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Bankruptcy Decision Making

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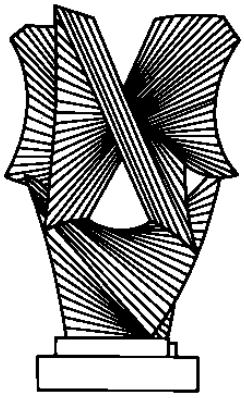

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Douglas G. Baird and Edward R. Morrison

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Bankruptcy Decisionmaking

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Abstract

When a firm encounters financial distress, there is a significant possibility that, at some point, the firm itself should be shut down and its assets put to a better use. But Chapter 11 and indeed all market-mimicking reorganization regimes other than a speedy auction entrust the shutdown decision to a bankruptcy judge who lacks information and expertise, as well as the ability to control the timing of her decisions. Understanding the costs of entrusting the shutdown decision to a bankruptcy judge is central to assessing any law of corporate reorganizations. This paper models the shutdown decision as the exercise of a real option. The model suggests that the shutdown decision may loom so large in the early parts of the bankruptcy case that it erases any significant difference between Chapter 11 and many alternative market-mimicking regimes. All these regimes take more time than mandatory auctions and thus increase the cost of taking the shutdown decision away from a market actor. Moreover, the real option itself gives parties an incentive to withhold information. Only a system of mandatory auctions both limits the amount of time the shutdown option resides with an inexpert decisionmaker and forces insiders to give that decisionmaker sufficient information to value the option while it is in her hands.

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1. Introduction

The difficult bankruptcy cases tend to be the ones in which the firm's future as a going concern is uncertain. These firms—typically closely held businesses that do several millions of dollars of business a year—form only a fraction of the firms that enter reorganization, but these firms are the ones where differences in the legal rules governing reorganization matter the most. Large publicly traded firms survive as going concerns in the overwhelming majority of cases. The costs of Chapter 11 for large firms in financial distress seem on a par with the costs of other corporate control transactions.[1] Alternative regimes might be less costly, but not dramatically so.[2] At the other end of the spectrum are the small enterprises that have no future as going concerns.[3] The reorganization process serves to wrap up the affairs of these firms. It is a "reorganization" in name only and lasts only as long as the relevant creditors want it to (Bufford, 1994).[4] Whatever assets are not repossessed will be sold piecemeal. Alternative regimes will

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[1]See Andrade and Kaplan (1998). Modern Chapter 11 practice for large publicly traded firms is not the drawn-out affair commonplace in the early 1980s. The process is now centered in Delaware, where the bankruptcy judge behaves in much the same way as Chancellors that decide matters of corporate law. Investment bankers now oversee the drafting of the reorganization plan; they would also run the auction or implement an options-based recapitalization. It would be surprising if the costs of these corporate control transactions were dramatically different from others.

[2]Proposals begin with outright support of mandatory auctions. See Baird (1986). They extend to market-mimicking mechanisms that use options (and other devices) that try to avoid some of the potential problems of a mandatory auction. See Bebchuk (1988); Aghion, Hart, and Moore (1992); Rhodes-Kropf and Viswanathan (2000). Others have pressed reforms that would let creditors and debtors choose contractually among forms of reorganization. Rasmussen (1992); Schwartz (1998).

[3]More than half the firms in Chapter 11 have assets of less than $500,000. See Warren and Westbrook (1999:529) (giving figure of 58%). The overwhelming majority never leave Chapter 11 as going concerns. See Flynn (1989).

[4]In many of these cases, the only creditor in the money is the IRS, which is owed FICA and withholding taxes. The owner-managers of the business are likely to be personally liable for these taxes. Chapter 11 provides a forum for IRS to work out a settlement with them. The role that the IRS plays in many small Chapter 11s makes inapt many of the conventional analyses of Chapter 11, based as they are on notions of the creditors' bargain. In any event, the use of Chapter 11 to string out creditors and play for time so prevalent in the 1980s has changed in recent years with the increasing sophistication and professionalizaton of the bankruptcy bench.

bring about a piecemeal sale as well and will also largely be controlled by creditors.

In the cases between these two ends of the spectrum, a firm's chances of reorganizing successfully are less clear.[5] Hence, the process used to reorganize the firm—whether through a sale, an options mechanism, or a negotiated plan—matters. We do not want to destroy the value the firm has as a going concern, but we do not want to continue a losing venture when the assets are better used elsewhere. If the legal regime demands a swift mandatory auction of the assets and the firm is acquired by a single buyer, the shutdown decision is quickly put into the hands of a market actor who likely has both the appropriate skills and incentives. To the extent the reorganization takes time, however, the shutdown decision rests with a bankruptcy judge or some other actor who lacks both the expertise and the incentives needed to make this decision well. Entrusting the shutdown decision to such a person can be costly, even if the reorganization lasts only a few months.[6]

This paper explores the shutdown decision. Part I models the bankruptcy decisionmaking as the exercise of one or more real options. Part II uses this model and recent empirical evidence to assess bankruptcy decisionmaking in Chapter 11 and alternative regimes. We show that that the shutdown decision looms largest in the early part of the case. Alternatives to Chapter 11 that require some number of months to implement, such as Bebchuk (1988) or Aghion, Hart and Moore (1992) may have few advantages over Chapter 11.

Part III contrasts mandatory auctions with Chapter 11 and alternative regimes. Mandatory auctions have their own costs. They give the bank-

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[5]As discussed in footnote 18, *infra*, our preliminary analysis of corporate Chapter 11 filings in the Northern District of Illinois, Eastern Division, reveals that the shutdown decision looms largest in cases between the two ends of the spectrum. Among the firms with debt between $500,000 and $10 million, half were shut down in Chapter 11. Most shutdown decisions take place within the first few months.

[6]To give only one example, Merry-Go-Round was one of the most successful retailers of teen fashions during the 1980s. See Martin (1996). It fell on hard times during the 1990s and found itself in Chapter 11. Even then, however, the company still possessed a well-recognized brand name, employed thousands, and had more than $100 million in cash. Few creditors wanted to exercise the shutdown option. But a few months later (less than a year), the money was gone, as was most everything else. Its principal asset was a cause of action against the management consultants who had advised the firm during the bankruptcy.

ruptcy judge little discretion, and firms may be liquidated when no buyer appears who is willing to buy the firm as a going concern.[7] The costs of mandatory auction depend on how often a buyer will not appear when the firm should be kept as a going concern. Whether a buyer appears, however, turns in large measure on how easy it is for potential buyers to learn about the firm. The cost of mandatory auctions might well be small if the prospect of the auction itself induces managers to make information about the firm's value more accessible.

2. Real Options and Bankruptcy Decisionmaking

Whether in bankruptcy or out, the assets of a firm can be put to many different uses. Each departure from the original business plan abandons firm-specific investments. This problem is a species of what is known in the finance literature as an optimal stopping (or "real options") problem.[8] Outside bankruptcy, the firm's owners decide whether to reconfigure the troubled firm's operations. In a reorganization regime, however, a judge makes this decision and how well it is made turns in large measure on the legal rule in place.

2.1 A Simple Model

When a firm files for reorganization, it triggers a mechanism designed to give it a new capital structure. When that process is complete, the shutdown decision will once again reside in the hands of a market actor, but while the firm is being reorganized the bankruptcy judge must be prepared to shut it down if such a course maximizes the value of the assets. More formally, the firm files for reorganization at $t=1$ but it takes until $t=3$ to complete the reorganization. In the meantime, the bankruptcy judge (or other decisionmaker) will receive new information about the firm's prospects as a going concern. Using this information, the judge must decide at $t=1$ and $t=2$ whether to continue the reorganization efforts or to shut the

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[7]In addition, a reorganization law that mandates speedy auctions is a "hard" regime in the sense that existing managers have relatively little bargaining power and may well lose their jobs. This will give managers incentives to delay filing a bankruptcy petition, an incentive that is less important under a "softer" regime such as Chapter 11. Thus, we need a mechanism that helps ensure auctions occur at the optimal time. See Baird (1991); Povel (1999).

[8]For a general discussion of real options, see Dixit and Pindyck (1994). Real options analysis has begun to make its way into legal analysis, including Cornell (1990), Triantis and Triantis (1998), and Huang (1998).

firm down.[9] If she exercises the "shutdown option" at t=1, we realize a fixed amount L,[10] but we forgo the opportunity to learn whether the firm will be worth more than L next period. The news at t=2 could be good or bad. Let us assume that firm earnings at t=1 are certain (π_1),[11] while earnings at t=2 will be either high (π^h) or low (π^l) with probability p and 1-p. After t=2, the earnings of the firm are constant. Thus if the bankruptcy judge waits until t=2 to make the shutdown decision, we may find that the firm should remain intact, implying that the decisionmaker was wise not to exercise the shutdown option at t=1. Or we may find that the firm should have been shutdown from the very beginning. Waiting to obtain this information is costly. The firm's shutdown value at t=2 will be L in nominal dollars, as it was at t=1. But time is money: there is a discount rate of 10% for each period. Thus the decisionmaker must balance the cost of waiting against the value of new information.

To make things more concrete, assume that the piecemeal value of the assets (L) after the firm is shut down is \$100, firm earnings are $\pi^h = 1.5\pi_1$ and $\pi^l = .5\pi_1$, and the probability of high earnings (π^h) is $p = .5$. If the firm receives high earnings at t=2, it will receive high earnings at t=3 and at all subsequent times. If we discount this future income stream, its present value at t=2 is $15\pi_1$. By contrast, if the firm generates low earnings at t=2, the discounted value of its future earnings for the rest of its life, measured at t=2, is $5\pi_1$.

First consider the decisionmaking process at t=2, assuming the firm was not liquidated at t=1. The decisionmaker can either shut the firm down and realize \$100 or she can keep the firm intact as a going concern forever. If the decisionmaker takes the latter course when earnings are low (π^l), the present value of the future stream of earnings is worth $5\pi_1$. If this sum is less than \$100 (that is, if $\pi_1 < 20$), the decisionmaker will shut down the firm. In contrast, if the firm's earnings turn out to be high (π^h) at t=2, the decisionmaker will shut the firm down if $\pi_1 < 6.7$, but not otherwise.

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[9]In an Appendix (available on request), we show that the same results hold when the shutdown decision can be made continuously. This model draws on the framework in Dixit and Pindyck (1994:26-46). The model can be extended to cases in which the decisionmaker confronts a range of choices, rather than the stark choice between selling the assets piecemeal in a liquid market or continuing the assets in their current use. In all cases, the decisionmaking process turns crucially on recognizing that an option is embedded in each course of action.

[10]We relax the assumption that L is fixed below.

[11]These earnings are net of any expenses incurred during the period and exclude any payments to creditors.

The problem facing the decisionmaker at t=1 depends on the initial firm earnings π_1. Suppose $\pi_1 = 8$. We want to calculate the expected value of the firm if it remains a going concern indefinitely. We can predict that the firm will receive earnings of π^h = \$12 or π^l = \$4 at t=2 with equal probability. Hence, from the perspective of a decisionmaker at t=1, the expected earnings at t=2, and all future dates, is \$8. This expected earnings stream discounted to its present value at t=1 is \$80. This amount (or "net present value") is less than what the firm is worth if shut down at t=1 (\$100). Thus, it might seem that the decisionmaker should shut the firm down. But this is wrong. We must also take into account the value of waiting for a period to find out whether the firm's future earnings in all future periods will be high or low.

Let us assume that the decisionmaker does not shut the firm down at t=1. What is the expected value of the firm to the creditors, bearing in mind that the decisionmaker has the power to shut the firm down at t=2? There is a 50% chance that earnings will be high and the firm will receive \$12 at t=2 and in all subsequent periods. As we showed above, if earnings are high a decisionmaker will keep the firm intact if $\pi_1 > 6.7$, which is clearly the case here. Hence, in the good state, \$132 will be available to the creditors at t=2. (The creditors enjoy the \$12 earnings received at t=2 and the present value of the future income stream worth \$120.) It is equally likely, however, that the firm's earnings at t=2 will be low. The decisionmaker then must decide whether to shut the firm down. In the bad state, this decision is easy. We know a decisionmaker will shut the firm down if $\pi_1 < 20$, which is the case here. Hence, in the bad state of the world, \$104 is available at t=2 (\$4 in earnings received at t=2 and \$100 received from selling the assets). Thus, assuming the decisionmaker does not shut the firm down at t=1, the expected value of the firm at this date must reflect the equal possibilities of the good state (worth \$132) or the bad state (worth \$104) in the next period. The expected value of the firm is \$118 at t=2 and (using a 10% discount rate) \$107 at t=1.

We want to compare the amount we can realize at t=1 by shutting the firm down immediately (or \$100) with the expected present value of the firm if we delay shutdown until t=2 (or \$107). When $\pi_1 = 8$, the decisionmaker should wait until t=2 and should not liquidate at t=1. Even though at t=1 the break-up value of the firm is \$100 and its expected value as a going concern is only \$80, it should still be kept intact. If we focus only on the value of the firm if it remains as a going concern, we fail to take into account the benefits of waiting until we gather more information.

More generally, we can characterize the value of the "shutdown option" in cases where the present value of firm earnings is less than its shut-

down value. The value of the ability to postpone the shutdown decision until t=2 instead of having to make a once-and-for-all decision at t=1 is given by the difference between the expected value of the firm (discounted) if the shutdown decision is made at t=2 and the liquidation value of the firm at t=1. Once we simplify, we learn that earnings in the first period need to be only a little more than $7 for it to make sense to put off shutting down the firm. But at this level of earnings, the firm's expected value as a going concern (ignoring the shutdown option available at future dates) is only $70, far below the liquidation value ($100). As this example shows, we may still want to keep the firm intact, at least for a short period, even when the expected income of the firm discounted to present value is less than the liquidation value. The ability to postpone the shutdown decision has value and should be factored into the calculation when deciding whether to shut down a firm.[12]

Understanding the shutdown decision as a real option gives us some purchase on the problem the decisionmaker faces. The value of the option *rises* as the uncertainty about future earnings increases. The decisionmaker should be more patient—more willing to defer the shutdown option to the next period—when there is large uncertainty over firm earnings than when future earnings are more predictable. To return to our model, expected earnings of the firm turn only on the value of π_1. We do not need to know the value of either π^h or π^l. In expectation, the firm will earn π_1 in every period. Increasing the spread between π^h and π^l has no effect on expected earnings. Such a change, however, does alter the value of the option. This in turn affects the shutdown decision. When $\pi^h = 1.5\pi_1$ and $\pi^l = .5\pi_1$, earnings had to be over $7 to justifying keeping the firm open. When $\pi^h = 1.75\pi_1$ and $\pi^l = .25\pi_1$, earnings have to be only a little more than $6.[13]

We can understand the problem facing the decisionmaker more generally using (a now standard) framework from the real options literature. The variation in the earnings of the firm ($d\pi_t$) at any moment in time can be modeled as

$$d\pi_t = \mu\pi_t\, dt + \sigma\pi_t\, dW_t$$

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[12]This is another way of restating the familiar point that net present value (NPV) analysis in its simplest form is appropriate only if the decisionmaker must make a once-and-for-all decision. As soon as the decisionmaker has the ability to postpone a decision about how an asset is used, the net present value of a firm must take into account of option value inherent in delay.

[13]This is shown in the Appendix (available on request).

This process can be used to determine the value of the shutdown option.[14] The process has two components. The first tells us how we expect earnings to change over time. We have so far assumed that earnings remained constant after t=2. If the firm is recovering from economic distress, however, we would expect the earnings to improve over time. The predicted rate of growth of earnings is μ. The higher μ, the more valuable the firm as a going concern and the more valuable the shutdown option.

Also crucial is the second component, σ, which measures the volatility (or variance) of future earnings. Although σ has no independent effect on the expected value of the future stream of earnings of the firm as a going concern, it does affect the value of being able to postpone the shutdown decision. As the volatility of firm earnings increases, the potential gain from waiting increases. If we can sell off the assets of the firm for L at any point in time, the increase in downside exposure from higher volatility is merely the lower earnings we receive before we shut the firm down, not the amount realized in the piecemeal sale. These low earnings in bad states do indeed become lower in each period as the variance increases. But the possibility of very low earnings for one period (after which the decisionmaker shuts down the firm and sells off the assets for L) is more than offset by the possibility of high earnings in *all* future periods when things turn out better than we expected.

A decisionmaker needs to know how much can be realized by selling the assets (L); she also needs to know the current income the firm is generating (π_l). But less recognized are the two additional elements that affect the value of the real option embedded in the shutdown decision: (1) the average growth (μ) of this earnings stream over time; and (2) the variance of earnings (σ) within any period of time. Current bankruptcy practice sometimes ignores these elements, especially σ.

If a firm's collateral is not depreciating in nominal dollars, modern bankruptcy judges are likely to focus on whether the debtor is satisfying postpetition obligations, not on the uncertainty associated with the firm's income stream. Judges will not let a debtor go too long in the red postpetition, but they will allow the case to proceed months or even years if the debtor is at least breaking even. The case can remain in Chapter 11 as long as the debtor has some argument that it will be able to support a plan in

[14]This representation of the process is known as geometric Brownian motion with drift, where changes in the level of earnings are lognormally distributed. Again, this model of the information process is now standard. See Dixit and Pindyck (1994:59-132).

the near future and no adverse event gives a secured creditor or other interested party an affirmative reason to protest. When the assets can generate more in an alternative use, however, we should continue the firm only if the shutdown option is sufficiently valuable. A necessary condition for it to have value is for there to be sufficient uncertainty about future earnings.

In short, existing practice treats certainty in future earnings as a factor that militates in favor of keeping the firm intact rather than liquidating it. This is wrong. Other things being equal, certainty cuts in the opposite direction. Lower variance has no effect on expected earnings, but the value of the option drops as the variance decreases. Armed with this information alone, a decisionmaker might well be able to make the shutdown decision once she had only modest and readily accessible knowledge about the firm. The hard cases arise when the volatility of firm earnings (σ) is high.

2.2 Estimating the Growth Rate and Volatility of Earnings

Both characteristics of the firm—μ and σ—will depend on industry- and firm-specific factors. When profitability of firms in a particular industry grows slowly and is fairly predictable (μ and σ are relatively low), the value of the shutdown option is small. The decisionmaker does not raise the value of the firm by deferring the shutdown decision to a future date. The relevant information is at hand and the possibility that earnings will unexpectedly rise is low.

The hard cases—those in which deferring the shutdown decision may bring the greatest gains—involve firms with highly volatile earnings (high σ). Long-term volatility, the climate in which the shutdown decision matters the most, can arise when there is wide-variation among similar firms in the same industry. From the perspective of the decisionmaker, the variance of earnings σ is quite high in these firms, even though the expected growth rate μ may be high or low. Greater uncertainty (σ) by itself increases the value of the shutdown option. If the firm is generating a positive cash flow and the shutdown value of the assets is stable, delaying the shutdown decision merely postpones the time at which we realize *L*, the value of the firm's assets when sold off piecemeal. This cost is worth bearing when there is a possibility that the future income in every period may turn out to be large.[15]

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[15]Although we characterize σ as a measure of the volatility, uncertainty, or "riskiness" of firm profits, we use these terms informally. Technically, σ is only a measure of the standard deviation of profits, i.e., the spread of outcomes around the expected (average) profit level. Thus, σ should not be confused with the typical

For any given firm, volatility is likely to decline over time. When a firm first enters bankruptcy, the decisionmaker has very little information about the firm and its prospects. The decisionmaker will not know the extent of the firm's assets. The demand for the firm's products is uncertain, as are its costs. The firm needs to make significant changes in its operations, perhaps because of mismanagement in the past. Similarly, mismanagement may make it hard for anyone to have a grasp on the firm's prospects. Only time will tell whether efforts to clean house are successful.

As the court receives more information about the firm's assets or the ability of the firm to cut costs, it will gain a clearer picture of the firm's prospects. Thus, we expect this component of variance to decline over time. However, total variance σ is unlikely to fall so far that the variance of profits is insignificant. Uncertainty about the industry and about demand for the firm's product—as well as uncertainty arising from factors not considered here—will remain relatively constant over time. Thus we expect σ to fall, but at a decreasing rate. In other words, there are diminishing returns to gathering information over time.

Thus, the value of the shutdown option will generally decrease with time. Recall that the value of the shutdown option increases with the variance of profit. Hence, as the variance of profit decreases over time, the value of the shutdown option will also decrease. This implies that the earnings π^* one needs to justify delaying the shutdown decision *increases* over time. In other words, a decisionmaker should be less patient, more willing to make a once-and-for-all shutdown decision, as she learns more about the prospects of the firm (and therefore the variance of future earnings σ declines).

Empirically, the probability that a decisionmaker will shut the firm down should be low when the firm enters the recapitalization process: uncertainty (σ) is large and the decisionmaker must gather additional information before she knows whether to shut down the firm. The probability of shutdown, however, should rise dramatically as more information becomes available and the variance of earnings σ falls. The probability of shutdown should eventually decline. If the decisionmaker chooses not to shut the firm down within the first few months of the recapitalization process, she is unlikely to do so ever. Those firms that survived the decisionmaker's scrutiny during the early months should be the ones with the strongest prospects.

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measure of "riskiness", *beta* (β), which measures the extent to which a particular asset contributes to the variance (or riskiness) of the market portfolio.

This is a form of "selection" effect: only the firms with the brightest futures survive the early period of judicial scrutiny. These are the firms that are most likely to remain as going concerns, so the probability of shut down will be quite low. In short, if bankruptcy judges make shutdown decisions well, the probability of shutdown during the immediate postpetition period should be hump-shaped (that is, an upside-down U-shape that is skewed to the right). It should be low initially when little information is available, then rise substantially as the decisionmaker identifies the firms with no future, and then fall gradually as the remaining weak firms are weeded out and only the strong remain.[16]

The task the judge faces is comparable to that faced by someone who wants to bid at an auction of a solvent firm. The entire process of gathering information and making it available to potential bidders takes about three months (Hansen and Thomas, 1998). To be sure, recordkeeping may be worse for firms in Chapter 11, and bankruptcy judges may be less adept at gathering it. But we do see auctions of insolvent firms in Sweden taking on average less than three months.[17] Moreover, tools are available to judges that are not available to potential bidders at auctions. (At the start of the case, the managers of the debtor must identify the firm's assets and earnings and generally make themselves available for questioning under oath.) Firm conclusions require empirical study, but it seems reasonable to assume that most of the shutdown decisions should happen within the first several months of the filing.[18]

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[16]These implications of our model are identical to those arising from models of job search, where a real options model is frequently used to study the decisions of workers to enter and exit firms. A seminal paper in this area is Jovanovic (1979). Scholars have confirmed the empirical predictions of job search models and found that the probability (or "hazard rate") that workers will exit a firm is "hump-shaped" with respect to worker tenure. See, e.g., Lane and Parkin (1998).

[17]In Sweden the average time from filing to the date firm assets are sold is about 2.4 months with a standard deviation of 3.4 months. See Thorburn (1999). Swedish law, however, does not permit the banks that are typically the largest creditors from bidding at these auctions. Thus, a mandatory auction regime should take even less time since anyone can bid. Unlike nonbankruptcy auctions of solvent firms, the auction goes forward even if no one appears willing to buy the entire firm. See Baird (1993).

[18]Preliminary study reenforces this intuition. We collected data on all corporate Chapter 11 filings (138 in all) during 1998 in the Northern District of Illinois Bankruptcy Court, Eastern Division. From these filings, we selected the substantial firms (those with debts over $500,000) that were still operating businesses at the time the petition was filed. (We excluded both business that had already closed

2.3 Firm-Specific Investment

Up to this point, we have made several assumptions, but none affect the general conclusions of our analysis.[19] For example, we have assumed

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their doors and single-asset real estate ventures that had never been operating businesses in any meaningful sense.) This left us with 49 filings and 43 firms (there were 6 duplicate filings by sister firms with the same ownership and management). We could gather data on 41 of the 43 firms.

Identifying the date of shutdown (or the date of the firm leaves Chapter 11 intact as a going concern) cannot be linked with a formal event in the history of the Chapter 11 case, such as the confirmation of the plan of reorganization, closing of the case, or conversion to Chapter 7. The assets of the business may be sold as a going concern quickly, but fighting among creditors may keep the case in Chapter 11 for months (or even years) longer. Moreover, the case may end with a dismissal after the outstanding disputes are resolved. What seems by the standard benchmarks to be a long-drawn out affair that ends in liquidation is a quick and successful reorganization. Similarly, what seems a successful reorganization may, on examination, prove to be a Chapter 11 plan that calls for piecemeal liquidation of the assets.

Hence a study that focuses only on such legal milestones as whether a plan was confirmed or not gives a wrong and misleading impression of whether the firm was shutdown or not. The only reliable way to identify the shutdown date or the date the firm leaves bankruptcy intact is to study the various filings in the case. These include the initial Chapter 11 petition and the disclosure statements, the periodic summaries of the firm's revenues and expenses (which indicate whether the firm is in fact operating), and the various filings by creditors, the debtor, and the United States Trustee.

Of the 41 substantial firms in our sample that entered Chapter 11 as operating businesses, 21 were shutdown in bankruptcy. The others left bankruptcy intact as going concerns—and most of these remain in business today. Our preliminary analysis suggests that the probability of shutdown over time is indeed "hump-shaped." A small number (2) of firms were shutdown within one month; the majority of firms that were closed were shut down between two to five months after filing (13); the remaining firms in our sample (6) were shut down one to two years after filing. These preliminary data are consistent with the hump-shaped distribution we would expect from judges who exercise the shutdown decision well. In the same sample, the probability of leaving peaked between seven and twelve months after filing among firms that left Chapter 11 intact. Few firms took less time or more. See Baird and Morrison (2001).

[19]In addition to the assumption discussed in the text, we have assumed that the decisionmaker in bankruptcy has only two choices—a piecemeal liquidation or a reorganization. Sometimes a decisionmaker confronts a number of choices—different reorganization plans, different plans for managing firm assets in bankruptcy—each of which cannot be reversed or is reversible only at a significant cost.

that the value of the assets L in a piecemeal sale remains constant. But we can easily imagine cases in which the value L may rise or fall as a troubled firm continues operating. The shutdown value in any period might be correlated with earnings in that period. If earnings fall, L also falls. But when L falls, the change in the value of the shutdown option is not clear. Variation in L will reflect firm decisions that also change μ and σ. L may fall because the firm has taken decisions that *increase* the option's value.

For example, decline in the liquidation value L may be due to firm-specific capital investments. Such investments, at least over the short term, reduce L—the value of the assets sold off after shut down. Firm-specific investments, by their nature, have value only if the firm continues as a going concern. On the other hand, these same investments should increase the value of the firm when it survives as a going concern. In terms of our model, it increases μ, the rate at which the earnings will grow. These investments also affect the value of σ. The effect on σ, however, is ambiguous. Some investments may, for example, improve the reliability of the firm's equipment and ensure that the firm can maintain a high level of output. Other investments, however, may have a high component of risk associated with them. These are the most interesting ones.

All else constant, however, the more L decreases the earlier one should exercise the shutdown option.[20] But the same riskiness that leads to a lower liquidation value also should lead to greater benefits from keeping the firm intact as a going concern. Investments that lower L may also raise the volatility of earnings sufficiently that the value of the shutdown option increases. Even assuming the decisionmaker is well-positioned to assess such a change in the firm's operations, much turns on the relationship between the time at which firm-specific investments need to be made and the speed that we learn whether they will pay off. The shutdown option is most

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Each choice offers different combinations of expected earnings growth μ and volatility σ. The wider set of choices does not change the basic nature of the problem, however. Indeed, the possibility of multiple options motivated the early, pioneering work in real options theory. See Weitzman (1979). The decisionmaker must rank the various alternatives and choose the one that brings the highest value, taking into account how the selection of one alternative will affect the value of the remaining options. For a discussion and application to job search, see Miller (1984).

[20]If L is correlated with the firm's earnings π_t, the qualitative features of our analysis change, but the implications do not. The value of the shutdown option will still depend critically on μ and σ, but we also need to account for the strength of the correlation between L and π_t. This type of problem is analyzed in Scheinkman and Zariphopoulou (1998).

likely to be valuable where the initial firm-specific investments are small and where σ declines quickly. Waiting is least attractive when the investments come early and information about their efficacy comes later.

3. The Costs of Complex Reorganization Regimes

Bankruptcy judges are imperfect substitutes for market actors. Market actors have their own money on the line and this makes them intensely interested in making good decisions. Moreover, there is a natural sorting mechanism as only those market actors who make good decisions survive. There is no similar competitive process or sorting mechanism for bankruptcy judges. They are subject to reappointment only every 14 years and making the shutdown decision is a small part of their docket. Moreover, the people who make the reappointment decision (other federal judges) are not themselves well-positioned to assess the bankruptcy judge's performance.

In addition, once the Chapter 11 case starts, the judge must stand at a distance. Section 341 of the Bankruptcy Code forbids the bankruptcy judge from attending the meetings at which the managers of the firm must turn over information to the creditors. Rules of judicial conduct limit the ability of the bankruptcy judge to gather information informally. She cannot even talk with any of the players outside the presence of the others, nor can she conduct her own investigations. Indeed, she typically is empowered to act only when one of the players files a motion.

For these (and other) reasons, one might well conclude that the bankruptcy judge is ill-equipped to make the shutdown decision. But before the firm is again in the hands of someone whose own money is on the line, there may not be better alternatives. It is hard to create a mechanism in which the person who makes the shutdown decision in bankruptcy also has a financial incentive to make the right decision. One might require the bankruptcy judge to hire investment bankers and others to do the job and structure their compensation in a way that gives them an incentive to make the decision well. It may, however, be no easier to find such a person and negotiate their compensation than to find a buyer of the assets. In any event, it may be as hard for the bankruptcy judge to oversee someone else making the shutdown decision as it is to make the shutdown decision herself.

The costs of entrusting the shutdown decision to a nonmarket actor exist both in Chapter 11 and in every reorganization regime that takes a significant amount of time. As we observed in the last part, most of the shutdown decisions should be made within the first few months after the filing

of the petition. If the bankruptcy judge makes the shutdown decision well—and we find preliminary empirical evidence that this is the case[21]—then Chapter 11 as now practiced may not be significantly different from the more complex alternatives. Modern Chapter 11s may not last longer than the Bebchuk (1988) or Aghion, Hart & Moore (1992) regimes.[22] Even if it does, the empirical evidence suggests that firms in reorganization run their day-to-day operations at the plant level as well as firms outside of Chapter 11 (See Maksimovic and Phillips, 1998). More importantly, most of the firms that should not survive have already been shut down before any of these processes are over.[23] Hence, if bankruptcy decisionmaking can be done well, there may be few costs of Chapter 11 over alternative complex regimes.

Now consider the possibility that the bankruptcy judge does not make the shutdown decision well. Firms that ought to be shut down linger longer in Chapter 11 than under alternative regimes to the extent that Chapter 11 takes more time. By the same account, however, these alternative regimes are worse than mandatory auctions. Here lies the challenge facing anyone who promotes complicated mechanisms such as Bebchuk (1988) and Aghion, Hart and Moore (1992). If the bankruptcy judge can make shutdown decisions well, Chapter 11 may not seem particularly more costly. And if the bankruptcy judge cannot make them effectively, these procedures seem distinctly worse than mandatory auctions, at least over this dimension.

The reliance Chapter 11 and alternative complex regimes place upon effective bankruptcy decisionmaking suggests that we reassess mandatory auctions. When no buyer of all the assets bids at the auction, the firm will be shut down and its assets sold piecemeal, even if it is worth keeping intact as a going concern. While the shutdown decision might be made too late in the other regimes, it may happen too soon in a regime of mandatory auctions. Whether and when a buyer appears, however, is not independent of the legal regime itself. In the next part of the paper, we turn to the ques-

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[21]See footnote 18, *supra.*

[22]For example, while four months is needed to implement Aghion, Hart and Moore (1992) in every case, the typical pre-packaged Chapter 11 takes only two or three. See Tashjian et al. (1996:142) (reporting a mean of 3.3 months and a median of 2.1 months).

[23]Our preliminary study of the shutdown decision suggests that bankruptcy judges can and do make the shutdown decision within a few months of the filing. See footnote 16, *supra.* The fate of the firm is effectively decided before the procedure of Aghion, Hart and Moore (1992) can be implemented.

tion of how the choice of the legal regime itself affects the amount of information that will be available to potential buyers.

4. Auctions and Information-Forcing Rules

The nature of the bankruptcy regime itself will affect the amount of information about μ and σ that is available to the judge. Specifically, the more a regime ties a judge's hands and forces her to make a once-and-for-all shutdown decision, the greater the incentive parties will have to make sure information is available at that moment. This information forcing effect—reducing uncertainty about the firm's future—may offset (or more than offset) the cost of being forced to make a decision too soon.

Under existing law, the bankruptcy judge's role in a reorganization is passive. The bankruptcy judge's window on the case is largely limited to the discrete issues that parties bring before her in open court. If the shutdown decision is not made at the very start of the case, the bankruptcy judge might not have the chance to shut the firm down for weeks or months. Over the years, bankruptcy judges have mitigated this deficit by calling status hearings on their own motion. Congress added explicit statutory authority for this practice in 1994 when it added §105(d) to the Bankruptcy Code. These and other provisions, however, fall short of giving the bankruptcy judge the ability to monitor the case continuously. This constraint on her decisionmaking tends to bring about more premature shutdowns than we would see if bankruptcy judge had greater control over the administration of the case. We get worse decisions when we put artificial constraints on the decisionmaker. The distortion here—premature shutdowns—has the greatest effect on those firms for which the real option is the most valuable. These are the firms most likely to benefit from waiting.[24]

A mandatory auction regime is effectively one in which the shutdown decision is made at the outset of the case if no buyer for the assets appears. Hence, everything else being equal, such a regime neglects even more of the option value of keeping the firm intact than a regime that gives the bankruptcy judge little discretion. But all else is not equal. Each bankruptcy regime—and the restraints it imposes on judicial decisionmaking—will affect the amount of information that comes to the bankruptcy judge

[24]These again are the cases in which variance in earnings is the greatest. A formal proof is contained in the Appendix (available on request). Triantis (1996) points out this weakness in U.S. law in his comparative study of Canadian bankruptcy laws, which empower bankruptcy judges to "screen" firms while they are being reorganized.

and how quickly it comes. The value of the real option is itself endogenous to the choice of bankruptcy regime. In a mandatory auction regime, managers of firms that have value as going concerns will do everything they can to make this information readily available at the start of the case. They will keep their jobs only if a single buyer of the assets can be found and the chances of finding such a buyer go up the more such information is available.

By contrast, when a bankruptcy regime takes time and judges are required to make the shutdown decision as well as they can, insiders have an incentive to withhold information. The less information that is available at the start of the case, the greater the returns to waiting before shutting down the firm. Even after the firm has entered Chapter 11, insiders have an incentive to engage in behavior that increases the decisionmaker's uncertainty about the firm's future. Making information hard to find, investing in high-variance projects, and engaging in other activities that raise σ increase the value of the shutdown option and hence induces the decisionmaker to wait. For this reason, there is an offsetting benefit in a speedy auction regime to limiting the ability of the decisionmaker to account for the value of the shutdown option.

A regime of mandatory auctions is strongly information-forcing. It gives managers (and everyone else with an incentive to preserve the firm as a going concern) an incentive to make information available and verifiable to potential buyers. Such a rule destroys the option value associated with keeping the firm running for a short time (assuming no buyer is willing to purchase the firm *in toto* at the outset), but it gives the managers an incentive to ensure that a market for the firm's assets always exists. Less traumatic checks on the bankruptcy judge's ability to exercise the shutdown option bring similar costs and benefits on a smaller scale. Hence, if one is committed to a complex bankruptcy regime, whether Chapter 11 or one of the alternatives, one must be cautious about reforms that allow the bankruptcy judge too much control over the course of the proceedings.

One can also try to create a mechanism that forces parties to come forward with information. Such is the Canadian system. The bankruptcy judges of Canada have broad powers to force insiders to reveal information about a firm's future potential (Triantis, 1996). When a firm applies for bankruptcy protection under Canadian law, the judge will force the debtor to explain why the firm fell into financial difficulties and to show why the going-concern value of the firm exceeds its shutdown value. The judge will dismiss a bankruptcy case if she is not convinced by the debtor's explanation. Additionally, Canadian bankruptcy judges will regularly appoint a "monitor" or trustee to collect information about the debtor firm and re-

port this to the court and interested parties. The trustee, for example, must submit a report attesting to the reasonableness of the debtor's projected cash-flow statement. If the statement is misleading, the trustee may be liable to outsiders who rely on the statement.

The Canadian bankruptcy judge enjoys broader powers to compel insiders to reveal private information. The information gathering mechanism, however, might not be as effective as the one built into a mandatory auction regime. Instead of relying upon administrators to extract information from an adversarial process, the auction creates a set of incentives that produces the same result. The parties who control the information (the managers who lose their jobs if the firm is sold off piecemeal) have an incentive to gather it and disclose it. If there is a mandatory auction and the information is not at hand that would convince someone to buy the firm as a going concern, one might infer that such information does not exist. The process is, of course, an imperfect one, but it may be better than alternative regimes in which information had to be gathered in an adversarial process and the absence of information gave decisionmakers a reason to wait.

There are, to be sure, costs[25] to a regime of speedy and mandatory auctions, particularly a risk that no buyer may appear and the firm is sold piecemeal.[26] Indeed, these are precisely the costs that motivate alternative regimes such as those set out in Bebchuk (1988) and Aghion, Hart and Moore (1992). They assume that speedy sales are too likely to lead to a piecemeal sale of the firm. But complex reorganization mechanisms bring their own costs, even if they take advantage of market-mimicking mechanisms. These regimes commit the shutdown decision to a nonmarket actor,

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[25]These include the costs of designing the auction itself. Recent work argues that the design has important incentive effects and is best left to ex-ante contracting. Bhattacharyya and Singh (1999).

[26]And the firm may not be sold to the highest valuing bidder, as that person may be liquidity constrained. See Shleifer and Vishny (1992). The importance of liquidity constrants, however, is unclear. Even when the old managers face such constraints, they are not necessarily frozen out even in an auction regime as a major creditor may be willing to lend managers money to "buy back" the firm. Strömberg (2000) finds evidence of such buy backs after mandatory auctions in Sweden, although he notes that this procedure can create bad incentives on the part of managers and the creditor who finances the managers. An alternative method for avoiding liquidity constraints is the noncash auction (which is similar to a buy back). But recent research shows that such auctions are quite complex (if done properly) and can create their own set of bad incentives. See Rhodes-Kropf and Viswanathan (2000).

who lacks expertise, lacks incentives, and is unable to act continuously. Moreover, this decisionmaker must operate in a world in which many of the participants have incentives to keep information hidden.

5. Conclusion

In any bankruptcy regime some decisionmaker (perhaps a judge) must be given the task of making decisions that are, as a practical matter, irreversible. This decision involves the exercise of a real option. The value of this option depends in large part on the reorganization regime in place. Seen from this perspective, the debate about corporate reorganizations takes on quite a different character. Instead of a debate about the benefits and costs of Chapter 11 versus a number of different mechanisms that use markets, we have a debate that focuses on the complexity and the duration of the bankruptcy process. From this perspective, Chapter 11 and what seem like radical reforms, such as Aghion, Hart & Moore (1992), are much more like each other than either is like a mandatory auction regime. All of these relatively complicated regimes share the common problem that they entrust the shutdown option to a nonmarket actor for a significant period and at the same time increase its importance. Chapter 11 and alternative market-mimicking reforms give insiders insufficient incentive to share crucial information with the judge or other decisionmaker. Only a system of mandatory auctions both limits the amount of time an inexpert decisionmaker handles the shutdown option and forces insiders to give that decisionmaker sufficient information to exercise the option well while it is in her hands. Understanding the shutdown decision as the exercise of a real option provides new reasons for being skeptical about the virtues of both Chapter 11 and complex, market-mimicking alternatives to it.

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