DOES CHAPTER 11 SAVE ECONOMICALLY INEFFICIENT FIRMS?

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I. INTRODUCTION

The United States has two separate bankruptcy procedures: Chapter 7 of the Bankruptcy Code is a procedure for liquidating failing firms, while Chapter 11 is a procedure for reorganizing failing firms. From an economic standpoint, the justification for having two separate bankruptcy procedures is that there are two different types of firms in bankruptcy: those that are economically inefficient in the sense that their resources would be more valuable in some alternate use, and those that are economically efficient despite their financial distress since their resources have no higher value use. Economically inefficient failing firms should be liquidated, freeing their resources to be allocated to higher value uses, while economically efficient but failing firms should be saved. However, in practice it is difficult to identify which firms fall into which category. As a result, U.S. bankruptcy procedures may operate with error: Type I error occurs if economically inefficient firms are saved in Chapter 11, while Type II error occurs if economically efficient firms are shut down under Chapter 7.[1] Two recent surveys of small and medium-size firms in Chapter 11 find that only one-sixth to one-quarter succeed in adopting a reorganization plan and remain in operation.[2] And two surveys of large

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1. See Michelle J. White, *Corporate Bankruptcy as a Filtering Device: Chapter 11 Reorganizations and Out-of-Court Debt Restructurings*, 10 J.L. ECON. & ORGANIZATION (forthcoming 1994) [hereinafter White, *Corporate Bankruptcy*], for a discussion of the characteristics of efficient versus inefficient firms. *See also* Michelle J. White, *The Costs of Corporate Bankruptcy: A U.S.-European Comparison*, *in* BANKRUPTCY: ECONOMIC AND LEGAL PERSPECTIVES (Jagdeep S. Bhandari ed., forthcoming 1995) [hereinafter White, *Comparison*] (discussing the costs of type I and type II error in bankruptcy).

2. *See* Susan Jensen-Cocklin, *Do Confirmed Chapter 11 Plans Consummate? The Results of a Study and Analysis of the Law*, 97 COM. L.J. 297 (1992); Edward Flynn, Statistical Analysis of Chapter 11 (Admin. Office of the U.S. Courts, unpublished study, 1989).

public firms in Chapter 11 find that, although these firms are very likely to adopt reorganization plans, about one-third of them either file under Chapter 11 a second time or undergo a private restructuring within a few years after emerging from Chapter 11.[3] This suggests that Type I bankruptcy error in particular is an important problem: many of the firms that file under Chapter 11 may fail to reorganize, or may reorganize but continue to experience financial difficulties, because they are economically inefficient and should not have been in Chapter 11 in the first place.

This paper presents a game theoretic model that explains why Type I error may occur in bankruptcy.[4] In the model, there are two types of failing firms: efficient and inefficient. Managers are assumed to know whether their firms are efficient or inefficient, but creditors and bankruptcy court officials are assumed not to possess this knowledge. Managers of failing firms are assumed to choose between filing for bankruptcy under Chapter 7 or filing under Chapter 11. Two types of equilibria may occur. The first is the ideal outcome in bankruptcy: all efficient but failing firms file under Chapter 11 and all inefficient failing firms file under Chapter 7. This equilibrium is referred to as a "perfect filtering" equilibrium, since the bankruptcy system acts as a perfect filter in distinguishing between the two types of failing firms even though creditors and other outsiders cannot tell them apart.

Under the second type of equilibrium, all efficient failing firms file under Chapter 11, but some or all of the inefficient failing firms also file under Chapter 11. This type of outcome is referred to as a "filtering failure" equilibrium since the bankruptcy system fails to distinguish between inefficient and efficient failing firms. As a result, some or all inefficient firms succeed in reorganizing in bankruptcy, which wastes resources by retaining assets in inefficient uses. Filtering failure may occur because managers of efficient firms benefit from making their firms appear less efficient than they actually are *and* because managers of inefficient firms benefit from making their firms appear more efficient than they actually are. Efficient firms benefit from appearing to be less efficient since this allows them to pay less to creditors under the reorganization plan; inefficient firms benefit from appearing to be more efficient since this allows them to obtain the benefits of reorganizing. Thus, the model

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3. *See* Edith S. Hotchkiss, *The Post-Bankruptcy Performance of Firms Emerging from Chapter 11*, 50 J. FIN. (forthcoming 1995); Lynn M. LoPucki & William C. Whitford, *Patterns in the Bankruptcy Reorganization of Large, Publicly Held Companies*, 78 CORNELL L. REV. 597 (1993).

4. The model does not allow for Type II error—i.e., efficient firms liquidating in bankruptcy.

suggests an explanation for why Chapter 11 works badly and why firms that file under it often fail in their attempts to reorganize: many of these firms are economically inefficient and should liquidate.

Part II describes the model and illustrates it with an example. Part III presents a simulation of the model which explores whether filtering failure is likely to be a problem in practice. Using values taken from recent empirical research on bankruptcy, the simulation suggests that filtering failure is likely to occur. Part IV concludes.[5]

II. THE MODEL

The model is shown in Figure 1. At the top, a chance event determines whether failing firms are efficient or inefficient, where all firms of each type are assumed to be identical. The proportion of failing firms that are economically efficient is 0.4 and the proportion that are economically inefficient is 0.6. The top left node shows the choice faced by managers of efficient firms. I assume that they always file under Chapter 11 rather than Chapter 7, because under Chapter 11 they remain in control of a potentially viable firm, while under Chapter 7 the firm is liquidated and they lose their jobs.

Once in Chapter 11, managers of efficient firms are assumed to choose between offering reorganization plans which involve paying either a high or a low amount to creditors. Under the high payment reorganization plan, creditors receive an amount which they would be willing to accept in bargaining over a Chapter 11 reorganization plan if they knew that the firm was economically efficient. Under the low payment reorganization plan, creditors receive less. The top right node shows the choice faced by managers of inefficient firms. One possibility is that they file under Chapter 11 and offer a reorganization plan that pays creditors the same low

5. There are several other papers that use the assumption of imperfect information to explore aspects of the bankruptcy process, but they focus on other questions. Ronald M. Giammarino, in *The Resolution of Financial Distress*, 2 REV. FIN. STUD. 25 (1989), examines why firms rationally may choose to incur high bankruptcy costs, and Robert Gertner and Randal C. Picker, in Bankruptcy and the Allocation of Control (University of Chicago Working Paper, 1992) (on file with author), examine the efficiency of investment incentives by managers of firms in bankruptcy. There are also several game theory models of bankruptcy which focus on how the value of the firm in reorganization is divided between managers and creditors. *See* David T. Brown, *Claimholder Incentive Conflicts in Reorganization: The Role of Bankruptcy Law*, 2 REV. FIN. STUD. 109 (1989); Lucian A. Bebchuk & Howard Chang, *Bargaining and the Division of Value in Corporate Reorganization*, 8 J.L. ECON. & ORGANIZATION 253 (1992); Alan Schwartz, *Bankruptcy Workouts and Debt Contracts*, 36 J.L. & ECON. 595 (1992).

payment amount offered by managers of efficient firms. Alternately, managers may avoid bankruptcy as long as possible, use up the firm's assets, and file eventually to liquidate under Chapter 7. A third possibility (not shown in Figure 1) is that managers of inefficient firms file under Chapter 11 and offer a reorganization plan that pays creditors the same high payment amount that managers of efficient firms offer. I assume that this alternative is never chosen because the high payment amount is high enough to make managers of inefficient firms prefer to avoid bankruptcy as long as possible and eventually liquidate under Chapter 7.

An Example of Filtering Failure in Bankruptcy

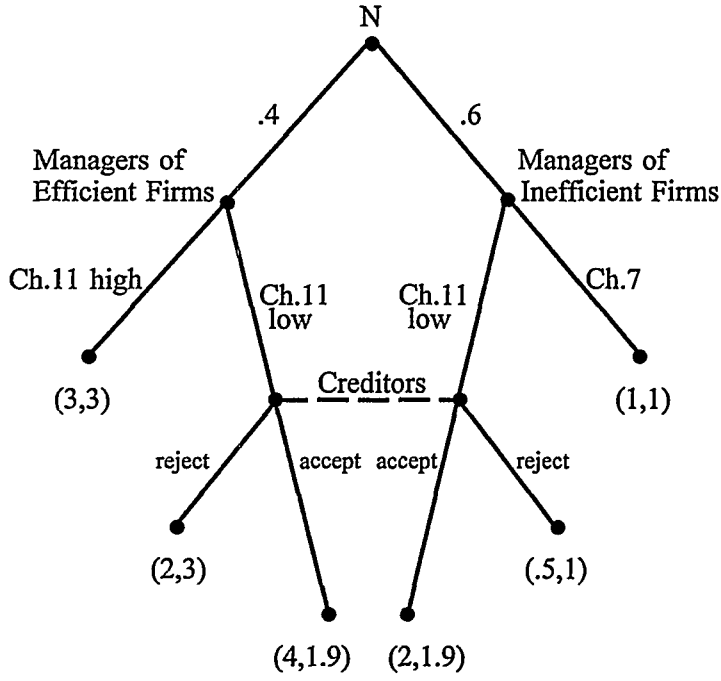

Figure 1

Creditors are all assumed to be identical. They know the characteristics of both efficient and inefficient failing firms and the overall probability that

failing firms are efficient, but they cannot determine whether individual firms are efficient or inefficient. Now suppose that managers offer high payment reorganization plans. Since only managers of efficient firms offer high payment plans, creditors learn that any firm offering a high payment plan is efficient. And since creditors were assumed willing to accept the high payment amount if they knew that the firm making the offer was efficient, they always accept these plans.

Now assume that managers offer low payment reorganization plans. Then creditors must decide whether to accept or reject without knowing whether the firm is efficient or inefficient. Their decision is shown by the two central nodes in Figure 1 which are connected by a dashed line. If creditors accept low payment plans, then the plans go into effect and the game ends. If creditors reject low payment plans, then I assume that a trustee is appointed, managers are displaced, and firms are offered for sale on the open market.

The process of selling firms on the open market is assumed to reveal individual firms' types. If a firm is inefficient, then it sells for a low price and the proceeds, net of transactions costs, are paid to creditors. If a firm is efficient, then either it may be sold or a creditor may offer a second reorganization plan which is accepted. In either case, creditors receive a higher amount. Finally, if managers of inefficient firms file under Chapter 7, then creditors learn that the firm is inefficient, but they have no decision to make.

Figure 1 shows the payoffs to managers and creditors, respectively, in parentheses at each terminal node in the game. Consider managers of efficient firms first. They receive 3 with certainty if they offer high payment plans, but they gamble if they offer low payment plans since they receive 4 if creditors accept but only 2 if creditors reject. Therefore, the best outcome for managers of efficient firms is to offer low payment plans which creditors accept; their worst outcome is to offer low payment plans which creditors reject; and their intermediate outcome is to offer high payment plans (which creditors always accept). If managers offer either low or high payment plans and creditors accept, then managers are assumed to remain in control of their firms. But if managers offer low payment plans and creditors reject, then managers are displaced.

Now consider managers of inefficient firms. They receive 1 with certainty if they choose Chapter 7, but they gamble if they offer low payment plans, since they receive 2 if creditors accept but only 0.5 if creditors reject. These figures imply that the best outcome for managers of inefficient firms is to offer low payment Chapter 11 plans which

creditors accept; their worst outcome is to offer low payment plans which creditors reject; and their intermediate outcome is to avoid filing for bankruptcy as long as possible and to file eventually under Chapter 7. Filing under Chapter 11 and offering a low payment plan which creditors accept is good for managers, because they benefit from debt forgiveness and other subsidies in Chapter 11 and they remain, at least temporarily, in control of the firm. (Since the firm is inefficient, it is likely to fail eventually despite benefitting from Chapter 11.) Managers' intermediate outcome is to remain outside of bankruptcy and file eventually under Chapter 7, because they remain in control of the firm even though it does not receive the benefits of Chapter 11. Offering a low payment plan in Chapter 11 that creditors reject is the worst outcome for managers because they are displaced as soon as the plan is rejected.[6]

Finally, consider the position of creditors. If managers of inefficient firms liquidate under Chapter 7, then creditors' payoff is 1. If managers of efficient firms offer high payment plans, then creditors receive 3—the high payment amount. If managers offer low payment plans, then creditors receive a sure payoff of 1.9—the low payment amount—if they accept. But creditors gamble if they reject the plans, since they receive 3 if the firm turns out to be efficient but only 1 if the firm turns out to be inefficient. When creditors are offered a low payment plan, their best outcome occurs if they reject the plan and the firm turns out to be efficient; their worst outcome occurs if they reject the plan and the firm turns out to be inefficient. This follows from the assumption that when creditors reject low payment plans, managers are displaced, and firms are offered for sale on the open market. Through this process, individual firms' types are revealed. Since efficient firms' assets are more valuable than inefficient firms' assets, creditors receive more when their firms turn out to be efficient. Creditors' intermediate outcome occurs if they accept low payment plans, which will occur only if the low payment amount is between 1 and 3.[7] The low payment amount must be greater than 1 or else creditors would never accept low payment plans, and must be less than

6. Arguably, managers of inefficient firms are better off filing under Chapter 11 than remaining outside of bankruptcy and filing eventually under Chapter 7, even if their reorganization plans are rejected by creditors. The argument is that managers can delay offering their reorganization plans by obtaining extensions of the exclusivity period from the bankruptcy judge. Consequently, they can remain in control of the firm longer by filing under Chapter 11 than by avoiding bankruptcy as long as possible. If this were true, then filtering failure would always occur in bankruptcy.

7. Although the low payment amount is set equal to 1.9 in the example, it is endogenously determined by the model discussed below.

3 or else creditors would never reject low payment plans.

Now turn to the solution of the model. Consider creditors' decision when managers offer low payment reorganization plans. Since the probability that failing firms are efficient equals 0.4, creditors' expected return if they reject low payment plans is 0.4(3) + 0.6(1), or 1.8.[8] Creditors therefore prefer to accept low payment plans, since their sure payoff if they accept, 1.9, exceeds their expected return if they reject. However, because creditors always accept low payment plans, managers always offer them. Managers of inefficient firms receive a payoff of 2 if they offer low payment plans and creditors accept, compared to a payoff of only 1 if they file under Chapter 7. Managers of efficient firms receive a payoff of 4 if they offer low payment plans and creditors accept, compared to a payoff of only 3 if they offer high payment plans. Therefore, if creditors always accept low payment Chapter 11 plans, then all managers of failing firms file under Chapter 11 and offer these plans.

This type of equilibrium is called a pooling equilibrium because the result of the game is that the firms' type is not revealed. In the bankruptcy context, I refer to this type of equilibrium as a filtering failure equilibrium. It is economically inefficient since all inefficient failing firms file under Chapter 11 and successfully reorganize, when they should liquidate under Chapter 7. The equilibrium occurs because managers of both types of failing firm benefit when creditors cannot distinguish between them: managers of efficient firms benefit because creditors accept a lower payment in reorganization than they would be willing to accept if they knew that the firm were efficient, and managers of inefficient firms benefit because they are able to reorganize rather than being forced to liquidate.[9]

However, if we change the example in Figure 1 slightly, then a different type of equilibrium occurs. Suppose the probability that failing firms are efficient rises from 0.4 to 0.6. Now creditors' expected return if they reject low payment plans is 0.6(3) + 0.4(1), or 2.2. Since this is greater than their payoff of 1.9 if they accept low payment plans, they always reject. Therefore, it is never in managers' interest to offer these plans. Managers of inefficient firms receive a payoff of 1 if they file under Chapter 7, compared to a payoff of only 0.5 if they offer low payment plans under Chapter 11 which creditors reject. Managers of efficient firms receive a

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8. All parties are assumed to be risk neutral.

9. A pooling equilibrium occurs in the example as long as the low payment amount takes a value greater than 1.8 and less than 2. See *infra* note 15 for the derivation of the condition that the low payment amount must be less than 2.

payoff of 3 if they offer a high payment plan under Chapter 11, compared to a payoff of only 2 if they offer a low payment plan under Chapter 11 which creditors reject. Therefore, all managers of efficient failing firms offer high payment plans under Chapter 11 and all managers of inefficient failing firms file under Chapter 7. This type of equilibrium is called a separating equilibrium, because the result of the game is that managers of the two types of firms choose different strategies and, therefore, reveal their firms' type. In the bankruptcy context, I refer to this type of equilibrium as a perfect filtering equilibrium. This type of equilibrium is the best that can occur in bankruptcy, since all inefficient failing firms liquidate under Chapter 7 while all efficient failing firms file under Chapter 11 and have the opportunity to be saved.[10]

Actually, the model has other equilibria which lie somewhere between the perfect filtering and filtering failure equilibria. For example, suppose the probability that failing firms are efficient falls to 0.45. Then creditors would be indifferent between accepting and rejecting low payment plans since their expected return under both strategies is 1.9. Suppose they play mixed strategies, which means that they accept or reject randomly. One possibility is that creditors accept low payment plans with probability 0.6. Then managers of efficient firms get 3 if they offer high payment plans, compared to an expected return of 0.6(4) + 0.4(2), or 3.2, if they offer low payment plans. Similarly, managers of inefficient firms get 1 if they choose Chapter 7, compared to an expected return of 0.6(2) + 0.4(0.5), or 1.4, if they offer low payment plans under Chapter 11. Thus, managers of both types of firms still offer only low payment plans under Chapter 11. In this case the equilibrium involves imperfect filtering since all failing firms file under Chapter 11 and offer low payment plans, but creditors reject 40% of these plans. Since the rejection of a reorganization plan leads to the firm's type being revealed, this means that 40% of inefficient firms liquidate and only 60% of inefficient firms successfully reorganize.

Other possible imperfect filtering equilibria involve managers of inefficient or efficient firms (or both) playing mixed strategies—i.e., randomly choosing between offering low payment plans under Chapter 11 or pursuing their other strategies—and creditors also playing mixed strategies. Imperfect filtering equilibria are intermediate in economic efficiency between filtering failure and perfect filtering. This is because

10. A pooling equilibrium cannot occur since the low payment amount must be greater than 2.2, but also must be less than 2. *See infra* note 15.

under imperfect filtering some inefficient failing firms liquidate, but others file under Chapter 11 and either succeed in reorganizing or fail to reorganize but delay shutting down until managers' plan is rejected.[11]

Although the model is fairly stylized, it incorporates many of the important features of U.S. bankruptcy law. The model captures the fact that managers of failing firms can choose to file under Chapter 11 and that they have the exclusive right to propose the first reorganization plan. It also captures managers' ability to control the flow of information concerning the firm during at least the initial period of reorganization. The assumption that information about the firm's type is revealed if managers' plan is rejected reflects the fact that firms in Chapter 11 are often offered for sale on the open market if a reorganization plan is not adopted. The model reflects the fact that managers have an incentive to delay offering Chapter 11 reorganization plans as long as possible, because delay reduces the payoff to creditors in Chapter 11 relative to Chapter 7 (see below). Also, the model incorporates the effects of the various subsidies that firms in reorganization receive from creditors and the government. Among the important features of Chapter 11 that are ignored here is the fact that creditors are diverse and are treated differently in reorganization depending on their priority and whether they are secured.

III. A SIMULATION

The next step is to simulate the model. To do so, it is necessary to move from examples involving specific payoffs to more general conditions that define when a particular type of equilibrium occurs. To keep the simulation simple, I focus on the (complete) filtering failure equilibrium in which all managers of both firm types offer low payment plans under Chapter 11 and creditors always accept these plans. The object of the simulation is to establish whether this equilibrium is likely to occur under real world conditions. If the conditions for filtering failure do not hold, then perfect filtering is likely to occur.[12]

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11. See White, *Corporate Bankruptcy*, *supra* note 1, for further discussion of the various equilibria in the model.

12. Since there are several imperfect filtering equilibria, failure to meet the conditions for the filtering failure equilibrium could imply that one of the imperfect filtering equilibria holds rather than the perfect filtering equilibrium. However, the conditions for the imperfect filtering equilibria are more specialized and less likely to hold than the conditions for either perfect filtering or filtering failure. Therefore, if filtering failure does not occur, then perfect filtering is likely to occur. See White, *Corporate Bankruptcy*, *supra* note 1, for further discussion.

A. Conditions for Filtering Failure

There are three conditions that are required for the filtering failure equilibrium to hold, one for each set of players. First, creditors must accept all low payment reorganization plans. Suppose the amount that creditors receive if they accept low payment plans is denoted P_L. Now consider what creditors receive if they reject low payment plans. In that case the firm is offered for sale as a going concern on the open market. If it turns out to be inefficient, then it is sold for an amount L. Transactions costs are C_l. (The subscript l indicates liquidation under Chapter 7.) Creditors receive the proceeds of sale net of costs, or $L - C_l$. Assume that $P_L > L - C_l$. If the firm turns out to be efficient, then either it may be sold as a going concern or a creditor may propose a second reorganization plan which is accepted. In either case, suppose creditors receive the same payoff that they would have received if managers had chosen to offer a high payment reorganization plan. This amount is denoted P_H, where $P_H > P_L$. Suppose the probability that failing firms are efficient is denoted γ. Creditors' expected return when they reject low payment reorganization plans is $\gamma P_H + (1 - \gamma)(L - C_l)$. For creditors to accept all low payment plans, they must receive more when they accept these plans than their expected return if they reject, or:

$$P_L > \gamma P_H + (1 - \gamma)(L - C_l) \quad (1)$$

The second condition needed for the filtering failure equilibrium to hold is that managers of efficient firms must always choose to offer low payment plans. Assuming that creditors always accept these plans, the cost to managers of offering low payment reorganization plans is P_L. Managers' alternative is to offer high payment plans with a cost to managers of P_H. Therefore, the condition for managers to offer low payment reorganization plans, assuming that creditors always accept, is:

$$P_L < P_H \quad (2)$$

The third condition necessary for the filtering failure equilibrium to hold is that managers of inefficient firms must always choose to offer low payment reorganization plans. Since managers know that creditors always accept these plans, this condition requires that managers be better off when they file under Chapter 11 and their low payment plans are accepted than when they remain out of bankruptcy as long as possible and file eventually under Chapter 7. Suppose inefficient firms' revenues from the time managers make their strategy decision until the firm closes down after

reorganizing in Chapter 11 are R_r. (The r subscript indicates reorganization under Chapter 11.) Also suppose inefficient firms' revenues from the time managers make their strategy decision until the firm closes down after remaining outside of bankruptcy are R_l. The magnitudes of R_r and R_l are affected by the length of time that inefficient failing firms continue to operate when they file under Chapter 11, or when they avoid Chapter 11. R_r is likely to be greater than R_l, since the subsidies to firms in Chapter 11 probably allow these firms to remain in operation longer. However, firms filing under Chapter 11 must pay transactions costs of C_r and they must pay creditors P_L under the reorganization plan. Thus, when inefficient failing firms offer low payment reorganization plans and creditors accept, the firms' net revenues are $R_r - C_r - P_L$.

Managers of inefficient firms that remain outside of bankruptcy may also make payments to certain creditors, although they probably do not pay most of their creditors. Those creditors that are paid presumably have collateral interests in assets of the firm that are necessary for its continued operation and would, if not paid, cause the firm to shut down prematurely. The amount of payments to creditors by firms remaining outside of bankruptcy and filing eventually under Chapter 7 is denoted E_l.[13] Therefore, the net revenues of inefficient firms when managers choose Chapter 7 are $R_l - E_l$. Suppose managers of inefficient firms choose their strategy to maximize the value of the firms' net revenues. Then the condition for managers to offer low payment reorganization plans, assuming that creditors always accept these plans, is:

$$R_r - C_r - P_L > R_l - E_l \qquad (3)$$

Expression (3) also shows that the longer managers delay before offering low payment reorganization plans, the more likely they are to offer these plans. Delaying offering a plan lowers the value of P_L relative to the other terms in (3), since P_L is paid only after managers offer and creditors accept these plans. Therefore, the longer managers can delay, the lower is P_L and the more likely that the inequality in (3) holds.[14]

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13. The value E_l includes payments to creditors made both before and after the firm files under Chapter 7, although data suggest that the latter are extremely small for firms filing under Chapter 7. *See* Michelle J. White, *Bankruptcy Liquidation and Reorganization, in* HANDBOOK OF MODERN FINANCE (Dennis Logue ed., 2d ed. 1990).

14. Different payments in the model occur at different times, so that to be precise, all payments should be defined in terms of their present value at a particular time. For example, C_r is paid when firms file under Chapter 11, E_l is paid before firms file under Chapter 7, and P_L is paid after a low payment reorganization plan has been adopted. Thus, the longer managers delay before offering a plan,

Another version of expression (3) is $(R_r - R_l) + (E_l - P_L) > C_r$. The quantity $(R_r - R_l)$ is the increase in the firm's future revenues when it files under Chapter 11 rather than under Chapter 7, including the effect of government subsidies to firms in Chapter 11. The quantity $(E_l - P_L)$ is the net subsidy from creditors to firms in Chapter 11, or the difference between the amount that inefficient firms pay creditors in Chapter 7 versus Chapter 11. The expression implies that in order for managers of inefficient firms to choose Chapter 11, either the increase in the firm's future revenues or the net subsidy from creditors—but not both—must be positive. The two terms together must be greater than the transaction costs of reorganizing, C_r.

If we solve inequalities (1), (2), and (3) for P_L and put them together, we get the following condition defining when the filtering failure equilibrium occurs:

$$\gamma P_H + (1 - \gamma)(L - C_l) < P_L < min[P_H, (R_r - R_l) - C_r + E_l] \qquad (4)$$

Suppose we treat all the variables here as being exogenously determined, except P_L. Then filtering failure occurs as long as $\gamma P_H + (1 - \gamma)(L - C_l) < min[P_H, (R_r - R_l) - C_r + E_l]$, so that some range of values of P_L exists which satisfies the conditions in (4).[15]

Now suppose we divide all of the dollar values in (4) by the firm's total liabilities to creditors. The resulting variables are denoted with asterisks. Inequality (4) then becomes:

$$\gamma P_H^* + (1 - \gamma)(L - C_l)^* < P_L^* < min[P_H^*, (R_r - R_l)^* - C_r^* + E_l^*] \qquad (5)$$

I follow the procedure of adopting values for all of the variables in (5) except P_L^*. I then examine whether filtering failure occurs at the assumed parameter values, i.e., whether there is some range of values of P_L^* for which (5) is satisfied. Then to check for sensitivity of the results to particular assumptions, I vary each parameter value individually to determine whether the filtering failure equilibrium still holds.

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the more P_L decreases in present value relative to the other terms in (3).

Note also that while there is a transactions cost of liquidating, C_l, it does not affect the strategy of managers of inefficient firms since it is not paid until after managers are displaced.

15. Since managers of inefficient firms were assumed always to prefer filing under Chapter 7 over offering high payment plans under Chapter 11, it must be the case that $R_r - C_r - P_H < R_l - E_l$, or $P_H > (R_r - C_r) - (R_l - E_l)$. In the example in Figure 1, $P_H = 3$, $R_l - E_l = 1$, and $R_r - C_r - P_L = 2$. Substituting these values into the inequality, we find that $P_L < 2$. Thus, the pooling equilibrium in the example occurs as long as $1.8 < P_L < 2$.

B. *Base Case Values*

Values must be adopted for P_H^*, $(L - C_l)^*$, $(R_r - R_l)^*$, C_r^*, E_l^*, and γ. Since the characteristics of small versus large firms in bankruptcy are quite different, I adopt separate values for each.

Consider first the transaction costs of filing under Chapter 11 as a proportion of total liabilities, C_r^*. Several studies have found it to be around 0.03.[16] I use this value for both large and small firms. P_H^* is the high payment rate to creditors of firms in reorganization and is also assumed to equal the amount that creditors receive if they reject a low payment plan and the firm is revealed to be efficient. To establish a ballpark value of P_H^*, I divide Weiss' sample of large firms that filed under Chapter 11[17] into upper and lower halves based on their payoff rates to unsecured creditors.[18] The mean payoff rate for firms in the top half of the sample is about 0.80. For small firms, I follow the same procedure using LoPucki's sample of small firms that filed under Chapter 11[19] and obtain a figure for the upper half of approximately 0.40. I therefore use 0.80 and 0.40 as the base case values of P_H^* for large and small firms, respectively.

Turn now to the value of $(L - C_l)^*$, the amount paid to creditors if a firm in reorganization is liquidated after creditors reject managers' reorganization plan. In White's sample of small firms in bankruptcy, a number of firms filed under Chapter 11 but did not adopt reorganization plans and were sold as going concerns while remaining in Chapter 11. The average payoff rate to creditors of these firms was 0.13.[20] Since large firms are rarely observed to liquidate, little data is available for them. I therefore assume that $(L - C_l)^*$ equals 0.13 for both large and small firms.[21]

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16. See Karen H. Wruck, *Financial Distress, Reorganization and Organizational Efficiency*, 27 J. FIN. ECON. 419 (1990), for a survey of the evidence.

17. Lawrence A. Weiss, *Bankruptcy Resolution: Direct Costs and Violation of Priority of Claims*, 27 J. FIN. ECON. 285 (1990).

18. *Id.* at 295.

19. *See* Lynn M. LoPucki, *The Debtor in Full Control: Systems Failure Under Chapter 11 of the Bankruptcy Code?*, 57 AM. BANKR. L.J. 99, 99-126, 247-73 (1983). The top half of firms in LoPucki's sample all promised payment rates of 100%, but without interest and with payout periods of up to 14 years. *Id.* at 125. To take account of both risk and high nominal interest rates during his sample period (the early 1980s), I discounted the promised payments using a discount rate of 0.20.

20. White, *supra* note 13, at 37-41.

21. A recent example of a large firm that filed under Chapter 11 but eventually liquidated is Eastern Airlines, which paid nothing to unsecured creditors. *See* Lawrence A. Weiss, Restructuring Complications in Bankruptcy, The Eastern Airlines Bankruptcy Case (1992) (unpublished manuscript,

Consider next the difference between the revenues of inefficient firms that reorganize, rather than liquidate, as a proportion of total liabilities, or $(R_r - R_l)^*$. This difference includes both government subsidies to firms that file under Chapter 11 and increases in the revenues of inefficient firms that file under Chapter 11 since they remain in operation longer. Turn first to government subsidies. They have two main components. First, failing firms may transfer their pension plans to the Pension Benefit Guaranty Corporation (PBGC), a government agency. The right to do so constitutes a subsidy since these plans are often underfunded.[22] Second, firms in Chapter 11 also receive various tax benefits, including (subject to a number of conditions) the right to keep their accumulated net operating loss (NOL) carryforwards and investment tax credit (ITC) carryforwards, and to avoid liability for taxes on cancellation of indebtedness under the reorganization plan.[23] The value of these subsidies depends on the likelihood that firms will make profits in the future.

To investigate the importance of these subsidies, I obtained data from Compustat on unfunded vested pension liabilities, NOL carryforwards, ITC carryforwards, and total liabilities for 943 public firms that filed for bankruptcy between 1980 and 1990. Since data for many firms is not reported or is misleading during the period close to the firm's bankruptcy filing, I obtained data for each firm for the year of bankruptcy and the four years prior to filing. Consider unfunded vested pension liabilities first. Only 75 firms, or 8%, reported positive unfunded vested pension liabilities in either the year of bankruptcy or any of the four prior years. (The others either reported having no unfunded vested pension liabilities or did not report at all.) For firms that reported these liabilities, I calculated the ratio of unfunded vested pension liabilities to total liabilities for each year for which nonzero values were reported. I then calculated an average figure, weighting each firm equally regardless of how frequently it reported data. The resulting average ratio of unfunded vested pension liabilities to total liabilities was 0.67. Thus, the proportion of bankrupt firms that benefit from transferring their pension plans to the PBGC is low, but a few firms

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on file with author).

22. Pension funds are also transferred to the PBGC when firms file under Chapter 7, but in that case managers do not benefit.

23. Firms that file under Chapter 7 lose these benefits completely. However, some of the tax benefits are available to firms that are in financial difficulty but have not filed for bankruptcy. *See* Stuart C. Gilson, Debt Reductions, Optimal Capital Structure, and Renegotiation of Claims During Financial Distress (1993) (unpublished manuscript, on file with the *Washington University Law Quarterly*).

benefit enormously. The expected benefit per firm in bankruptcy from transferring unfunded vested pension liabilities to the PBGC is (0.08)(0.67) = 0.05 as a proportion of total liabilities.[24]

Now consider NOL carryforwards. Firms that file for bankruptcy are much more likely to report NOL carryforwards than unfunded vested pension liabilities: about 70% of public firms in bankruptcy report positive NOL carryforwards. For firms that report positive NOL carryforwards, I calculated the ratio of NOL carryforwards to total liabilities for the year in which the firm filed for bankruptcy. The average ratio was 1.20. If these carryforwards were all used immediately, they would be worth (1.2)(0.34) or 41% of total liabilities, where 0.34 is the corporate profits tax rate. However, firms use their NOL carryforwards only after some delay and firms in Chapter 11 may never use them at all. Altschuler and Auerbach found that the average tax rate on firms making losses is 45% of the statutory tax rate.[25] Therefore, the expected value of the subsidy implied by firms in Chapter 11 retaining their NOL carryforwards is (0.70)(1.2)(0.34)(0.45), or 13% of total liabilities.[26] I also calculated the expected value of the subsidy implied by firms in Chapter 11 retaining their ITC carryforwards, but it turned out to be extremely small.[27]

These figures suggest that while government subsidies to firms in Chapter 11 are important for some firms, they are fairly unimportant for the average firm in bankruptcy. However, government subsidies are only one component of $(R_r - R_l)^*$, which also includes increased revenues from inefficient firms remaining in operation when they file under Chapter 11. Combining these, I therefore assume that the base case value of $(R_r - R_l)^*$ is 0.36 for large firms and 0.13 for small firms. The base case figure of 0.36 for large firms is about double the value of the two government subsidies together. The base case figure of 0.13 for small firms is assumed to equal just the average tax subsidy to firms in bankruptcy, since these

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24. The firm with the largest ratio of unfunded vested pension liabilities to total liabilities—52.2—was Mesta Machinery Company. Recent examples of firms that filed for bankruptcy and transferred large unfunded pension liabilities to the PBGC include Pan American World Airways and the LTV Corporation, with $900 million and $1.7 billion in unfunded pension liabilities, respectively. *See* Thomas C. Hayes, *LTV's Creditors Support Bankruptcy Exit*, N.Y. TIMES, Feb. 15, 1992, at 37, col. 3.

25. Rosanne Altschuler & Alan J. Auerbach, *The Significance of Tax Law Asymmetries: An Empirical Investigation*, 105 Q.J. ECON. 61, 70-75 (1990).

26. The firm with the largest ratio of NOL carryforwards to total liabilities was Century Oil and Gas, with a ratio of 48.0.

27. The average ratio of ITC carryforwards to total liabilities was .00005.

firms are not likely to have unvested pension liabilities and probably receive little gain in terms of remaining in operation longer.

There is virtually no data available to guide the choice of E_l^*, the amount that managers of inefficient firms pay creditors outside of bankruptcy as a proportion of total liabilities. I assume that creditors of large firms monitor more carefully and therefore receive more outside of bankruptcy. Thus, as a base case assumption, I assume that E_l^* equals 0.30 for large firms and E_l^* equals 0.12 for small firms.

For γ, the proportion of failing firms that are economically efficient, there is no direct evidence available due to the difficulty of observing whether failing firms are economically efficient or inefficient. However, several recent surveys of small firms in Chapter 11 suggest that about one-quarter of them adopt reorganization plans and emerge from Chapter 11.[28] Yet, many of the firms that emerge from Chapter 11 fail to make the payments to creditors that are specified under their plans.[29] I therefore assume that the base case value of γ is 0.17 for small firms. For large public firms, a much higher proportion of firms adopt reorganization plans, but the adoption of a plan by itself provides less evidence that the firm is economically efficient. (Adoption of a plan merely provides evidence that the firm has some valuable assets.) I assume that a higher proportion of large public firms that file under Chapter 11 are economically efficient, so that the base case value of γ equals 0.50.[30] The base case values for large and small firms are listed at the top of Tables 1 and 2.

C. Results

Many of these parameter values are obviously quite speculative and, therefore, the simulation should be interpreted as suggestive only. As further empirical research on bankrupt firms occurs, better data can be used to refine the analysis.

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28. LoPucki, *supra* note 19, at 100.

29. *Id.* at 126.

30. Evidence concerning small firms in bankruptcy comes from White, *supra* note 13; LoPucki, *supra* note 19; Flynn, *supra* note 2; and Jensen-Cocklin, *supra* note 2. For a summary of survey evidence concerning firms in bankruptcy, see Michelle J. White, *Survey Evidence on Business Bankruptcy*, *in* BANKRUPTCY: ECONOMIC AND LEGAL PERSPECTIVES (Jagdeep S. Bhandari ed., forthcoming 1995).

Table 1:
Simulation Results for Large Firms

Base case values for large firms:

$P_H^* = .8$, $(L - C_l)^* = .13$, $C_r^* = .03$, $E_l^* = .3$, $(R_r - R_l)^* = .36$, $\gamma = .50$

	Filtering failure	Range for P_L^*
Base case	yes	.47 - .63
$P_H^* > 1.13$	no	
$P_H^* = 1.0$	yes	.57 - .63
$P_H^* = .30$	yes	.22 - .63
$\gamma > .75$	no	
$\gamma = .75$	yes	.63
$\gamma = .10$	yes	.20 - .63
$\gamma = 0$	yes	.13 - .63
$(L - C_l)^* > .45$	no	
$(L - C_l)^* = .45$	yes	.63
$(L - C_l)^* = .25$	yes	.53 - .63
$(L - C_l)^* = 0$	yes	.40 - .63
$E_l^* + (R_r - R_l)^* = .90$	yes	.46 - .80
$E_l^* + (R_r - R_l)^* = .76$	yes	.46 - .73
$E_l^* + (R_r - R_l)^* = .50$	yes	.46
$E_l^* + (R_r - R_l)^* < .50$	no	

Table 2:
Simulation Results for Small Firms

Base case values for small firms:

$P_H^* = .4$, $(L - C_l)^* = .13$, $C_r^* = .03$, $E_l^* = .12$, $(R_r - R_l)^* = .13$, $\gamma = .17$

	Filtering failure	**Range for P_L^***
Base case	yes	.18 - .22
$P_H^* > .65$	no	
$P_H^* = .65$	yes	.22
$P_H^* = .13$	yes	.13
$P_H^* < .13$	no	
$\gamma > .35$	no	
$\gamma = .30$	yes	.21 - .22
$\gamma = .10$	yes	.16 - .22
$\gamma = 0$	yes	.13 - .22
$(L - C_l)^* > .18$	no	
$(L - C_l)^* = .18$	yes	.22
$(L - C_l)^* = 0$	yes	.07 - .22
$E_l^* + (R_r - R_l)^* = .50$	yes	.18 - .40
$E_l^* + (R_r - R_l)^* = .21$	yes	.18
$E_l^* + (R_r - R_l)^* < .21$	no	

With these caveats, turn to the results in Tables 1 and 2. Table 1 reports the results for large firms. The base case outcome is shown in the first line of the table. It indicates that the conditions for filtering failure are satisfied at the base case values as long as P_L^* is within the range 0.47 to 0.63. Now suppose that P_H^* changes, while all other parameters remain at their base case values. Filtering failure still occurs if P_H^* rises as high as 1.13 (implying that creditors receive more than they are owed). If P_H^* equals 1.0, then the range of values of P_L^* consistent with filtering failure is 0.57 to 0.63. The conditions for filtering failure are also satisfied at much lower values of P_H^*. If P_H^* equals 0.30, then the range of possible values of P_L^* is 0.22 to 0.63. Lower values of P_H^* cause the range of values of P_L^* that is consistent with filtering failure to shift downward, so that it becomes more attractive for managers of inefficient firms to file under Chapter 11 and, therefore, filtering failure is more likely to occur.

Next suppose the value of γ changes. The conditions for filtering failure are still satisfied if γ takes values up to 0.75 or as low as zero. Reductions in the value of γ make it more likely that filtering failure occurs, because creditors prefer to accept rather than reject low payment reorganization plans as the probability that the firms offering them are inefficient rises. At $\gamma = 0$, the range of possible values of P_L^* is wide—0.13 to 0.63.

The next lines in the tables show the effect of variation in $(L - C_l)^*$. Complete filtering failure occurs if $(L - C_l)^*$ takes values as high as 0.45, in which case P_L^* must equal 0.63, or as low as 0, in which case P_L^* can take any value in the range 0.40 to 0.63. However, values of $(L - C_l)^*$ greater than 0.45 are inconsistent with the complete filtering failure equilibrium. As $(L - C_l)^*$ rises, it becomes more attractive for creditors to reject low payment reorganization plans since the worst outcome for them if they reject is not so bad. Thus, the filtering failure equilibrium is less likely to hold at higher values of $(L - C_l)^*$.

Now turn to variations in E_l^* and $(R_r - R_l)^*$. These two terms enter the simulation additively (see the inequalities in (4)), so that the effect of increasing or decreasing either of them by a uniform amount is the same.[31] The base case value of $E_l^* + (R_r - R_l)^*$ is 0.30 + 0.36, or 0.66. Complete filtering failure still occurs as $E_l^* + (R_r - R_l)^*$ rises. For example, if $E_l^* + (R_r - R_l)^*$ rises from 0.66 to 0.90, then complete filtering failure still occurs and the range of possible values of P_L^* is 0.46 to 0.80. Higher

31. The same is also true of C_r^*, except that its sign is reversed. Thus, increasing E_l^* or $(R_r - R_l)^*$ has the same effect on the outcome as decreasing C_r^* by the same amount.

government subsidies in Chapter 11 and/or higher payments to creditors outside of bankruptcy make it more attractive for managers of inefficient firms to file under Chapter 11. Therefore, complete filtering failure is more likely to occur. But if $E_I^* + (R_r - R_l)^*$ falls, then filtering failure is less likely to occur. If managers of inefficient firms can pay relatively little to creditors outside of bankruptcy or if the subsidies they receive in Chapter 11 fall, then it becomes more attractive for them to remain outside of bankruptcy and to file eventually under Chapter 7. If $E_I^* + (R_r - R_l)^*$ falls to 0.50, then the conditions for filtering failure are still satisfied as long as P_L^* equals 0.46. However, the conditions for filtering failure break down if $E_I^* + (R_r - R_l)^*$ falls below 0.50. The simulation results are clearly sensitive to the values of E_I^* and $(R_r - R_l)^*$—the parameters about which we know the least.

Table 2 gives results of the same simulation procedure using the base case values for small firms. Here the conditions for the filtering failure equilibrium are again satisfied at the base case values, as long as P_L^* is in the range of 0.18 to 0.22. Varying P_H^*, filtering failure still occurs if P_H^* rises as high as 0.65 or falls as low as 0.13. It also still occurs if the proportion of firms that are efficient, γ, falls as low as zero or rises as high as 0.35. Filtering failure still occurs if the liquidation value of inefficient firms, $(L - C_l)^*$, falls to zero or rises as high as 0.18. Finally, the combined value of $E_I^* + (R_r - R_l)^*$ is 0.25 in the base case. The sum $E_I^* + (R_r - R_l)^*$ may fall as low as 0.21 or rise as high as 0.50 or more and the conditions for filtering failure are still satisfied. Thus, filtering failure also may occur for small firms in bankruptcy within fairly wide ranges of the parameter values.

Another interesting result of the simulation is that creditors in reorganization tend to receive substantially more than the liquidation value of the firm's assets, i.e., P_L^* is well above $(L - C_l)^*$ even when P_L^* is assumed to take the minimum value within its range. This result supports several recent theoretical models of the bargaining process in Chapter 11 which imply that creditors receive more in Chapter 11 than they would get if the firm liquidated under Chapter 7,[32] even though the U.S. Bankruptcy Code only gives creditors the right to receive in Chapter 11 what they would get in Chapter 7.[33]

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32. *See* Douglas G. Baird & Randal C. Picker, *A Simple Noncooperative Bargaining Model of Corporate Reorganization*, 20 J. LEGAL STUD. 311 (1991); Bebchuk & Chang, *supra* note 5; Brown, *supra* note 5.

33. 11 U.S.C. § 1129 (1988).

The simulation results thus suggest that complete filtering failure may occur in bankruptcy under a wide range of parameter values and that it may occur both for large and small firms in bankruptcy. The efficiency losses associated with Chapter 11 bankruptcy reorganization may therefore be quite large.

IV. CONCLUSION

The model in this paper suggests a new explanation for why things go wrong in Chapter 11. In the model, there are two types of firms in financial distress: those that should liquidate because they are economically inefficient and those that should remain in operation because they are economically efficient. I assume that it is difficult for outsiders such as creditors to identify individual firms' types. Under an ideal bankruptcy policy, all failing firms that are economically efficient, and therefore worth saving, would file under Chapter 11 and have an opportunity to be saved, while all failing firms that are economically inefficient would file and be liquidated under Chapter 7. However, the model shows that in fact both efficient and inefficient failing firms may file under Chapter 11 and both may successfully reorganize. This wastes resources, since reorganizing inefficient firms delays their shutdown and delays the movement of resources to new and more valuable uses. It thus contributes to economic stagnation. The paper suggests a new reason for why the two-track bankruptcy procedure in the United States needs rethinking and provides a justification for reform proposals that would reduce managers' control over the reorganization process.[34]

The model also suggests one specific reform that would improve efficiency by reducing the probability that economically inefficient firms reorganize. Under the reform, whenever creditors rejected a low payment reorganization plan, firms would be sold on the open market in Chapter 11. This change would encourage the market for bankrupt firms to become

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34. Many reform proposals have been put forward. *See, e.g.*, Mark J. Roe, *Bankruptcy and Debt: A New Model for Corporate Reorganization*, 83 COLUM. L. REV. 527 (1983); Douglas G. Baird, *The Uneasy Case for Corporate Reorganizations*, 15 J. LEGAL STUD. 127 (1986); Lucian A. Bebchuk, *A New Approach to Corporate Reorganizations*, 101 HARV. L. REV. 775 (1988); Michael Bradley & Michael Rosenzweig, *The Untenable Case for Chapter 11*, 101 YALE L.J. 1043 (1992); Philippe Aghion et al., *Improving Bankruptcy Procedure*, 72 WASH. U. L.Q. 849 (1994).

See White, *Comparison*, *supra* note 1, for a discussion of bankruptcy law in the United Kingdom, France, and Germany. In all three countries, managers of firms in bankruptcy are displaced and an official appointed by the bankruptcy court makes the decision whether to liquidate or to reorganize firms in bankruptcy.

more active, which would cause values to rise. But if the value of assets of failing firms sold on the open market rose, then creditors would be less likely to accept low payment reorganization plans because their expected payoff if they rejected these plans would be higher. As a result, managers of inefficient firms would find it less attractive to file under Chapter 11 in the first place, and the inefficient filtering failure equilibrium would then be less likely to occur.