Public policy toward bankruptcy: me-first and other priority rules

Michelle J. White*

This article analyzes the economic efficiency properties of bankruptcy liquidation rules, including both conventional legal rules and the me-first rule proposed by economists. It also examines the incentives of firms to undertake investment projects when bankruptcy is a possible outcome. The results show that none of the rules leads to private investment incentives which are socially efficient. Depending on circumstances, it may be privately profitable to liquidate firms which should be continued or to continue firms which should be liquidated. Investments in low productivity projects may be approved while worthwhile projects may be abandoned. Public policy implications are considered.

1. Introduction

■ The rules of bankruptcy are important determinants of the rate of new capital formation in the economy in general and of individuals' investment incentives in particular. Bankruptcy practices affect both the likelihood that investment projects may default and the amount paid to investors if default occurs.

The subject of bankruptcy is particularly of interest at the current time for two reasons. First, bankruptcy rates for U.S. firms have been rising in recent years. The rate of default on corporate bonds, for example, was several times as high in the 1970s as in the 1950s or 60s.[1] Clearly, the more likely the possibility of default, the more important it is to have bankruptcy rules which lead to incentives for efficient investment decisions. Second, in 1978, for the first time since 1938, Congress passed major new legislation reforming the bankruptcy process. The new law was the result of seven years of debate by lawyers and law makers, but with little or no input from economists. This is not surprising, since economists have expended little effort on analyzing the effects of bankruptcy procedures or bankruptcy law provisions. Rather, most analysts have tended to assume the existence of whatever legal or institutional arrangements are necessary to facilitate efficient economic outcomes. Fama

* New York University.

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[1] The default rate as a percentage of total bonds outstanding was .035 percent per year during the period 1950–1969 and .21 percent in 1970–1977 (see Gordon and Malkiel, 1980). While these rates are low in absolute terms, they are the ratio of a flow to a stock. Presumably the market for most corporate bonds would disappear at a fairly low default level.

and Miller (1972, pp. 150–152) in a much referenced passage pointed out that a set of efficient institutional arrangements would require that bondholders be paid before stockholders, that lower priority bonds be retired before higher priority bonds, and that part of a bond issue not be retired without retiring the whole issue. These practices have become known as "me-first rules". Fama and Miller argued that if me-first rules were in effect and firms' investment policies were fixed, managers would have incentives to act efficiently and to maximize the value of the firm.[2]

The goal of this paper is to analyze the economic effects of bankruptcy law, with no *ex ante* assumptions concerning whether the law is efficient. We consider in our analysis both the effects of Fama and Miller's me-first rules and those of several other rules which come closer to formalizing actual bankruptcy practices. Unlike Fama and Miller, we do not assume the firm's investment decisions to be fixed. Rather, we model explicitly the interrelationship between firms' economic and financial decisions. Further, we assume that transactions are not costless, and that the pattern of transactions which does occur will reflect the relative costs of particular groups' bargaining with each other. Also, we assume that a firm facing a financial crisis will either continue (i.e., meet its current obligations in full) or be liquidated. Reorganization is ruled out.

The legal procedure in a liquidation (or straight bankruptcy) is fairly straightforward. A court-appointed trustee sells the firm's assets, and creditors are paid in full for their claims in the following order: first, administrative expenses of bankruptcy, including lawyers' fees and other expenses incurred after the start of bankruptcy proceedings; second, taxes; third, wages up to $600 per worker and rent due to landlords; fourth, unsecured creditors; and last, equity holders. Secured creditors having liens on particular assets can reclaim their property or its value. If their claims exceed the value of the security, they become unsecured creditors for the remainder. Bondholders, bank lenders, and trade creditors each may be secured, unsecured, or partially secured creditors. If many claimants, such as unsecured creditors, have the same priority, then all are paid an equal fraction of the face value of their claims. We refer to the general ordering of claims as the absolute priority rule (APR) and the division within classes of creditors having the same priority as the proportionate priority rule (PPR). Note that the me-first rule is a special case of the APR when bondholders are fully secured and all other claimants are unsecured.

How likely are these rules to be applied in practice? An examination of liquidation cases suggests that there are many possible legal maneuvers which can push up or down particular creditors' priority. For example, while creditors must be notified of the failing firm's bankruptcy petition, each creditor bears the burden of coming forward and proving his claim. Thus, small claims may not be asserted because of high transactions costs. Also, secured creditors'

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[2] See Stiglitz (1972) for an early model exploring the effect of bankruptcy on financial variables. More recent writers, such as Kim, McConnell, and Greenwood (1977), Warner (1977), and Scott (1977), have pointed out various ways in which managers can evade me-first rules, but have not considered whether the rules themselves lead to efficient results. Smith and Warner (1978) have probed the legal/institutional detail of bondholder-stockholder relations more generally in considering how bond covenants affect managers' incentives to maximize the value of the firm versus the value of equity alone.

liens must be "perfected," i.e., registered with the proper local government official within a certain period, or they are subject to challenge. The bankruptcy trustee has the power to challenge these claims, since the trustee acts in the interests of creditors generally, and unsecured creditors prefer to minimize the number of secured claims. Further, banks can increase their payoff by "setting off" at full face value reciprocal claims by the bank on the debtor and by the debtor on the bank. Debts incurred by the firm after the petition date take priority over previous debts as "expenses of administration." This often leads unsecured creditors to force the firm to file a bankruptcy petition as a condition for a renewed loan. Finally, the bankruptcy court typically will not attempt to sell the debtors' assets in a way that maximizes the return, and "forced sale" proceeds may be small relative to value (Blum and Kaplan, 1976). Thus, there clearly are possibilities for legal maneuvering in liquidation cases. For small firms and small claims, such maneuvering is not worthwhile. But the larger the firm, the greater the rewards. However, subject to these qualifications, the use of the APR and the PPR as the rule governing division of assets among creditors in liquidations is well established in practice.

In the model presented below, the me-first rules, the APR, and the PPR are subject to two tests of economic efficiency. *Ex post* efficiency requires that a priority rule give parties incentives to choose continuance or liquidation for an already failing firm only when that choice is efficient from a social standpoint, i.e., Pareto optimal. *Ex ante* efficiency requires that a priority rule also lead to efficient investment incentives for new projects, i.e., investors should have incentives to invest only in projects which are socially worthwhile. This criterion should apply to investment undertaken by any firm, regardless of its financial condition.

Our results are quite consistently negative: we find that neither the APR, nor the PPR, nor the me-first rule gives managers efficient investment incentives, except in special cases. We establish the conditions necessary for efficient results under the various priority rules, and we investigate what factors influence the inefficient incentives that result when the rules break down.

Sections 2 and 3 analyze the *ex post* and *ex ante* efficiency of the APR and the me-first rule. Section 4 applies the same analysis to the PPR. Section 5 is the conclusion.

2. Ex post efficiency and the absolute priority rule

■ In this section we examine the effect of the APR on the social efficiency of private parties' incentives to liquidate or continue an already failing firm. We first define a socially efficient condition for continuing a failing firm and then consider the circumstances under which the APR gives private parties incentives to make socially efficient decisions.

We take as a starting point the coalition model of bankruptcy presented by Bulow and Shoven (1978). We assume that there are three classes of creditors with claims on the firm: the bank (B), bondholders (D), and equity holders (E). Thus, there are no claims for taxes, lawyers' fees, wages, or rents. However, the bank can represent a variety of types of unsecured or secured creditors. Continuance is assumed to occur if a bank loans the firm enough cash to meet its current period obligations. We assume that the loan comes from a bank, rather than from a new bond or stock issue: since the bank is an insider, the

transaction cost of convincing the bank to make the loan is assumed to be smaller than the cost to the failing firm of floating a new bond or stock issue. A coalition of the bank lender and equity holders makes the continuance versus liquidation decision. Since equity holders' interest is eliminated if liquidation is chosen, we assume that equity holders are willing to transfer some or all of their interest in the firm to the bank to induce it to choose continuance.

Why assume a bank-equity holders' coalition rather than a bank-bondholders coalition? First, equity holders always favor continuance, since their interest disappears under liquidation, while bondholders may be better off under liquidation. Further, unlike equity holders, each individual bondholder always has the legal right to force the firm into bankruptcy if current period claims are not paid in full. Thus, it is more costly to bargain with bondholders as a group, since if some bondholders agree to partial payment and continuation, others could disrupt the plan by forcing bankruptcy unless they are paid off in full. Finally, holders of long-term bonds are not a likely source of the new funds needed to keep the firm in operation; thus, they do not realize the bargaining power that goes along with providing these funds.[3]

The bank-equity coalition favors continuance over liquidation if the following condition holds:

$$E_c + B_c > B_b, \tag{1}$$

where the subscript c indicates continuance and b indicates liquidation or bankruptcy. Inequality (1) says that the combined interest of the bank and equity holders under continuance must be greater than the value to the bank of bankruptcy. (By assumption equity holders get nothing if bankruptcy occurs.) Alternately (1) can be expressed as

$$P > B_b + D_c, \tag{2}$$

where P is the expected present value of future earnings of the firm if it continues, net of operating expenses such as wages, rent, and materials costs. D_c is the value to debtholders of continuance. By definition, $P = D_c + E_c + B_c$.

Having defined a private condition for continuance to be profitable, we need a social condition defining when continuance should occur. We ignore financial considerations, since the firm's past investments represent sunk costs, and focus on real considerations. We assume that the firm should continue if the liquidation value of its assets, L, is less than the present value of future earnings of the firm if it continues, P, or

$$P > L. \tag{3}$$

L represents the value of the best alternative use of the firm's assets, whether sold as scrap or as a going concern, piecemeal or as a whole. Normally we expect P to exceed L, but the opposite may also occur if, for example, a new management can make more efficient use of the firm's capital or if the land or buildings are more valuable in some other use.[4] The criterion for continuance

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[3] See White (1979) for a formal analysis of the conditions under which alternative coalitions may occur. Note that trade creditors or other short-term lenders could play the role of the bank.

[4] We follow Bulow and Shoven (1978) and Haugen and Senbet (1978) in defining the economic costs of bankruptcy as the quantity $P - L \gtrless 0$. Other transactions costs of bankruptcy, such as lawyer's fees and court costs, can be included in the quantity $P - L$ without changing the analysis.

is assumed to hinge solely on the best use of the firm's current assets; thus, it is possible that a firm should be continued even when its expected future earnings are insufficient to pay all of its future obligations.[5]

If (3) is the socially optimal condition for continuance and (2) is the private profit condition, then to give private parties incentives to make socially optimal decisions, the priority rule in bankruptcy must cause the inequality in (2) to hold if and only if the inequality in (3) also holds. The bank has an incentive to choose continuance too frequently if the inequality in (2) holds when the inequality in (3) is reversed. Similarly, it has an incentive not to choose continuance frequently enough if (2) is reversed when (3) holds. Therefore, the condition for the bank to choose continuance only if it is socially efficient is

$$L = B_b + D_c \qquad \text{or} \qquad D_c = D_b. \tag{4}$$

Any bankruptcy policy which is *ex post* efficient must give bondholders the same return, regardless of the legal status of the firm.

We turn now to the efficiency effects of the APR. Since both the bank and the bondholders could be either unsecured or secured creditors, several possibilities are consistent with the APR. Either group could have priority over the other, or they could have equal priority, or one group could have priority up to the value of its collateral, but be equal or lower in priority for further claims. We examine two possibilities here. First, we suppose that bondholders have priority for the full amount of their claims: the me-first rule. Second, we assume that the bank comes first for an arbitrary amount, but then it comes after bondholders. Equal priority is treated in Section 4.

We make several further assumptions, following Bulow and Shoven (1978). First, creditors are assumed to be risk-neutral. Second, we use a two-period framework. Third, we characterize uncertainty by assuming that the firm's earnings in the next period in present value terms are $P + G$ or $P - G$, each with probability 1/2. If the favorable outcome occurs, then the firm's earnings are assumed adequate to pay off all its obligations. If the unfavorable event occurs, then the firm is liquidated in period 2, and the priority rule comes into play. G is referred to as the risk factor. Fourth, we assume that the same priority rule is used, regardless of whether the firm is liquidated in period 1 or period 2. Finally, since the firm is in a financial crisis, we assume that no dividends are paid.

We define the following terms, representing claims on the firm:

D_1 = face value of bond debt due in period 1;
D_2 = face value of bond debt due in period 2;
R_1 = accrued interest on bonds due in period 1;
r_D = coupon rate on bond debt;
B_1 = amount due to the bank in period 1;
s = current discount rate; and
C = cash in hand at period 1.

We can now show that the APR gives efficient results under two condi-

[5] In general, P should represent the value of the firm, given its best investment opportunities under continuance. However, some investment opportunities, such as closing down the firm, are only possible under bankruptcy if the "investment" generates returns insufficient to pay all claims in full.

tions: (1) bondholders are fully paid off both under liquidation and continuance and (2) the bond interest rate equals the current discount rate. If these conditions hold, then

$$B_b = L - (R_1 + D_1 + D_2) \qquad \text{and} \qquad D_c = R_1 + D_1 + D_2 \frac{(1 + r_D)}{(1 + s)} . \quad (5)$$

In (5), bondholders under bankruptcy get $R_1 + D_1 + D_2$ immediately, so the bank gets L minus this amount (where by assumption $L > D_1 + D_2 + R_1$). Under continuance bondholders get $R_1 + D_1$ plus the discounted present value of $D_2(1 + r_D)$. Substituting (5) into the private condition for the bank to choose continuance, $P - D_c \geq B_b$, we get

$$P - (R_1 + D_1) - D_2 \frac{(1 + r_D)}{1 + s} \geq L - (R_1 + D_1 + D_2). \quad (6)$$

But if $s = r_D$, then (6) implies that $P \geq L$, the socially efficient condition for continuance. Thus, the bank will have an incentive to choose continuance or liquidation only when that alternative is socially efficient.

We have shown that the me-first rule gives parties socially inefficient incentives when the possibility of default on bond obligations is introduced. However, the conditions in (5) are actually sufficient rather than necessary. The necessary condition for efficiency can be referred to as the indifference property: it requires that bondholders be indifferent to the liquidation-continuance decision. Thus, if bondholders receive with certainty the same payment, K, regardless of the firm's fate, and if $s = r_D$, then (6) becomes $P - K \geq L - K$, the socially efficient decision criterion. But the law requires full payment to bondholders under continuance. Therefore, the only indifference point compatible with the law is that given in (6) of the text.

More realistically, the assumptions made in deriving (6) are unlikely to hold. Even with top priority, bondholders often get less than the face value of their claims when liquidation occurs. Alternatively, the bank might have priority over bondholders for part of their claims, or the interest rates s and r_D may differ. We examine each of these possibilities separately below.

First, suppose bondholders are not always fully paid off if liquidation occurs in either period. Then (6) becomes

$$P - (R_1 + D_1) - 1/2\left[D_2 \frac{(1 + r_D)}{1 + s}\right] - 1/2[P - G]$$
$$\geq \begin{cases} L - (D_1 + D_2 + R_1) & \text{if} \quad D_1 + D_2 + R_1 < L \quad \text{or} \\ 0 & \text{if} \quad D_1 + D_2 + R_1 \geq L. \end{cases} \quad (7)$$

Here bondholders get $R_1 + D_1$ with certainty if continuance occurs. We assume they also are fully paid off in period 2 if a favorable outcome occurs (since this seems a minimal condition for continuance). If an unfavorable outcome occurs, we assume they get $P - G$, which is only partial payment; i.e., $0 < P - G < D_2(1 + r_D)/(1 + s)$. If immediate liquidation occurs, the bank gets $L - (D_1 + D_2 + R_1)$ or zero, whichever is greater.

Equation (7) implies that the me-first rule can lead either to incentives for the coalition to choose liquidation when continuance is socially preferred or continuance when liquidation is socially preferred. The direction of bias

depends on which alternative presents greater opportunities for reduced payments to bondholders. If $L > D_1 + D_2 + R_1$, then continuance becomes more attractive, since bondholders may be paid less than $D_2(1 + r_D)$ in period 2 under continuance, but must be fully paid off under liquidation. If $L \leq D_1 + D_2 + R_1$, then liquidation is likely to be more attractive, since bondholders get less than the face value of their claims in both periods under liquidation, while they must be paid $D_1 + R_1$ in full under continuation. Thus, too many or too few bankruptcies may occur under the me-first rule, depending on particular circumstances.

Second, suppose the bank has priority over bondholders for an arbitrary amount B^* (perhaps because the most recent bank loan was secured by a lien on an asset worth at least B^*). Then (7) becomes

$$P - (R_1 + D_1) - 1/2\left[D_2 \frac{(1 + r_D)}{1 + s}\right] - 1/2\left[P - G - \frac{B^*}{1 + s}\right]$$

$$\geq \begin{cases} L - (D_1 + D_2 + R_1) & \text{if} \quad L > B^* + D_1 + D_2 + R_1 \quad \text{or} \\ B_2 & \text{if} \quad B^* \leq L \leq B^* + D_1 + D_2 + R_1 \quad \text{or} \\ L & \text{if} \quad 0 < L \leq B^*. \end{cases} \tag{8}$$

Here we assume that if the unfavorable outcome occurs in period 2, then $P - G$ exceeds B^* but is less than $D_1 + D_2 + R_1$.

Comparing this case with the previous one, if liquidation is chosen, the coalition's return is higher, except when $L > B^* + D_1 + D_2 + R_1$, while if continuation is chosen, its return is higher only in the unfavorable outcome. Thus, the effect of the bank's receiving priority over bondholders for part of its claims is probably to cause the coalition to choose liquidation more often. This change is inefficient, since it is not mirrored in any increase in the social efficiency of liquidation.

Finally, suppose $s > r_D$: the current discount rate exceeds the bond interest rate. If the bonds are old, then this is a likely possibility. In this case the coalition has an incentive to choose continuation too often. There are two reasons for this. First, the law gives bondholders a claim in bankruptcy equal to the face value of the bonds, D_2. But if $s > r_D$, then the market value of the bonds under continuance is the lower amount $D_2(1 + r_D)/(1 + s)$. Thus, only under continuance does the firm avoid having the bondholders acquire a claim in excess of market value. Second, only under continuance does the firm still benefit from the below market interest rate on bonds. Again, both these incentive effects are inefficient, since they do not reflect any increase in the social efficiency of continuance.

We have shown that the "me-first" rule leads to *ex post* efficient results only under a very restrictive set of assumptions. More generally, the bank-equity holders' coalition may have incentives to choose either continuation or liquidation when the other alternative is socially preferred, but the direction of incentives depends on particular circumstances. In the next section we extend the analysis by considering the efficiency of absolute priority and me-first rules when firms consider undertaking new investment projects.

3. Ex ante efficiency

■ Our previous analysis examined the effects of priority rules on incentives to liquidate or continue an already failing firm. However, priority rules also

affect the profitability of new investments by influencing the probability of bankruptcy and the return that investors get if the project fails. These projects might be undertaken by new firms, by existing firms, or by otherwise failing firms, where the new investment project is part of the decision to continue the firm. In this section we analyze the influence of priority rules on new investment incentives, again taking a public policy viewpoint. We derive a social efficiency condition and then consider the circumstances under which the APR or the me-first rule gives private parties efficient investment incentives.

Assume again that an existing firm has an expected present value of future earnings equal to P. Actual earnings in period 2 in present value terms are $P \pm G$, each with probability 1/2, where G is the risk factor. Suppose the firm is considering an investment project which will cost T' and which will raise the expected present value of earnings by an amount P'. The project itself also has a risk factor G'. We assume that the project returns $P' \pm G'$, each with probability 1/2, regardless of which firm undertakes it. Thus, there are no technological factors affecting the project's cost or its return which depend on the present characteristics of the firm.[6]

The correlation between the two risk factors G and G' is of interest. In our simple case the returns on the firm's existing investments and on the new investment could either be positively correlated, in which case earnings would be $P + P' + G + G'$ or $P + P' - G - G'$, or negatively correlated, in which case earnings would be $P + P' + G - G'$ or $P + P' - G + G'$. From a social viewpoint the investment project is worthwhile if the expected present value of the increase in the firm's earnings exceeds the cost of the project, or if $P' \geq T'$.

From a private viewpoint we assume again that a bank-equity holders' coalition determines whether the project is undertaken. Again lenders are risk neutral. The project may be financed entirely by bank loans or by a combination of bank loans and a new bond issue.[7] Also, we assume that the project is considered by a firm whose continuance in the current period is not in doubt. The coalition considers the effect of the new project on its own costs and returns. The project is privately profitable if

$$\Delta(P - D_c) = \Delta(E_c + B_c) > T' - D_2'. \tag{9}$$

The coalition undertakes the project if the increase in its expected earnings net of payments to debtholders, new and old, exceeds the cost borne by the coalition, where D_2' represents the proceeds of the new bond issue.

The coalition therefore has an incentive to undertake projects that are not socially worthwhile if $\Delta(P - D_c) + D_2' > P'$, while it has an incentive not to undertake projects that are socially worthwhile in the opposite case. The condition for the coalition to have private incentives to undertake only projects that are efficient from a social standpoint is:

$$\Delta(P - D_c) + D_2' = P'. \tag{10}$$

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[6] Higgins and Schall (1975) refer to this as a conglomerate merger, where the new project is itself assumed to be an existing firm. See their paper for an analysis of the effect of such mergers on firm value. The cost of the project and its returns could alternatively be assumed to depend on the characteristics of the firm undertaking it, owing perhaps to economies of scale which depend on the firm's current capital structure. This would not greatly change the analysis below. We make the stricter assumption to establish whether in the absence of such technology-induced profit variation, the attractiveness of the investment could vary across firms because of financial factors alone.

[7] Since the firm is not in a financial crisis, all methods of finance are possible.

Turning first to the effects of the me-first rule, we can show that the rule achieves efficient investment incentives under the same conditions as were required in the *ex post* efficiency case: (1) full payoff to bondholders regardless of the outcome and (2) the discount rate to equal the rate of interest on all bonds, new and old. Under these circumstances, the coalition's incentives are expressed by the condition:

$$1/2\left[P + P' + G + G' - D_2\frac{(1 + r_D)}{1 + s} - D_2'\frac{(1 + r_D')}{1 + s}\right]$$
$$+ 1/2\left[P + P' - G - G' - D_2\frac{(1 + r_D)}{1 + s} - D_2'\frac{(1 + r_D')}{1 + s}\right]$$
$$- 1/2\left[P + G - D_2\frac{(1 + r_D)}{1 + s}\right] - 1/2\left[P - G - D_2\frac{(1 + r_D)}{1 + s}\right]$$
$$+ D_2' \gtreqless P'. \quad (11)$$

(11) holds as an equality if $r_D = r_D' = s$, where r_D' is the rate of interest on the new bonds. Thus, in this case the coalition has efficient investment incentives. Further, note that while (11) assumes positive correlation of risk factors, the result holds regardless of whether the correlation is positive or negative.[8]

Once again, however, this is a mostly negative result, since the conditions assumed in deriving it are unlikely to hold in practice. It suggests that in most cases the coalition's incentives are *not* likely to be socially efficient. For example, suppose that the me-first rule still holds, but that bondholders are not always fully paid off when an unfavorable outcome occurs. More specifically, suppose that if no new investment occurs, then bondholders get less than full payoff under the unfavorable outcome or $P - G < D_2[(1 + r_D)/(1 + s)]$. But if new investment does occur, then we assume that $P' > G'$ and that all bondholders—old and new—are fully paid off. Then the fourth term of (11) drops out and (11) becomes $P + G > D_2(1 + r_D)/(1 + s)$. Thus, when debtholders come first, but are not always fully paid off, the bank-equity coalition may have an incentive to invest in projects which are inefficient from a social standpoint. There will be a tendency for too many new projects to be undertaken.

Now suppose that the me-first rule still holds, but that returns are insufficient to cover bond claims in the two unfavorable cases. In these cases, the coalition gets nothing. Then (11) becomes

$$1/2\left[P + P' + G + G' - D_2\frac{(1 + r_D)}{1 + s} - D_2'\frac{(1 + r_D)}{1 + s}\right]$$
$$- 1/2\left[P + G - D_2\frac{(1 + r_D)}{1 + s}\right] + D_2' \gtreqless P'. \quad (12)$$

If $s = r_D = r_D'$, then we get $G' + D_2' \gtreqless P'$. Since this inequality can go either

[8] Once again (11) holds as an equality as long as debtholders are indifferent among outcomes, i.e., they get the same expected payment, regardless of whether the new investment occurs (the indifference property). This payment can either be full payoff, $D_2(1 + r_D)$ or $D_2'(1 + r_D')$, or some other amount, K.

way, the coalition again has incentives to act inefficiently, but the direction of bias now depends on particular circumstances.

This case suggests several points of interest. First, the incentive of the coalition to invest in the new project now depends on the project's risk level. With high risk levels, i.e., G' large relative to P', then the coalition may have an incentive to invest in projects which are not socially worthwhile. With low risk levels, i.e., G' small relative to P', then the coalition may have an incentive not to invest in projects which are socially worthwhile. But the level of riskiness itself has no effect on the desirability of the project from a social standpoint.

Second, the coalition's incentives now depend on the correlation between the risk factors G and G'. If the old and new projects' risk factors are negatively correlated, rather than positively correlated as assumed above, then (12) becomes either $-G' + D_2' \gtreqless P'$, if $G > G'$, or $-2G + G' + D_2' \gtreqless P'$, if $G' > G$. (These two cases result from the possibility that earnings of either $P + P' - G + G'$ or $P + P' + G - G'$ might represent the "good" outcome.) In both cases the firm has a greater tendency to underinvest regardless of risk, but in the former, greater risk implies a tendency to underinvest rather than to overinvest.

Third, the type of financing chosen for the project has an effect on the coalition's incentive to invest. As more funds are raised via a new bond issue, the project becomes more desirable to the coalition. Since financing considerations do not affect the project's economic efficiency, the tendency to overinvest increases as more funds are raised from bonds.

Thus we see that the coalition's incentive to under- or overinvest depends on (1) the relation between the returns of the new project and those of the firm's existing investments, (2) the riskiness of the project itself, and (3) the type of financing chosen. New investment projects will tend, therefore, to be more or less attractive to particular firms depending on the characteristics of their current investments, even though the social efficiency of projects is the same regardless of what firm undertakes them. Also, risky investment projects will tend to be more, rather than less, attractive to particular firms depending on the characteristics of their current investments, even though the social efficiency of any arbitrary project is the same regardless of what firm undertakes it. Also, risky investment projects will tend to be more, rather than less, attractive to a firm as long as the new project has returns that are positively correlated with the firm's old investments. Thus, the variance of returns on a project and the covariance of returns on new and old projects within a firm, rather than just the covariance of returns with those of the market, are important in determining investment behavior when bankruptcy is a possibility.

Fourth, suppose under the APR the bank has priority over bondholders for some fixed amount, B_1. Then in most cases the results are the same as in the case described by (13). Note that the coalition gets the same return if the unfavorable outcome occurs, regardless of whether new investment is undertaken. The coalition gets 0 if returns are zero or negative, then it gets all the returns up to B_1, then it gets nothing extra if the returns are between B_1 and $B_1 + D_2(1 + r_D)/(1 + s) + D_2'(1 + r_D')/(1 + s)$. If returns exceed the latter amount, then the coalition gets the rest up to the total available, given the unfavorable outcome. Only in the upper reaches of the distribution can the returns differ in the two cases. Therefore, the terms in the two unfavorable cases cancel out and the outcome is generally the same as in (13).

Fifth, if the interest rate on either set of bonds is lower than the current discount rate, r_D or $r_D' < s$, then the bank has an incentive to overinvest, i.e., to invest in projects which are not socially efficient.

Sixth, Myers (1977) has recently proposed a theory of firm investment behavior which predicts that firms will use lower debt-to-equity ratios in financing "growth opportunities" than in financing replacement investment. While our model is quite different from Myers', it is interesting to compare their results. Suppose a growth investment tends to have a higher level of risk, G', relative to costs, T', than a nongrowth investment. Also suppose the pattern of returns is as described in (12). Then we can establish a relation between the riskiness of the investment project and the debt-equity ratio, such that the firm's private investment incentives are socially efficient. Suppose e measures the fraction of the cost of the firm's investments financed by debt, assumed to be the same for old and new projects. Thus $D_2 = eT$ and $D_2' = eT'$. Then writing (12) as an equality and substituting, we find that if $r_D = r_D' = s$, then

$$\frac{\partial e}{\partial G'} = -\frac{1}{T'} < 0. \tag{13}$$

Thus, our model suggests that if firms have socially efficient investment incentives, they will tend to finance riskier investment projects with a lower component of bond debt relative to equity and, in our model, bank loans from the coalition bank. Thus, our results are similar to those of Myers. While we have made very specific assumptions in deriving this result, it remains unchanged if the risk factors G and G' are negatively, rather than positively, correlated (where $G' > G$) or if the firm's debt ratio for the new investment is allowed to differ from its debt ratio for its existing investments. The result is also unchanged if the firm has no bankruptcy risk in the absence of the new ("growth") investment, but does go bankrupt if the new investment has an unfavorable outcome in period 2.

Finally, it is interesting to examine the effect of "proportionate growth" by a firm on the efficiency of its investment incentives. Under proportionate growth the firm increases in size, while not changing the proportion of debt in its financial structure nor the relative riskiness of its investments. Suppose e again measures the proportion of debt used by the firm and f measures relative risk, where $f = G/P = G'/P'$. We assume that G and G' are positively correlated and that the firm is liquidated under both unfavorable outcomes with no payoff to the coalition. Then, substituting into (12), we find that the firm has an incentive to over- or underinvest, depending on the direction of the inequality,

$$(f - 1)P' + eT' \gtrless 0. \tag{14}$$

Thus, firms with more debt in their financial structure will tend to overinvest as they grow proportionately, as will firms with riskier investments. Less debt and less risky investments will cause a tendency to underinvest. Therefore, no simple growth pattern seems consistently to cause firms to have efficient investment incentives.

Our results thus far have been mostly negative: we showed that only under a very stringent and unrealistic set of conditions would the APR or the me-first rule cause parties to have efficient incentives in deciding whether to continue failing firms and whether to invest in new projects. These rules only lead to

efficient results when assumptions are made which in essence insulate bondholders completely from the effects of bankruptcy. When the effects of bankruptcy are brought back into the model, neither rule leads to efficient results in either the *ex post* or the *ex ante* context.

4. Proportionate priority rules

■ In previous sections we explored the conditions under which absolute priority rules, including the me-first rule, would achieve both *ex post* and *ex ante* efficiency. In situations where the APR did not lead to efficient results, we established what factors would affect the incentives of the coalition to over- or underinvest in new projects or to continue or liquidate the wrong firms. In this section we examine situations in which the APR breaks down because two or more creditors have the same priority. The priority rule which commonly operates when the amount available to pay a class of creditors is less than the total amount of their claims is the proportionate priority rule or PPR. It calls for paying all creditors the same proportion of the face value of claims.

In our model the PPR might come into play because the bank and the bondholders both are unsecured creditors or because one party was originally secured, but its security was disallowed during bankruptcy proceedings. Alternatively, one party could be partially secured, in which case it becomes an unsecured creditor for the difference between the value of its claims and the value of the security.

First, we address the question of whether the PPR leads to incentives for *ex post* efficiency. Under the PPR, B_b and D_c become

$$B_b = \frac{B_1}{B_1 + D_1 + R_1 + D_2 \dfrac{(1 + r_D)}{1 + s}} [C + L]$$

and

$$D_c = D_1 + R_1 + 1/2\left[D_2 \frac{(1 + r_D)}{1 + s}\right] + 1/2\left[(P - G) \frac{D_2(1 + r_D)}{B_2(1 + s) + D_2(1 + r)}\right]. \quad (14)$$

In (14), B_2 is the amount of the loan extended by the bank in period 1 to cover current period claims and to enable the firm to continue; thus $B_2 = D_1 + R_1 + B_1 - C$. The interest rate on the bank's loan is assumed to be s. Substituting (14) into the condition for *ex post* efficiency, $L = D_c + B_b$, we find that the PPR leads to socially inefficient incentives to continue or to liquidate failing firms depending on the sign of the inequality:

$$D_1 + R_1 + 1/2\left[D_2 \frac{(1 + r_D)}{(1 + s)}\right] + 1/2\left[(P - G) \frac{D_2(1 + r_D)}{D_2(1 + r_D) + B_2(1 + s)}\right] + \frac{B_1}{B_1 + D_1 + R_1 + D_2 \dfrac{(1 + r_D)}{1 + s}} [C + L] \gtreqless L. \quad (15)$$

Socially efficient incentives are achieved under the PPR only in the special case where (15) holds as an equality.

Bulow and Shoven (1978) have discussed the nature of the incentive structure facing the bank-equity coalition under the PPR in the *ex post* case. Essentially, the coalition is more likely to gamble on continuance when the amount of the new loan it must make to the firm, B_2, is small and when the riskiness of the firm's future return, G, is large. Greater risk is attractive to the coalition, since the riskier the firm's future earnings, the more that can be transferred away from bondholders to the coalition.

Turning to *ex ante* efficiency considerations, the PPR leads to socially inefficient incentives to over- or underinvest in new projects, depending on the direction of the inequality:

$$1/2\left[P + P' + G + G' - D_2\frac{(1+r_D)}{1+s} - D_2'\frac{(1+r_D')}{1+s}\right]$$
$$+ 1/2\left[(P + P' - G - G')\frac{B_2'(1+s)}{B_2'(1+s) + D_2(1+r_D) + D_2'(1+r_D)}\right]$$
$$- 1/2\left[P + G - D_2\frac{(1+r_D)}{1+s}\right] - 1/2\left[(P-G)\frac{B_2(1+s)}{B_2(1+s) + D_2(1+r_D)}\right]$$
$$+ D' \gtrless P'. \quad (16)$$

In (16) the coalition's share under liquidation is $B_2(1+s)/[B_2(1+s) + D_2(1+r_D)]$ if no new investment is undertaken, but is $B_2'(1+s)/[B_2'(1+s) + D_2(1+r_D) + D_2'(1+r_D')]$ if the new investment project does occur. $B_2' = B_2 + T - D_2'$ is the amount of the new bank loan if the new project is undertaken and if part of its cost is met via a new bond issue D_2'.[9] Only in the special case when (16) holds as an equality does the PPR lead to socially efficient investment incentives. Note that (16) is derived by assuming positive correlation between the risk factors G and G'. If, however, the returns are negatively correlated, then the sign of either G or G' in the first term of (16) becomes negative. Which term becomes negative depends on the direction of the inequality $G' \gtrless G$.

Under the PPR, the coalition has a greater incentive to invest in projects which are not worthwhile from a social viewpoint as the riskiness of the return on the new project increases, assuming that G and G' are positively correlated. Also greater debt financing of the new project increases the coalition's incentive to overinvest, since it shifts some of the costs to bondholders. Greater reliance on bank financing has the opposite effect. But changes in these factors affect only the private attractiveness of the project, not its economic efficiency.

Thus we have shown that the PPR, the rule commonly used to allocate assets in liquidation among creditors in the same priority class, does not lead to incentives for *ex post* or *ex ante* efficiency except in special cases. This is an important result, since situations requiring the use of a share rule arise frequently in reality.

5. Conclusion

■ In this paper we analyze the efficiency effects of alternative priority rules in bankruptcy. Our double efficiency criterion requires (1) that the controlling

[9] If part of the project's costs is covered by a new stock issue, then (16) is unchanged if B_2' is assumed to equal the total of the new bank loan and the new stock issue.

bank-equity holders' coalition have private incentives to liquidate or to continue firms only when it is socially efficient for them to be liquidated or to be continued (*ex post* efficiency) and (2) that the coalition have private incentives only to invest in new projects that are socially efficient (*ex ante* efficiency). We applied the model to both the absolute and proportionate priority rules—the conventional legal rules—and to the me-first rule suggested by economists.

Our strongest result is that the APR, the PPR, and the me-first rules are not efficient by either criterion, except under very strong assumptions: bondholders must be paid the same amount, regardless of whether the firm continues or is liquidated (the indifference property) and all interest rates on bonds, both new and old, must be the same as the current discount rate. Since bondholders have a claim under continuance equal to the face value of the amount owed them in the current period, the former condition suggests that the APR and the me-first rule are only efficient if bondholders receive full payoff under both liquidation and continuance. This, however, implies that the two rules are only efficient if we assume away the risk of bankruptcy. We also investigated the conditions under which the various priority rules would lead to socially excessive rates of continuance or liquidation of failing firms and when they would lead firms to overinvest in new projects which are excessively risky from a social standpoint. We found the correlation of returns from new projects with those of the firm's existing investments and the level of debt finance of the new project to be important variables affecting the social efficiency of private investment incentives.

From a public policy standpoint, our results are rather mixed. On the one hand, we have shown that the conventional priority rules in bankruptcy do not lead to private investment incentives which are socially efficient. But on the other hand, our analysis does not suggest any simple alternative approach which would have better results.[10] In fact, the major public policy issue in the bankruptcy arena is not the priority rules in liquidation themselves, but the existence of an alternative procedure—that of reorganization in bankruptcy—which presents much greater possibilities for coalitions of management, equity holders, and large lenders to gain at the expense of bondholders and other lenders. Under reorganization the firm continues operating, usually under the same management, but a plan is formulated to cut back its debt obligations. The priority rule in reorganization is that creditors must receive the same amount as they would in a liquidation, but no more (see White, 1980). Thus, in theory the APR carries over from liquidation to reorganization, but in practice the courts judge reorganization plans with a strong bias in favor of "feasibility," i.e., keeping the failing firm going, over "fairness," the courts' somewhat ironic term for the APR. Since creditors can be forced to accept a reorganization plan they do not consent to, reorganization presents wider scope for circumventing fixed obligations than does liquidation. The coalition may therefore have an incentive to keep failing firms operating under a reorganization plan, because this option presents the greatest possibilities for redistribution away from bondholders and other long-term creditors toward equity, manage-

[10] Another alternative approach would be to set the coalition's share of the firm's assets in liquidation optimally, i.e., so that the coalition has an incentive to make socially efficient decisions. Experiments with such an approach suggest that it would be difficult to administer, however, because the payments to particular parties often tend to be greater than the value of the firm's assets in total. Thus, government intervention to administer a bankruptcy tax/subsidy program would be required.

ment, and bank creditors, rather than because continued operation is the best use of firms' assets. Reorganization, therefore, presents additional public policy problems, since any tightening up of liquidation procedures could lead firms to shift toward reorganization and *vice versa*. Improvements in one set of procedures but not in the other could lead to yet more inefficient decisions' being made and yet greater welfare losses to society.

Thus, while we have shown that the APR and the PPR do not lead to incentives for economically efficient decisionmaking by failing firms, the public policy implications of these results are complicated and require consideration of private incentives for reorganization as well. While a detailed consideration of reorganization is beyond the scope of this paper, our brief discussion suggests that the major public policy implications may point toward a tightening up of loopholes around the APR and the PPR, rather than a radical restructuring of the rules themselves.

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