

In order to analyze the effect of Chapter 11 bankruptcy reorganization on the restructuring, liquidation, and investment of financially distressed firms, I modify the model presented in Section III to permit Chapter 11 reorganization at time 1. The essence of the model's insights are best conveyed using a simplified characterization of the bankruptcy game, which is presented here. However, these simplifications are in no way central to the results. For the interested reader, I provide a more detailed description of Chapter 11 and a more rigorous treatment of the bargaining in Chapter 11 in Section V.

In this section I take the outcome of the bankruptcy process as given and model the choice to renegotiate outside Chapter 11 or file for Chapter 11. In doing so, I assume two general results from both theoretical and empirical work¹⁴ in this area. First, a Chapter 11 reorganization results in the maintenance of equity value. Equity holders receive valuable claims on the reorganized firm even though creditor claims are not satisfied in full. Second, management does not follow an investment policy (detrimental to debt holders) that maximizes equity value. In fact, Lopucki and Whitford (1992) find that 1) management does not expand into new lines of business, expand existing business, or engage in high-risk activity that would favor equity holders in Chapter 11, and 2) management avoids any quick liquidations of major assets that would favor senior debt holders in Chapter 11.

¹⁴ See Franks and Torous (1989), Eberhart, Moore, and Roenfeldt (1990), Weiss (1990), and LoPucki and Whitford (1992).

Investment policy and the maintenance of equity value in Chapter 11 are related. The Bankruptcy Code promotes bargaining in Chapter 11 among management, equity holders, and debt holders and effectively defines the bargaining position of each group. To the extent that management's incentives are tied to equity holders' payoff in Chapter 11, management acts on their behalf.¹⁵ Franks and Torous (1994) find that equity holders' payoff in Chapter 11 depends on the extent to which equity holders can bargain on their own behalf and the extent to which management bargains with debt holders on behalf of equity holders. Furthermore, a major source of management bargaining power is its control over investment policy. Thus, investment policy as well as the reallocation of claims on the firm are subject to bargaining in Chapter 11. Management may trade off an investment policy more favorable to creditors for a larger claim on the firm for equity holders. In this section, the results of the bargaining are taken as given; however, in Section V I endogenize the bargaining in Chapter 11.

For now, I assume that the bargaining in Chapter 11 allows stockholders to retain some valuable equity in the firm. The stockholders of an inefficient firm forego the equity in the firm that they can extract in Chapter 11 if the firm mimics an efficient firm's offer to debt holders in a debt restructuring, because the offer determines the stockholders' residual value. Inefficient firms voluntarily file for bankruptcy. Although inefficient firms reorganize in Chapter 11, liquidation is optimal. However, management gives up its bargaining power if it liquidates immediately. Therefore, I assume an investment policy that is inefficient but not completely in equity holders' interest. In Section V, investment policy is endogenized, which enables a discussion of the efficiency of investment in Chapter 11.

The maintenance of equity value in Chapter 11 and investment in Chapter 11 are defined as follows: first, the cost of investment in Chapter 11 is I at time 1. However, the present value of investment is equal to $\{\alpha(E(X|i)) + (1 - \alpha)I\}$, where $i \in \{b, g\}$ and $0 < \alpha < 1$. For both good and bad firms, investment in Chapter 11 results in an opportunity loss. For good firms the opportunity loss is $(1 - \alpha)(E(X|g) - I)$, and for bad firms the opportunity loss is $\alpha(I - E(X|b))$. Second, the equity holders' share of a firm reorganized in Chapter 11 depends on the reorganization plan that is confirmed. I assume that the expected value of the equity claims of a bankrupt firm at time 1 are $E_{file}^i > 0$, $i \in \{b, g\}$, where E_{file}^i is a function of firm type, cash flow at time 1, and the face value of the debt outstanding at time 1.¹⁶

The alternative to a Chapter 11 filing is to renegotiate with debt holders outside Chapter 11. Let π_i , $i \in \{b, g\}$, be the face value of the senior debt that must be offered (for each unit of debt outstanding) to creditors who believe

¹⁵In practice, management may not always act on behalf of equity holders. Gilson and Vetsuypens (1993) provide evidence of distressed firms in which CEO compensation is tied to creditor payoffs.

¹⁶The assumption is consistent with Betker (1992) who finds that deviations from absolute priority in favor of equity in Chapter 11 are significantly lower the more insolvent the firm.

firm type is i with probability 1. Let π_p be the face value of the senior debt that must be offered to creditors who believe firm type is good with probability λ . Let $E_{\pi_p}^i$, $i \in \{b, g\}$, be the value of the equity of a type i firm that 1) renegotiates (i.e., makes a senior debt for debt exchange offer) with debt holders, who believe the firm to be good with probability λ and 2) invests at time 1. Let $E_{\pi_j}^i$, $i, j \in \{b, g\}$, be the value of the equity of a type i firm that 1) renegotiates (i.e., makes a senior debt for debt exchange offer) with debt holders who believe the firm to be type j with probability 1 and 2) invests at time 1. It follows that

$$E_{\pi_p}^g = \int_{\pi_p D - Y + I}^{\infty} (X - \pi_p D + Y - I) f(X|g) dX, \quad (1)$$

and

$$E_{\pi_g}^g = \int_{\pi_g D - Y + I}^{\infty} (X - \pi_g D + Y - I) f(X|g) dX. \quad (2)$$

To induce separation of firm types, a necessary condition is that good firms prefer to renegotiate with debt holders outside Chapter 11 rather than file for bankruptcy. For simplicity, I assume¹⁷ that

$$E_{file}^g = \min\{E_{\pi_p}^g, E_{\pi_g}^g\} \quad (3)$$

and that if good firms are indifferent between 1) filing for bankruptcy and 2) renegotiating with debt holders and investing, good firms will renegotiate and invest if debt holders will accept their offer.

At time 1, the firm may now 1) renegotiate with debt holders and invest, 2) file for Chapter 11 bankruptcy and invest in Chapter 11, or 3) liquidate. Since the firm has the option to file for Chapter 11 bankruptcy at time 1, equity value is positive in Chapter 11, and equity value is zero in a liquidation, the firm will never choose immediate liquidation at time 1. Therefore, the remaining discussion only considers the choice between an informal reorganization (renegotiating and investing at time 1) and a Chapter 11 filing. In order to analyze the effect of Chapter 11 reorganization on investment, as in Section III, I divide firms into two categories: those that have cash flow, Y , greater than current obligations, qD , at time 1 and those that have cash flow less than current obligations at time 1.

A. Current Obligations Exceed Cash Flow

Suppose that current obligations, qD , exceed cash flow, Y , at time 1. Unless debt holders believe firm value is at least qD , the firm cannot renegotiate

¹⁷I relax this assumption in Section V.

with debt holders. As shown in the previous section, holdouts are always better off than debt holders who tender regardless of the offer to debt holders.

If $Y - I + E(X|g) < qD$, then, even if the public debt holders believe the firm is good with probability 1, the firm cannot renegotiate with debt holders. Since debt holders know firm value is less than qD for all firms, the firm files for bankruptcy at time 1 and invests in Chapter 11 regardless of whether the firm is good or bad.

Now let $Y - I + E(X|g) > qD$. There is no pooling equilibrium in which both types of firms renegotiate and invest at time 1. Since $Y < qD$, given beliefs that the firm is good with probability λ , debt holders will not accept any offer from the firm to renegotiate.

PROPOSITION 3: *Let $Y < qD$ and $Y - I + E(X|g) > qD$. Then at time 1 either 1) there exists a separating equilibrium in which good firms renegotiate and invest and bad firms file for bankruptcy, or 2) all firms file for bankruptcy.*

Proof: See Appendix.

Given equation (3), good firms are at least as well off renegotiating and investing at time 1 as they are filing for bankruptcy. Therefore, there exists a separating equilibrium if bad firms are better off filing for bankruptcy than mimicking the offer good firms make to debt holders. Chapter 11 permits the maintenance of equity value (which was absent in Section III) and consequently increases equity holders' reservation value in a debt restructuring. Furthermore, the reservation value of the equity holders of a bad firm may now be greater than their expected payoff from mimicking good firms.

Let $Y < qD$. If $Y - I + E(X|g) > qD$ and bad firms prefer to file rather than mimic good firms, only bad firms file for Chapter 11. Good firms make efficient investment decisions at time 1 but bad firms invest in Chapter 11 at time 1. Bad firms overinvest. Therefore, the social opportunity loss is $\alpha\{(I - E(X|b))(1 - \lambda)N\}$. However, if $Y - I + E(X|g) < qD$ or bad firms prefer to mimic good firms, all firms file for bankruptcy and invest in Chapter 11. The social opportunity loss is $(1 - \alpha)(E(X|g) - I)\lambda N + \alpha(I - E(X|b))(1 - \lambda)N$. This differs from the social opportunity loss of $(E(X|g) - I)\lambda N$ without Chapter 11 in Section III. Recall that without Chapter 11, all firms are liquidated immediately. Thus, for $Y < qD$, Chapter 11 increases investment. Either all firms invest in Chapter 11 or good firms renegotiate and invest outside Chapter 11 and bad firms invest in Chapter 11.

B. Current Obligations Less than Cash Flow

Now suppose that $Y > qD$ at time 1. Recall that if debt holders believe firm value is at least qD , the firm can renegotiate with debt holders. However, the maintenance of equity value in Chapter 11 provides an incentive for bad firms to file. Whether there is a separating equilibrium in which bad firms file for bankruptcy that satisfies the refinement depends on whether bad firms prefer to file for bankruptcy or renegotiate and invest at time 1.

PROPOSITION 4: *Let $Y > qD$. Then at time 1 either 1) there exists a separating equilibrium in which good firms renegotiate and invest and bad firms file for bankruptcy or 2) all firms renegotiate and invest.*

Proof: See Appendix.

If bad firms prefer to file for bankruptcy, there exists a separating equilibrium. Given equation (3), good firms are at least as well off renegotiating and investing at time 1 as they are filing for bankruptcy, but bad firms are better off filing for bankruptcy than mimicking the offer good firms make to debt holders. However, if bad firms prefer to renegotiate and invest at time 1, all firms renegotiate and invest rather than file for bankruptcy. Moreover, given $Y > qD$, there exists an offer that debt holders will accept.

For $Y > qD$, good firms make efficient investment decisions at time 1, but bad firms overinvest. It is efficient for bad firms to liquidate immediately, but bad firms either invest in Chapter 11 or renegotiate and invest at time 1.

For $Y > qD$, the social opportunity loss is either $\alpha((I - E(X|b))(1 - \lambda)N)$ or $(I - E(X|b))(1 - \lambda)N$. Good firms renegotiate and invest at time 1, but bad firms either invest in Chapter 11 or renegotiate and invest at time 1. However, recall that all firms renegotiate and invest at time 1 without Chapter 11 in Section III. The social opportunity loss without Chapter 11 is $(I - E(X|b))(1 - \lambda)N$. Thus, for $Y > qD$, Chapter 11 reduces overinvestment.

C. Discussion

The model illustrates the effect of public debt restructurings and bankruptcy law on investment by financially distressed firms. If public debt holders cannot fully coordinate their actions and cannot observe whether investment is efficient, investment is not first-best for all financially distressed firms. Under a bankruptcy law that liquidates bankrupt firms and applies the absolute priority rule strictly, efficient financially distressed firms, i.e., firms for which investment is efficient, cannot credibly convey their type. Inefficient distressed firms, i.e., firms for which liquidation is efficient, always have the incentive to mimic efficient firms because equity holders of distressed firms receive nothing in a liquidation. However, Chapter 11 reorganization permits the equity holders of inefficient firms to receive valuable claims on the reorganized firm, which reduces the incentive for inefficient firms to mimic efficient firms.

Given bankruptcy law without Chapter 11 reorganization, efficient and inefficient firms invest or liquidate in equal proportions. However, to the extent that Chapter 11 makes possible separation by firm type, there is a broader range of parameter values in which 1) efficient firms renegotiate with debt holders and invest and 2) inefficient firms file for bankruptcy.

Bankruptcy law with Chapter 11 permits the maintenance of equity value. To the extent that the maintenance of equity value induces separation, efficient financially distressed firms avoid bankruptcy and investment efficiency improves for efficient firms. However, if one considers only inefficient

firms, neither bankruptcy law with Chapter 11 nor bankruptcy law without Chapter 11 improves efficiency. With Chapter 11, a larger proportion of inefficient firms file for bankruptcy, but firms in Chapter 11 delay liquidations.

The most important empirical prediction of this model is that a larger proportion of distressed firms in Chapter 11 are inefficient rather than efficient. Although this does not imply that bankruptcy law without Chapter 11 dominates bankruptcy law with Chapter 11, the prediction does suggest that maintaining equity value in bankruptcy but reducing the incentive for firms to delay liquidations enhances efficiency.

To gain a better understanding of how investment in Chapter 11 differs across firm type and the extent to which the maintenance of equity value in Chapter 11 induces separation by firm type, I present a simple model of Chapter 11 in the next section of this article. In this model, management has some discretion over investment in Chapter 11. Moreover, debt holders may now bargain with management over investment policy as well as over the reorganization plan.

V. The Model of Chapter 11

In this section, I provide a model of Chapter 11 in the context of the analysis presented thus far. I analyze the bargaining and investment in Chapter 11 given the alternative of a renegotiation outside Chapter 11. I find that the more inefficient the investment of the firm, the more likely the firm voluntarily chooses to file for bankruptcy rather than mimic efficient firms in a renegotiation outside Chapter 11. Given a larger investment inefficiency, the surplus over which claim holders bargain in Chapter 11 is larger. This implies that management, on behalf of equity holders, is more likely to trade off a reduction in overinvestment for a larger claim on the firm for equity holders in a Chapter 11 reorganization. Chapter 11 reduces overinvestment for bad firms that file for Chapter 11 and allows more good firms to renegotiate with debt holders outside Chapter 11, reducing underinvestment.

This section proceeds as follows: Section V.A provides a description of the Chapter 11 process. In Section V.B, I examine management's choice to enter Chapter 11 and the bargaining in Chapter 11 and discuss the implications of Chapter 11 pertaining to investment efficiency.

A. A Summary of the Chapter 11 Process

The legislative intent of Chapter 11 of the Bankruptcy Code is to avoid the inefficient liquidation of distressed firms and to promote the reorganization of economically viable firms as ongoing concerns. In contrast to Chapter 7 of the Bankruptcy Code, in which a trustee is appointed to undertake immediate liquidation, filing for bankruptcy under Chapter 11 allows for a renegotiation between equity and debt holders over the allocation of claims on the firm.

Moreover, the Bankruptcy Code defines each claim holder's rights, which establishes the threat points under which the negotiation takes place.¹⁸

The Bankruptcy Code permits management to remain in control of the debtor firm in Chapter 11 bankruptcy and allows management considerable power to initiate the reorganization plan. The Bankruptcy Code defines a period in which management has an exclusive right to propose a plan of reorganization.¹⁹ Management may threaten to delay the reorganization and reduce the value of creditor claims.²⁰ Moreover, management determines investment policy, subject to court review.²¹

The Bankruptcy Code grants the court considerable power to impose a settlement of claims in Chapter 11. However, except in extreme cases (see LoPucki and Whitford (1992), Franks and Torous (1989), or Eberhart, Moore, and Roenfeldt (1990)), the court promotes bargaining among claim holders to reach a consensual reorganization plan. Bargaining and settlement rather than adjudication determines the outcome of a Chapter 11 reorganization.

Although the Bankruptcy Code restricts some creditor rights in Chapter 11, creditors do acquire additional rights in Chapter 11 and derive considerable bargaining leverage from the requirement that each creditor committee must consent to the reorganization plan.²² The automatic stay effectively extends the maturity of all outstanding debt. However, creditors can object to management's investment decisions and request court intervention. Creditors can request that the court remove management and appoint a trustee, and can request that the court require immediate liquidation. While creditors can move for court intervention, creditors also bargain directly with management. Since management needs creditor approval of a reorganization plan,²³ creditors, in practice, can exert considerable influence over investment policy as well as over the reorganization plan (see LoPucki and Whitford (1992)). Bargaining over the reorganization plan induces and interacts with bargaining over investment policy.

The Bankruptcy Code requires that a reorganization plan be approved by each class of claimants, with approval of a two-thirds majority of the securities required within the class. In Chapter 11, the voting mechanism forces a minority to exchange their debt. All debt holders are treated the same regardless of their vote. Public debt holders accept a plan of reorganization if and only if it is in the debt holders' collective interest. With one class of debt holders, in contrast to outside Chapter 11, there is no coordination problem in Chapter 11. Therefore, as in Bebchuk and Chang (1992), Baird and Picker (1991), and Brown (1989), I assume that public debt holders act as a single agent in Chapter 11.

¹⁸ Brown (1989) and Baird and Picker (1991) provide models of the negotiation in Chapter 11.

¹⁹ Bankruptcy Code (11 U.S.C.) §1121(d).

²⁰ See Bergman and Callen (1991).

²¹ Bankruptcy Code (11 U.S.C.) §§1107(a) and 1108.

²² The only exception to this requirement is a costly cramdown, Bankruptcy Code (11 U.S.C.) §1129(b).

²³ Bankruptcy Code (11 U.S.C.) §1126.

B. Management's Decision to Enter Chapter 11

In this section, I focus on the following fundamental aspects of Chapter 11. First, the automatic stay, together with management control of the debtor firm, grants equity "option value." Management can invest in Chapter 11, and equity captures the "upside" to the investment. The "option value" defines equity's threat point in the renegotiation. Second, if the management of an inefficient firm invests in Chapter 11, investment reduces the value of the firm and hence reduces the value of creditor claims. Management (acting on behalf of equity holders) can reduce investment and save the cost of overinvestment in exchange for a share of the savings (for equity holders). Moreover, if creditors believe that investment reduces the value of the firm, creditors agree to share the cost savings with equity holders. Thus, the surplus over which management (on behalf of equity holders) and creditors bargain in Chapter 11 is the savings from reducing overinvestment.²⁴ Finally, although creditors possess countervailing power, management derives bargaining power from its considerable power of initiation and control over investment policy. Therefore, I define γ as the maximum proportion of the surplus that management can capture for equity in a renegotiation with creditors, where $0 < \gamma \leq 1$.

In Chapter 11, I assume that there is an initial period before bargaining takes place between management and debt holders. In this initial period, debt holders organize in order to act as a single creditor once bargaining begins. Moreover, management operates the firm under court supervision. I assume that management must decide whether to invest before Chapter 11 bargaining begins. Management will invest because equity value is zero given an immediate liquidation. The cost of the investment is I . The present value of the investment is $\{\alpha(E(X|i)) + (1 - \alpha)I\}$, where $i \in \{b, g\}$ and $0 < \alpha < 1$. However, management may alter the investment after bargaining with creditors begins; management has discretion over α , where $0 < \alpha \leq \bar{\alpha} < 1$. For a firm in Chapter 11, the only investment choice variable is α . Increasing α increases option value and increases the value of a good firm, but decreases the value of a bad firm.

For a firm in Chapter 11, equity's reservation value is its option value, and management maximizes option value if it selects $\alpha = \bar{\alpha}$. Therefore, equity's reservation value²⁵ is

$$R(i) = \int_{D-Y+\bar{\alpha}I}^{\infty} (\bar{\alpha}X - D + Y - \bar{\alpha}I)f(X|i) dX, i \in \{b, g\}. \quad (4)$$

If creditors believe that a firm is good with probability 1, they believe investment in Chapter 11 increases firm value. Moreover, if creditors believe

²⁴ This is similar to Bebchuk and Chang (1992) and Bergman and Callen (1991).

²⁵ In this section, I do not assume equation (3). I no longer assume that good firms prefer to renegotiate with debt holders outside Chapter 11 rather than file for bankruptcy. Good firms may choose to file.

that a firm is good with probability λ (creditors' prior beliefs), by assumption²⁶ they believe investment in Chapter 11 has no effect on firm value. Creditors believe that there is no surplus over which they may bargain with management. No renegotiation takes place and equation (4) defines equity's payoff in Chapter 11.

If management can credibly convey that the firm is bad, then creditors believe that there is a surplus over which to bargain. The surplus is $(1 - \alpha)(I - E(X|b))$ and is maximized if management chooses $\alpha \rightarrow 0$. Therefore, given management bargaining power of γ , equity's payoff in a renegotiation is a fixed payoff (since the firm is effectively liquidated), F , such that

$$F = R(b) + \gamma(I - E(X|b)). \quad (5)$$

The first term of equation (5) is equity's reservation value, and the second term represents equity's share of the surplus.

Given equations (4) and (5), bad firms will not mimic good firms in Chapter 11 since bad firms only get more than their reservation value, $R(b)$, if they credibly signal their true type. However, good firms mimic bad firms if equity's share of the surplus is sufficiently large, i.e., if the fixed payoff, F , in a Chapter 11 renegotiation is larger than the largest alternative payoff to the equity holders of a good firm. A good firm's alternatives are its reservation value in Chapter 11, $R(g)$, and the value of the equity of a good firm that renegotiates outside of Chapter 11, $E_{\pi_g}^g$. To credibly convey its true type, a bad firm cannot propose a reorganization plan in Chapter 11 that gives equity more than a good firm's largest alternative payoff. Therefore, a bad firm selects $\alpha \rightarrow 0$ and offers a reorganization plan in which equity's payoff is

$$E_{file}^b = \min\left\{\max\{R(g), E_{\pi_g}^g\}, F\right\}. \quad (6)$$

Creditors accept such an offer because they believe that the firm is bad and that the offer will accomplish an increase in the value of the creditors' claims.

If bad firms choose to file for bankruptcy, equity's payoff is E_{file}^b . However, bad firms must first choose whether to file for bankruptcy or mimic good firms outside bankruptcy. As the surplus going to equity in a bankruptcy increases, E_{file}^b increases until it equals $\max\{R(g), E_{\pi_g}^g\}$. Since $E_{\pi_g}^b$, the payoff to a bad firm that mimics a good firm in a renegotiation outside Chapter 11, is strictly less than $E_{\pi_g}^g$ given FOSD, bad firms prefer to file.

PROPOSITION 5: *A sufficient condition for the existence of an equilibrium in which bad firms are liquidated (though not immediately) in Chapter 11 and good firms invest either in Chapter 11 or outside Chapter 11 is that the equity value of a bad firm that files for bankruptcy is greater than the equity value of a bad firm that mimics a good firm in a renegotiation outside Chapter 11.*

Proof: See Appendix.

If bad firms choose to file for bankruptcy, investment efficiency improves since management agrees to liquidate in Chapter 11 when creditors agree to

²⁶ Recall the assumption that $\lambda E(X|g) + (1 - \lambda)E(X|b) = I$.

an equity payoff of E_{file}^b . Chapter 11 reduces bad-firm overinvestment. Moreover, good firms either renegotiate and invest outside Chapter 11 or invest in Chapter 11. For a good firm, investment outside Chapter 11 is efficient, but investment is inefficient inside Chapter 11 since $\bar{\alpha}$ is less than 1. However, to the extent that good firms invest (inside or outside Chapter 11) rather than liquidate, Chapter 11 reduces good-firm underinvestment.

Bad firms are more likely to choose to file for bankruptcy, the larger the surplus that the bad firm equity holders can capture in Chapter 11. Equity's payoff in bankruptcy in excess of its reservation value is a function of equity's bargaining power, γ , and the magnitude of the total surplus, $I - E(X|b)$. Taking equity's bargaining power as given, whether bad firms voluntarily file for bankruptcy is directly related to the absolute value of the NPV ($NPV < 0$) of the investment. Therefore, bad firms are more likely to choose to file for bankruptcy, the more inefficient the investment.

C. Discussion

The model assumes frictionless bargaining always occurs in Chapter 11 and, as a result, Chapter 11 brings about the liquidation of inefficient firms. In practice, Chapter 11 does not typically result in liquidation. However, whether Chapter 11 brings about liquidation is unimportant in making the point that Chapter 11 induces voluntary filing for bankruptcy by inefficient firms.

In the absence of Chapter 11, some inefficient investment takes place that does not take place when Chapter 11 is available. Even though the firm is allowed to continue in Chapter 11, the preservation of equity value means that the firm will avoid risky investment activity that it would otherwise undertake. Chapter 11 results in a shift in investment policy away from high-risk activity (see LoPucki and Whitford (1992)) and allows shareholders to retain valuable equity in the firm. Furthermore, as long as equity holders extract a share of the surplus from avoiding inefficient investment in Chapter 11, inefficient firms have a greater incentive to file for bankruptcy than efficient firms.

VI. Concluding Discussion

A. Private versus Public Debt

In this section I will comment on the assumption in the model that all debt is public and diffusely held. The assumption motivates the focus on exchange offers with their associated free-rider problems. In the model, public debt holders cannot fully coordinate their actions. However, for a firm with a single creditor, there is no coordination problem.

Given a well-informed private creditor, there are no restrictions on out-of-court restructurings. Private creditors can distinguish between economically efficient and inefficient firms. Given the gain from allowing an efficient firm

to invest, private creditors renegotiate with an economically efficient firm and the firm invests. Moreover, to the extent that an inefficient firm can invest without renegotiating with the private creditor outside bankruptcy, the private creditor renegotiates with the firm and the firm liquidates. In general, investment is efficient, regardless of the bankruptcy law, as long as the firm can renegotiate with the well-informed private creditor outside bankruptcy.

If the private creditor is uninformed, then (in the absence of Chapter 11) renegotiation, investment, and liquidation depend on the creditor's prior beliefs about investment efficiency and the extent to which the firm can invest without renegotiating with the creditor outside bankruptcy. If the firm has sufficient cash flow to meet current debt obligations and invest, the firm renegotiates with the creditor if there is a surplus over which the creditors can bargain. If the firm is inefficient, the surplus is equal to the reduction in firm value if the firm invests. The inefficient firm renegotiates with the creditor and liquidates. If the firm is efficient, there is no renegotiation and the firm invests. Therefore, if the firm has sufficient cash flow to meet current debt obligations and invest, investment is first-best.

If the firm must renegotiate with the creditor in order to invest, the renegotiation depends on the creditor's prior beliefs about investment efficiency. In the absence of Chapter 11, an inefficient firm always mimics an efficient firm. If the creditor believes the firm is inefficient, the creditor refuses to renegotiate with the firm, the firm liquidates, and the equity holders' payoff is zero. The efficient firm cannot signal its type. Therefore, the only possible equilibria are two pooling equilibria. First, the creditor believes (a priori) that investment is on average (but not always) efficient, renegotiates with the firm, and permits investment. The alternative is that the creditor believes (a priori) that investment is on average (but not always) inefficient, refuses to renegotiate with the firm, and the firm liquidates. Therefore, either inefficient firms overinvest or efficient firms underinvest.

In contrast, Chapter 11 procedures impose costs on inefficient firms that would otherwise mimic efficient firms. All firms now have an incentive to reveal their type. In a separating equilibrium, efficient firms renegotiate with the creditor and invest. Inefficient firms either file for Chapter 11 (as in Berkovich and Israel (1991)) or renegotiate with the creditor outside Chapter 11 and liquidate. In a renegotiation outside Chapter 11, each claim holder's expected payoff in Chapter 11 serves as his reservation value in the renegotiation. In a separating equilibrium, investment is first-best.

Because Chapter 11 provides an incentive for an economically inefficient firm to reveal its type, investment efficiency improves relative to investment efficiency with bankruptcy laws that do not allow Chapter 11. This result is similar to the result in the model with public debt holders. However, with Chapter 11 and a single uninformed private creditor, a firm benefits from Chapter 11 but never enters Chapter 11 (if it can renegotiate outside Chapter 11). I focus on distressed firms with public debt, because the voting mechanism in Chapter 11 eliminates the public debt holder coordination problem

present outside Chapter 11 and motivates filing for Chapter 11. Therefore, firms with public debt outstanding are more likely to use Chapter 11.

Gilson, John, and Lang (1990) find that distressed firms with public debt outstanding are disproportionately large users of Chapter 11. To the extent that this article addresses empirical evidence about firms that file for Chapter 11, I assume the debt is public debt in order to motivate filing for Chapter 11. With a private creditor rather than public debt, the maintenance of equity value in Chapter 11 provides the same incentive for the inefficient firm to reveal its type but does not explain Chapter 11 filings.

B. The Limitations of Chapter 11

This article outlines the features of corporate financial structure that can make financial distress costly. I focus on both information asymmetry and coordination problems among public debt holders as the sources of inefficiency. Information asymmetry and coordination problems can lead to underinvestment by economically efficient firms and overinvestment by economically inefficient firms.

In the model presented in the article, Chapter 11 works well when inefficient firms file and has good incentive effects outside of Chapter 11. However, in practice, with respect to firms that file, there are limitations to what Chapter 11 can achieve because of conflicts between claim holders or between management and claim holders.

The model assumes that management bargains on behalf of equity holders in Chapter 11. Management liquidates an inefficient firm in exchange for a more valuable claim on the firm for equity holders. However, in practice, managers may care more about protecting their jobs than they care about shareholder wealth (see Bradley and Rosenzweig (1992)). Unless creditors can bribe managers to liquidate the firm, managers avoid liquidation. To the extent that managers of inefficient firms in Chapter 11 avoid liquidation, managers destroy value.

An alternative explanation for why inefficient firms are not completely liquidated in Chapter 11 is consistent with managers acting on behalf of equity holders. When the firm is completely liquidated in Chapter 11, creditors cannot credibly commit to permit the maintenance of equity value. Creditors have the incentive to offer valuable claims on the firm to equity holders in exchange for agreement to liquidate the firm. As soon as the firm is liquidated, the firm becomes just a collection of liquid assets. Creditors can then argue for the application of the absolute priority rule leaving equity holders with nothing (see Brown (1989)). Therefore, managers of inefficient firms acting on behalf of equity holders avoid a complete liquidation to maintain equity value in Chapter 11.

Hotchkiss (1992) presents evidence consistent with both of the above hypotheses, which suggests that managers of economically inefficient firms avoid liquidation in Chapter 11 and destroy firm value. Hotchkiss (1992)

finds that, for bankrupt firms, the relationship between the fraction of managers retained after filing and firm performance is significantly negative.

Bradley and Rosenzweig (1992) and others argue that the operating and investment inefficiencies possible in Chapter 11 can be avoided by eliminating Chapter 11 reorganization altogether and relying on Chapter 7. In a Chapter 7, a trustee sells the firm in its entirety, either through an auction or through negotiations with investors and other firms. In effect, Chapter 7 shifts control of a bankrupt firm to creditor-oriented managers. However, Hotchkiss (1992) finds no evidence that factors associated with increased creditor influence can be tied to improved firm performance.

The normative question of whether a forced sale regime is more or less efficient than some form of reorganization law is largely an empirical one given the potential allocative distortions of both systems. However, any thorough analysis of bankruptcy law cannot ignore the consequences of bankruptcy law for out-of-court restructurings. Since the maintenance of equity value in Chapter 11 has value for restructurings outside of Chapter 11, any reform of bankruptcy law should preserve this feature of Chapter 11. However, it follows from this article that firms filing for Chapter 11 are disproportionately economically inefficient. Given management's incentive to avoid liquidation in Chapter 11, one can expect economically inefficient firms to emerge from Chapter 11. In fact, Hotchkiss (1992) documents the post-bankruptcy poor performance of firms reorganized in Chapter 11. Therefore, it follows that a logical first step in reforming bankruptcy law is an actively enforced requirement that firms reorganized in Chapter 11 emerge with a financial structure conducive to operating and investment efficiency.

Appendix

Proof of Proposition 1: I set the off-the-equilibrium path beliefs of the probability the firm is good at λ everywhere. Debt holders believe firm value is $Y < qD$, and will reject all offers to renegotiate. Therefore, since debt holders will not accept any restructuring, neither type firm can deviate. The proposed equilibrium is a PBE.

I need to check that the equilibrium satisfies the refinement. There is no good-firm-consistent deviation, because any offer that a good firm prefers, a bad firm also prefers. There is no bad-firm-consistent deviation, because debt holders reject any offer if they believe the firm is a bad firm. There is no pooling-consistent deviation, because debt holders reject any offer if they believe the firm is good with probability λ . Q.E.D.

Proof of Proposition 2: Firms offer senior debt with a face value π' such that debt holders accept the offer but reject any offer of senior debt with face value less than π' , given debt holder beliefs that a firm is good with probability λ . I set the off-the-equilibrium-path beliefs of the probability the firm is bad at one everywhere. Since $Y - I + E(X|b) < qD$, debt holders will not accept any deviation. Because both good and bad firms get nothing if the

offer is rejected, neither type of firm will deviate. The proposed equilibrium is a PBE.

I need to check that the equilibrium satisfies the refinement. There is no good-firm-consistent deviation, because any offer that a good firm prefers, a bad firm also prefers. A good firm would only prefer to offer senior debt with a lower face value, i.e., an offer a bad firm would also prefer. There is no bad-firm-consistent deviation, because debt holders reject any offer if they believe the firm is a bad firm. There is no pooling-consistent deviation: any offer that both good and bad firms prefer, debt holders will reject with beliefs that the firm is good with probability λ . Both good and bad type firms are worse off with an offer that is rejected. Q.E.D.

Proof of Proposition 3: Because $Y < qD$, $Y - I + E(X|b) < qD$ and debt holders would not accept an offer to renegotiate with the firm if they believe that the firm is bad with probability 1. There cannot be a separating equilibrium in which only bad firms renegotiate and invest at time 1.

Because $Y < qD$, debt holders would not accept an offer to renegotiate with the firm if they believe that the firm is good with probability λ . There cannot be a pooling equilibrium in which both types of firms renegotiate and invest at time 1.

Define $\hat{\pi}$ such that

$$\int_{\hat{\pi}D - Y + I}^{\infty} (X - \hat{\pi}D + Y - I)f(X|b) dX = E_{file}^b + \varepsilon, \quad (7)$$

where $\varepsilon \rightarrow 0$. Let $\tilde{\pi} = \max\{\hat{\pi}, \pi_g\}$.

Suppose

$$E_{file}^b \geq \min \left\{ \int_{\pi_p D - Y + I}^{\infty} (X - \pi_p D + Y - I)f(X|b) dX, \right. \\ \left. \int_{\pi_g D - Y + I}^{\infty} (X - \pi_g D + Y - I)f(X|b) dX \right\}. \quad (8)$$

A possible equilibrium is one in which both types of firms file for bankruptcy. However, this is not an equilibrium that satisfies the refinement, because there exists a good-firm-consistent deviation. Given equation (3), good firms will offer to renegotiate with debt holders. Good firms will offer senior debt with face value $\tilde{\pi}$. Given equation (8), bad firms will not mimic the offer. Debt holders believe only good firms will offer to renegotiate, and debt holders will accept an offer of senior debt with face value $\tilde{\pi}$. Good firms will deviate, and debt holders believe only good firms deviate. Thus, there does not exist a pooling equilibrium that satisfies the refinement.

The only equilibrium is a separating equilibrium in which good firms renegotiate with debt holders and bad firms file for bankruptcy. I set the off-the-equilibrium path beliefs of the probability the firm is good at λ everywhere. If given a deviation, debt holders believe the firm is good with

probability λ , believe firm value is $Y < qD$, and reject the offer to renegotiate. If debt holders believe only good firms offer senior debt with face value $\tilde{\pi}$, given equation (8), bad firms will prefer to file. Given equation (3), good firms will offer $\tilde{\pi}$, and debt holders believe that a firm that offers $\tilde{\pi}$ is good. Since neither type of firm wishes to deviate, the proposed equilibrium is a PBE.

I now show that the separating equilibrium satisfies the refinement. First, there is no good-firm-consistent deviation: if $\tilde{\pi} = \pi_g$ and debt holders believe the firm is good, debt holders reject any offer that a good firm prefers. If $\tilde{\pi} > \pi_g$, any offer that a good firm prefers, a bad firm also prefers. There is no bad-firm-consistent deviation, because any offer that a bad firm prefers, a good firm also prefers. Last, there is no pooling-consistent deviation because debt holders will not accept an offer if they believe the firm is good with probability λ .

Now suppose

$$E_{file}^b < \min \left\{ \int_{\pi_p D - Y + I}^{\infty} (X - \pi_p D + Y - I) f(X|b) dX, \int_{\pi_g D - Y + I}^{\infty} (X - \pi_g D + Y - I) f(X|b) dX \right\}. \quad (9)$$

There is no separating equilibrium in which good firms renegotiate with debt holders and bad firms file for bankruptcy. Any offer that good firms prefer to filing for bankruptcy, bad firms also prefer given equations (3) and (9). Bad firms will mimic the offer. Given equation (9), bad firms deviate.

The only equilibrium is one in which both types of firms file for bankruptcy. I set the off-the-equilibrium path beliefs of the probability the firm is good at λ everywhere. If given a deviation, debt holders believe the firm is good with probability λ , believe firm value is $Y < qD$, and reject the offer to renegotiate.

I now show that the equilibrium satisfies the refinement. First, there is no good-firm-consistent deviation, because any offer that a good firm prefers, a bad firm also prefers given equation (9). There is no bad-firm-consistent deviation, since debt holders reject any offer if they believe the firm is bad. Last, there is no pooling-consistent deviation because debt holders will not accept an offer if they believe the firm is good with probability λ . Q.E.D.

Proof of Proposition 4: There cannot be a separating PBE in which only bad firms renegotiate and invest at time 1. If $\pi_b > \pi_p > \pi_g$, $E_{file}^g = E_{\pi_p}^g$. There is a pooling consistent deviation. Moreover, if $\pi_b < \pi_g$, $E_{file}^g = E_{\pi_g}^g < E_{\pi_b}^g$. Good firms mimic bad firms.

There is no pooling equilibrium in which both types of firms file for bankruptcy. Given equation (3), either good firms deviate or both types of firms deviate. There is a pooling PBE in which both types of firms renegotiate and invest, or a separating PBE in which good firms renegotiate and invest and bad firms file for bankruptcy.

If equation (8) is satisfied, following the same reasoning as in the proof of proposition 3, there is a separating PBE in which bad firms file for bankruptcy

with no good-firm- or bad-firm-consistent deviations. Furthermore, given equation (8), there is no pooling-consistent deviation. Given debt holder beliefs that a firm is good with probability λ , bad firms prefer to file for bankruptcy rather than pool with good firms. Therefore, if equation (8) is satisfied, the separating PBE satisfies the refinement.

If equation (9) is satisfied, bad firms deviate. Following the same reasoning as in the proof of proposition 3, there are no separating PBE.

Suppose equation (9) is satisfied. Given equation (9), both good and bad firms prefer to renegotiate and invest at time 1 rather than file for bankruptcy. The existence of Chapter 11 has no impact on bad-firm behavior. Therefore, the problem reverts back to Section III.B of this article. From Section III.B it follows that both good and bad firms renegotiate and invest at time 1. Q.E.D.

Proof of Proposition 5: Given equation (6), good firms do not mimic bad firms in Chapter 11. Therefore, $E_{file}^g = R(g)$.

Suppose

$$R(g) \leq \min\{E_{\pi_p}^g, E_{\pi_g}^g\}. \quad (10)$$

Equation (8) implies that $E_{file}^b \geq E_{\pi_g}^b$. Therefore, it follows from the proofs of Propositions 3 and 4 that there exists a separating PBE that satisfies the refinement.

Now suppose

$$R(g) > \min\{E_{\pi_p}^g, E_{\pi_g}^g\}. \quad (11)$$

There exists an equilibrium in which both types of firms file for bankruptcy. I set the off-the-equilibrium path beliefs of the probability the firm is good at 1 everywhere. Since both types of firms prefer to file for bankruptcy rather than make an offer that debt holders would accept, neither type firm deviates. The proposed equilibrium is a PBE.

The PBE satisfies the refinement: given equation (11), there is no good-firm-consistent deviation, because good firms prefer to file rather than make an offer that debt holders will accept. Given equations (5) and (6), there is no bad-firm-consistent deviation. Any offer a bad firm prefers, a good firm also prefers. Finally, there is no pooling-consistent deviation. Given equations (5), (6), and (11), both types of firms prefer to file rather than make an offer that debt holders will accept. Q.E.D.

REFERENCES

- Aghion, P., O. Hart, and J. Moore, 1992, The economics of bankruptcy reform, NBER Working paper No. 4097.
- Allen, F., 1985, Capital structure and imperfect competition in product markets, Working paper, The Wharton School, University of Pennsylvania.
- , 1986, The insignificance of bankruptcy costs to the theory of capital structure: A comment, Working paper, The Wharton School, University of Pennsylvania.
- Baird, D., 1991, The initiation problem in bankruptcy, *International Review of Law and Economics* 11, 223–232.

- , and R. Picker, 1991, A simple noncooperative bargaining model of corporate reorganizations, *Journal of Legal Studies* 20, 311–349.
- Bebchuk, L., 1988, A new approach to corporate reorganization, *Harvard Law Review* 101, 775–804.
- , 1994, The effects of Chapter 11 and debt renegotiation on ex ante corporate decisions, *Journal of Finance*, Forthcoming.
- , and H. Chang, 1992, Bargaining and the division of value in corporate reorganization, *Journal of Law, Economics, and Organization* 8, 253–279.
- Bebchuk, L., and R. Picker, 1992, Bankruptcy rules, managerial entrenchment, and management human capital, Working paper, Harvard University and University of Chicago.
- Bergman, Y., and J. Callen, 1991, Opportunistic underinvestment in debt renegotiation and capital structure, *Journal of Financial Economics* 29, 137–171.
- Berkovich, E., and R. Israel, 1991, The bankruptcy decision and debt contract renegotiations, Working paper, University of Michigan.
- Betker, B., 1992, Management changes, equity's bargaining power and deviations from absolute priority in Chapter 11 bankruptcies, Working paper, Ohio State University.
- Bradley, M., and M. Rosenzweig, 1992, The untenable case for Chapter 11, *The Yale Law Journal* 101, 1043–1095.
- Brown, D., 1989, Claimholder incentive conflicts in reorganization: The role of bankruptcy law, *The Review of Financial Studies* 2, 109–123.
- , C. James, and R. Mooranian, 1993, The information content of distressed restructurings involving public and private claims, *Journal of Financial Economics* 33, 93–118.
- Bulow, J., and J. Shoven, 1978, The bankruptcy decision, *Bell Journal of Economics* 9, 437–456.
- Coffee, J., 1990, Coercive debt tender offers: The problem of distorted choice revisited, Working paper, The Center for Law and Economic Studies, School of Law, Columbia University.
- Eberhart, A., W. Moore, and R. Roenfeldt, 1990, Security pricing and deviations from the absolute priority rule in bankruptcy proceedings, *Journal of Finance* 45, 1457–1470.
- Farrell, J., 1983, Communication in game I: Mechanism design without a mediator, Working paper, Massachusetts Institute of Technology.
- Franks, J., and W. Torous, 1989, An empirical investigation of U.S. firms in reorganization, *Journal of Finance* 44, 747–770.
- , 1994, Equity's bargaining power and deviations from absolute priority in Chapter 11 bankruptcies, *Journal of Financial Economics*, Forthcoming.
- Gertner, R., 1991, Capital structure signalling in distressed debt restructurings, Working paper, University of Chicago.
- , R. Gibbons, and D. Scharfstein, 1988, Simultaneous signalling to the capital and product markets, *Rand Journal of Economics* 19, 173–190.
- Gertner, R., and D. Scharfstein, 1991, A theory of workouts and the effects of reorganization law, *Journal of Finance*, 46, 1189–1222.
- Gilson, S., K. John, and L. Lang, 1990, Troubled debt restructurings: An empirical study of private reorganization of firms in default, *Journal of Financial Economics* 27, 315–354.
- Gilson, S., and M. Vetsuypens, 1993, CEO compensation in financially distressed firms: An empirical analysis, *Journal of Finance* 48, 425–458.
- Grossman, S., and M. Perry, 1986, Perfect sequential equilibrium, *Journal of Economic Theory* 39, 97–119.
- Harris, M., and A. Raviv, 1993, The design of bankruptcy procedures, Working paper, University of Chicago and Northwestern University.
- Heinkel, R., and J. Zechner, 1991, Debt payment structure, optimal default decisions and capital structure renegotiation, Working paper, Faculty of Commerce, University of British Columbia.
- Hotchkiss, E., 1992, The post-bankruptcy performance of firms emerging from Chapter 11, Working paper, New York University.
- LoPucki, L., and W. Whitford, 1992, Corporate governance in the bankruptcy reorganization of large publicly held companies, Working paper, University of Wisconsin Law School.
- Roe, M., 1987, The voting prohibition in bond workouts, *The Yale Law Journal* 97, 232–279.

- Townsend, R., 1979, Optimal contracts and competitive markets with costly state verification, *Journal of Economic Theory* 21, 265–293.
- Weiss, L., 1990, Bankruptcy resolution: Direct costs and violation of priority of claims, *Journal of Financial Economics* 38, 477–488.
- White, M., 1994, Corporate bankruptcy as a screening device, *Journal of Law, Economics, and Organization*, Forthcoming.