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An Empirical Study of Small-Business Bankruptcies 

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ABSTRACT
It is well known that a large fraction of firms seeking to reorganize under the U.S. Bankruptcy Code will be liquidated instead, and that the liquidation decision will often be made by a bankruptcy judge. Little is known, however, about the characteristics of optimal judicial decision-making in this context and whether the behavior of actual judges is consistent with these characteristics. Despite the paucity of theory and evidence, it is widely suspected that judges are poor decision-makers who allow failing firms to linger under the protection of the court. Drawing on optimal stopping theory, this study develops several new models of optimal judicial decision-making. Each generates the same implications: the probability (or hazard rate) of shutdown should be hump-shaped over time and decreasing in the uncertainty (or volatility) surrounding a firm’s going-concern value. These implications are tested against new data on decision-making by bankruptcy judges of the Northern District of Illinois, Eastern Division, a jurisdiction covering Chicago and outlying areas. The

* Associate Professor of Law, Columbia Law School. This is a revised version of my Ph.D. thesis. In addition to my committee—Gary Becker (chair), Douglas Baird, and Steven Kaplan—I owe thanks to Jennifer Arlen, Kenneth Ayotte, Ian Ayres, Theodore Eisenberg, Jeffrey Gordon, Marcel Kahan, Avery Katz, Mark Ramseyer, Robert Rasmussen, Mark Roe, David Skeel, Susan Pierson Sonderby, Eugene Wedoff, and workshop participants at Vanderbilt, Georgetown, Yale, Columbia, Northwestern, University of Pennsylvania, NYU, Cornell, and Harvard for their help. I am especially grateful to the judges of the United States Bankruptcy Court for the Northern District of Illinois for giving me access to the court’s electronic records and to the staff of the court and the Seventh Circuit Court of Appeals (especially Steve Horvath, Jean Dalicandro, and David Dusenberry) for helping me download the data. Basil Alsikafi, Felton Booker, Alan Littmann, and Christopher Swart provided excellent research assistance. Financial support from the John M. Olin Foundation and the Lynde and Harry Bradley Foundation is gratefully acknowledged.
data include all corporate Chapter 11 filings during 1998; the vast majority of filings involve small firms with fewer than 20 employees. These data support the theory, and do not support conventional wisdom. Judges rendered shutdown decisions in over 40 percent of the cases and their decision-making was consistent with the implications of the theoretical models. This is shown using various empirical tests, including tabular comparisons and biostatistical duration models. These findings, and the additional finding that shutdowns occur rapidly (over 70% of shutdowns occur within the first five months of a case), are surprising and suggest that the behavior of bankruptcy judges may resemble that of market actors.

1. Introduction

Financially distressed corporations are shut down—operations are discontinued and assets sold off piecemeal—in a significant proportion of Chapter 11 bankruptcy cases, especially those involving small businesses. Some are shut down within weeks of filing a Chapter 11 petition, others after a year or more of legal protection. In either case, the shutdown decision is often made by a bankruptcy judge. When the judge grants a secured creditor’s motion to lift the automatic stay and seize core assets of the firm, or a landlord’s motion to repossess the debtor’s premises, or the U.S. Trustee’s motion to convert the case to Chapter 7, or many other motions, the judge effectively shuts down the firm.

This study examines how well judges make the shut-down decision. It compares the decision-making of members of a typical big-city bankruptcy court to that of a hypothetical market actor facing similar legal and institutional constraints. Would the outcomes of bankruptcy cases change if bankruptcy judges—inexperienced civil servants with no stake in the outcomes of their
cases—were replaced by rational actors seeking to maximize the return from troubled firms’ assets?\(^1\)

The rational-actor benchmark is derived from the literature on optimal stopping problems. I develop several models of judicial decision-making (a continuous-time real options model and a three-period matching model), each of which assumes that judges have the power to shut down failing firms, that shutdown decisions are irreversible (at least in part), and that these decisions can be delayed as information about a firm is accumulated. These models have two principal implications. First, the probability (or hazard) of shut-down should be hump-shaped over time due to a selection effect—the probability should be low when firms first file bankruptcy petitions because information about firm viability is limited; the probability should rise as information is obtained and terminal firms are identified; when most non-viable firms are eliminated, the probability of shutdown should fall because the remaining firms are those that will be reorganized or have highly uncertain futures. Second, the probability of shutdown should be negatively related to the variance surrounding the expected

value of a firm. The higher the variance, the greater the potential future payoff if a firm is kept intact. The downside risk (the possibility that a firm will have very low value in the future) is truncated because the firm can always be liquidated.

This rational-actor benchmark, Baird and Morrison\(^2\) argued previously, is appropriate because the Bankruptcy Code explicitly assigns judges the task of identifying optimal times to liquidate firms with highly uncertain futures. And, as Baird and Morrison (and recently Kahl\(^3\)) emphasized, great uncertainty typically surrounds the viability of a firm that enters financial distress. As the firm attempts to reorganize, either under the Bankruptcy Code or in a private workout, all parties to the case gain information and are better able to assess the firm’s viability. At some point (a “stopping time”) the parties will have sufficient information to determine whether the firm should survive or be liquidated. If the firm reorganizes under the Bankruptcy Code, that stopping point will be identified by a bankruptcy judge.

I compare the rational-actor benchmark against judicial behavior observed in the Northern District of Illinois, Eastern Division. The characteristics of this court and of its cases match those of most bankruptcy jurisdictions throughout United States (e.g., the vast majority of filings are by small firms with fewer than 20 employees\(^4\)). This study focuses on all corporate Chapter 11 filings during


\(^4\)See Elizabeth Warren and Jay Lawrence Westbrook, *Financial Characteristics of
1998. This amounts to 103 filings by 99 firms. For each firm, the study gathers
detailed information about events that triggered the firm’s financial distress, that
led to the firm’s shutdown in or exit from bankruptcy, and that led to the firm’s
success or demise after it exited bankruptcy. This information is obtained from
case files, state records, and interviews with managers of the firms and their
competitors.

This study departs markedly from previous work both because it addresses
an untested hypothesis and because it tests the hypothesis using a new dataset.5
The dataset answers three basic questions about all bankruptcy filings in a single
jurisdiction: Among firms that seek Chapter 11 protection, which have a corporate
form, ongoing operations, and multiple creditors and therefore present a
meaningful shutdown problem? Which of these firms exit bankruptcy intact, i.e.,
with largely the same configuration of assets? Among firms that do not exit
bankruptcy intact, what happens to their assets? Previous empirical work has
generally ignored these questions.6 Some studies have focused exclusively on

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5This study is, however, related to a recent paper by Joseph R. Mason, *A Real
Options Approach to Bankruptcy Costs: Evidence From Failed Commercial Banks During the
1990s*, Working Paper (Drexel Univ. 2002), which uses a real options approach to study
optimal timing of bank-liquidation decisions. These decisions are substantially different
from those made by bankruptcy judges for at least three reasons—a different set of laws
(the Federal Deposit Insurance Act, *et al*., not the Bankruptcy Code) govern bank
insolvencies, a different actor (an FDIC-appointed trustee, not a judge) makes bank shut-
down decisions, and the trustee’s decision to liquidate a bank (by selling off its portfolio
of financial assets) seems less irreversible than the judge’s decision to liquidate a firm
(which may have substantial sunk costs).

6But see Vojislav Maksimovic and Gordon Phillips, *Asset Efficiency and Reallocation
Decisions of Bankrupt Firms*, 53 J. Fin. 1495 (1998) (presenting evidence from manufacturing
procedural outcomes in Chapter 11 (e.g., time to confirmation of a plan of reorganization, dismissal, or conversion to Chapter 7) without considering the underlying substantive realities of the case. Other studies have focused on particular aspects of business bankruptcies that offer limited information about the economic outcomes of firms in bankruptcy. This study, therefore, helps fill a gap in the literature.

Empirical analysis suggests that actual judicial decision-making, at least in the Northern District, is consistent with the hypothetical rational-actor benchmark. We observe the hump-shaped hazard rate. And a variety of statistical techniques—tabular comparisons, simple logit models, and more sophisticated biostatistical duration models—confirm that the probability of shutdown is negatively correlated with the level of uncertainty surrounding firm value.

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firms that Chapter 11 neither helps nor hinders the redeployment of assets to higher valuing users); Gregor Andrade and Steven N. Kaplan, How Costly is Financial (Not Economic) Distress? Evidence from Highly Leveraged Transactions That Became Distressed, 53 J. Fin. 1443 (1998) (presenting evidence from highly leveraged transactions that Chapter 11 is not a significant source of the costs and benefits typically associated with financial distress).


Additionally, and surprisingly, I find that judges render shutdown decisions very quickly: about 50% of all shut-downs occur with the first three months of a case; 70% occur within the first five months.

These findings suggest that the costs\(^9\) of Chapter 11 are much smaller than its detractors claim, at least in cases involving small businesses. Instead of passive judges and debtors “in full control”—the image conjured in academic and popular writing\(^{10}\)—the evidence suggests that judges are quick decision-makers. We see a pattern of judicial decision-making roughly consistent with the decision-making process of market actors facing similar asset allocation problems.\(^{11}\)

These findings have important implications for the Bankruptcy Code, as applied to small-firm bankruptcies. First, the case for mandatory auctions and other market-mimicking regimes may be weaker than previously thought. Scholars proposed these regimes as solutions to the perceived costs of Chapter 11,\(^{12}\) but the evidence presented here suggests that these costs may not be high in cases involving small businesses.

Additionally, recent proposals to reform the Code, such as deadlines for confirmation of a plan of reorganization in small-firm bankruptcies, seem ill-conceived because they ignore the speed with which non-viable firms can be shut

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\(^{11}\)See Baird and Morrison, *Bankruptcy Decision-Making*, supra note 2.

down under current law. These reforms do little, if anything, to improve judicial decision-making along the most important margin in a bankruptcy case—the decision to shut down a failing firm. To improve decision-making along this margin in small-firm bankruptcies, sensible reforms should expand judicial discretion to respond quickly to new information about a firm’s health. This seems to be precisely the effect of a set of unique rules adopted by the Northern District. The Court’s motions practice allows judges to receive, hear, and decide motions at least twice each week. Only two days may pass between notice of a motion and the judge’s decision; in most other jurisdictions, weeks or months separate notice and decision. The Northern District’s unique motions practice allows its judges to respond quickly to information that a firm is failing. To the extent that the results presented here are driven by this unique practice, bankruptcy reform proposals should take notice.

These arguments are developed as follows. Section 2 sets out the theory underlying the empirical project (formal models appear in Appendices A and B). Section 3 describes the dataset; 4 presents preliminary results regarding bankruptcy judges’ expertise in shutting down failing firms, and 5 concludes.

2. Theory

This section offers a sketch of the theory (and underlying assumptions) motivating the subsequent empirical analysis. Appendices A and B present models that formalize the discussion here. The section closes with a comparison of the theory with conventional academic wisdom.
2.1  A Sketch of the Theory

The Bankruptcy Code entrusts judges with the option to shut down firms that seek to reorganize under Chapter 11 but have no viability in the long term.\textsuperscript{13} This type of shutdown decision is made routinely by market actors, such as the investor deciding whether to discontinue a troubled project and redeploy the assets to more profitable uses.\textsuperscript{14} The decision is also made by the worker deciding whether to quit a seemingly dead-end job and search for better employment,\textsuperscript{15} and by the contracting party deciding whether to repudiate a questionable contract today or at a future date.\textsuperscript{16} In each case, the market actor is faced with an irreversible decision but has the flexibility to wait for more information before exercising the “shutdown option.”

The theory of optimal stopping times—as studied in the economic literatures on real options and matching models—implies that a pattern will characterize shutdown decisions by market actors. Most importantly, the greater the uncertainty (or volatility) surrounding returns from the underlying venture, the greater the incentive to wait before exercising the shutdown option. The greater the uncertainty, the greater is the probability that the venture will be highly profitable tomorrow. There is, of course, also a higher probability that the

\textsuperscript{13}See Baird and Morrison, \textit{supra} note 2.

\textsuperscript{14}Avinash K. Dixit and Robert S. Pindyck, \textit{Investment Under Uncertainty} ch. 1-2, 7 (Princeton 1994), study this type of problem in detail.


venture will be unprofitable tomorrow, but the venture’s assets can be sold if this happens. The sale value of the assets provides a hedge against the downside risk from waiting to liquidate the firm. Hence, the greater the uncertainty surrounding a venture, the greater is the incentive to wait to exercise the shutdown option.\textsuperscript{17} Although this theoretical prediction can be reversed under certain conditions,\textsuperscript{18} it has been confirmed in recent studies of decision-making by market actors.\textsuperscript{19}

Additionally, since uncertainty surrounding the venture’s profitability decreases over time, the probability (or hazard rate) of exercising the shutdown option should decline over time. Additionally, the likelihood should be hump shaped—low initially, then rising, and ultimately declining—if firms file Chapter 11 petitions only when their value as going concerns is at least as great as their liquidation values (i.e., no firm files a petition when it is destined to be shut down immediately by the bankruptcy judge). The probability should be low when the market actor is first entrusted with the shutdown option because uncertainty is high. As information is obtained and uncertainty resolved, the actor should have stronger incentives to exercise the option. The probability of shutdown will

\textsuperscript{17} \textit{Id}. For application to a firm’s decision whether to shut down its operations, see Andre Kronimus, \textit{Valuation and Optimal Liquidation of Growth Companies}, Working Paper (WHU-Otto Beisheim Graduate School of Management 2002).

\textsuperscript{18} See the discussion in Luigi Guiso and Giuseppe Parigi, \textit{Investment and Demand Uncertainty}, 114 Q. J. Econ. 185 (1999).

therefore rise as ventures with no viability are discovered and abandoned. Once the shutdown option is exercised in these cases, however, the only remaining ventures will be those with relatively high profitability (put differently, the shutdown option is “out of the money”) or those with highly uncertain profitability. Some of these firms will never be shut down; others will be shut down only after a delay, during which the decision-maker gathers information about the firms’ viability. Thus, the probability of shutdown should fall gradually over time. While this implication is rarely discussed in the real options literature, it is regularly discussed (and empirically verified) in the related literature on matching models.

These two implications of stopping-time models provide a benchmark for evaluating decision-making by bankruptcy judges. Judges, like market actors, must decide whether to shut down troubled firms or wait for more information about their viability. If a firm is shut down, creditors receive the sale value of its assets; if it is kept intact, the parties receive the firm’s uncertain stream of future earnings. The judge must decide whether this stream of earnings is sufficiently promising to warrant keeping the firm intact, even if the firm is losing money today. The traditional justification for Chapter 11 is that this stream of earnings

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will be sufficiently promising in a significant number of cases. In these cases, the firm has “going concern surplus.” The surplus may exist because the firm owns specialized assets, such as managerial expertise and specialized machinery, which have little or no value outside the firm. Or the surplus may exist because the firm incurred sunk costs, such as the transaction costs of assembling the firm’s employees and assets, which cannot be recovered if the firm is shut down. The presence of these specialized assets or sunk costs can raise the value of the firm as a going concern above the value of its assets at a liquidation sale.

Put differently, the theory of optimal stopping-times is applicable to judicial decision-making under Chapter 11 if three assumptions hold:

(A1) Firms in bankruptcy either possess specialized assets or have incurred sunk costs, which drive a wedge between the firms’ liquidation value and the cost of reassembling the firm.

(A2) Bankruptcy judges have flexibility in deciding when to exercise the shut-down option, and

(A3) Bankruptcy judges are better able to estimate the viability of a financially distressed firm as information is accumulated during the pendency of a Chapter 11 petition.

These are natural assumptions. Assumption (A1) is sensible because every firm incurs transaction costs in hiring workers, purchasing assets, and entering contracts with suppliers and customers. Many firms also possess assets that have little value outside the firm (e.g., a restaurant’s fixtures) or the industry (e.g., a brewery’s equipment). Although it is questionable whether these transaction costs
or specialized assets are significant in the case of small firms,\textsuperscript{22} it seems uncontroversial that these costs or assets exist in every firm. Assumption (A2) is unproblematic as well. The Bankruptcy Code gives judges the power to grant or reject a variety of motions, e.g., a motion to lift the automatic stay, which will result in liquidation of a firm. Finally, Assumption (A3) merely reflects the great uncertainty surrounding the value of a troubled firm’s assets and debts when it first files a Chapter 11 petition. During the pendency of a Chapter 11 petition, the parties acquire new information about the extent of the firm’s insolvency and learn whether the firm’s troubles reflect a bad business model (economic distress) or a bad capital structure (financial distress). As an aside, it should be noted that (A3) is a sufficient, but not necessary, condition. It ensures that the hazard rate of shutdown will be hump-shaped and that the hump will appear fairly quickly in a case (the faster the judge obtains information about firms, the sooner the hump appears). The hazard will be hump-shaped even if this assumption is not satisfied, but it will take longer for the hump to appear (it appears only after a sufficient number of firms have received negative shocks and been shut down). See Teulings and van der Ende\textsuperscript{23} for more details.

The judge’s decision whether to shut down a firm is therefore analogous to a market actor’s decision whether to shut down a project. This is not to say that the judge’s decision-making process is identical to that of a typical market actor. Judges face different legal and institutional constraints than a market actor. The

\textsuperscript{22}See Baird and Morrison, \textit{Human Capital Firms and the Irrelevance of Bankruptcy Law}, supra note 9.

\textsuperscript{23}\textit{Supra} note 20.
Bankruptcy Code, for example, gives failing firms time to attempt a reorganization even if a market actor would liquidate the firms automatically. Moreover, the Code gives firms bargaining power that a market actor typically lacks (e.g., the power to breach collective bargaining agreements). On the other hand, in a world without bankruptcy law the fate of a troubled firm would not be made by a single market actor. The future of a firm is decided by the debtor and its many competing creditors. Bankruptcy law attempts to replace the collective action problem created by these competing interests with an orderly, coordinated process overseen by a single actor, the bankruptcy judge. For these reasons, the outcomes we observe in bankruptcy courts are, without doubt, very different from those we would observe in a world without bankruptcy law. And this study makes no claim that the behavior of judges resembles the behavior of market actors in a world without bankruptcy law. Rather, it argues that the behavior of bankruptcy judges resemble that of market actors who have been assigned (perhaps by the legal system) the task of deciding whether to liquidate or continue a financially distressed firm.

Formally, we can model the judge’s shutdown decision several ways. Appendix A\(^2\) develops a continuous-time model derived from the real options literature.\(^2\) Appendix B lays out simple discrete-time matching model derived


\(^{2}\) Chen and Sundaresan develop a more general model of the shutdown decision and extend it to consider debtor-in-possession financing. See Nan Chen and Suresh Sundaresan, *The Optimal Bankruptcy Resolution and the Role of Debtor in Possession Financing*, Working Paper (Columbia Business School 2003).
from the job matching literature. Both models yield the same conclusions even though they make somewhat different assumptions about the judge’s information and the evolution of firm value.26 The matching model assumes that the value of a firm is uncertain but constant over time. Uncertainty (and the variance in firm value) declines as information about the firm is accumulated. The real options model, in contrast, assumes that the value of a firm is certain at any given point but will change unpredictably over time. The future evolution of firm value is uncertain, and this uncertainty (and the variance in firm value) does not decline as information about the firm is accumulated. Scholars have recently attempted to synthesize the two models.27 I do not attempt this here.

2.2 Theory versus Conventional Wisdom

This empirical project conjectures that the bankruptcy process will in fact generate outcomes similar to those generated by the decision-making of market actors. Bargaining among the parties to a bankruptcy proceeding—creditors, debtor, and judge—will move the case in the direction of an efficient outcome that leaves no valuable opportunities on the table.28 This conjecture represents a much different vision of the bankruptcy process than that offered by many bankruptcy scholars. Conventional wisdom has it that the actual decision-making of bankruptcy judges is far removed from this market-actor baseline. Bankruptcy judges, it is commonly believed, are biased in favor of keeping failing firms intact.

26Teulings and van der Ende, supra note 20, explain these differences in greater detail.

27See, e.g., Mayor, Schonbucher, Wilmott, Whalley, and Epstein, supra note 20.

even if all creditors are made worse off.\textsuperscript{29}

This “pro-continuation” bias is made manifest by the story of Eastern Airlines, which burned through $1.3 billion dollars during 22 months of bankruptcy protection because the judge was determined to keep the firm alive.\textsuperscript{30} The bias can also be seen, according to Chapter 11’s critics, in the bankruptcy experience of smaller firms. The debtor is in “full control” and can run its business as long as it wishes without interference from the judge or creditors. Judges are passive and creditors are unable to shut down failing firms.\textsuperscript{31} Not all observers agree with this “conventional wisdom,” but even those who disagree often argue that the Chapter 11 process is too slow, especially for small firms.\textsuperscript{32}


\textsuperscript{31}See, e.g., LoPucki, supra note 10.

\textsuperscript{32}See, e.g., National Bankruptcy Review Commission, \textit{Bankruptcy: The Next Twenty Years} 609-10 (1997) (noting the large fraction of small-business cases in which the “debtor has no reasonable prospect of rehabilitation” and finding “a need for a longer list of reforms aimed at identifying those cases early and removing them from Chapter 11 via dismissal or conversion to Chapter 7”). See also Leif M. Clark, \textit{Chapter 11—Does One Size Fit All?}, 4 Am. Bankr. Inst. L. Rev. 167, 197-200 (1996) (The author, a bankruptcy judge, argues: “Bankruptcy judges may not be adequately trained to do their jobs effectively.”).
These arguments have led some to suggest that bankruptcy judges are ill-equipped to exercise the shutdown option that Chapter 11 puts in their hands. This study suggests that the conventional wisdom is overstated, and perhaps wrong, at least as applied to the mass of small-firm bankruptcies. Bankruptcy judges may make shutdown decisions in a manner that is consistent with the way a market actor makes such decisions.

3. Data and Summary Statistics

This section describes the data-collection methodology and presents summary statistics describing the firms and observed outcomes.

3.1 Sampling Procedure

This study gathered in-depth data on outcomes of a typical, big-city bankruptcy practice outside of Delaware and the Southern District of New York. The Northern District of Illinois, Eastern Division, was chosen because of its size and the availability of data. The Northern District’s jurisdiction encompasses Chicago, Cook County, and outlying areas—a large and diverse economy much like those within the Northern and Central Districts of California (covering Los Angeles and San Francisco), the Northern and Southern Districts of Texas (covering Dallas and Houston), and the District of New Jersey and Eastern District of Pennsylvania (covering Atlantic City and Philadelphia).

33If this problem is real, however, it is not merely an artifact of Chapter 11. It attends most proposals to reform the Code. Only a regime of mandatory auctions, which places the shutdown option in the hands of a market actor as quickly as possible, would avoid the purported bias in judicial decision-making. See Baird and Morrison, Bankruptcy Decision-Making, supra note 13, at 366-68.

34As of July 1999, these jurisdictions covered the largest Metropolitan Statistical
jurisdictions, the Northern District of Illinois employs respected judges who had nearly ten years of experience, on average, and had been schooled at national and regional law schools. See Table 2 (all tables appear in Appendix D). In the 1990s, the Northern District was not a favored venue for bankruptcy filings by large, publicly traded corporations. Such filings, at least during the 1990s, tended to be filed in the District of Delaware or the Southern District of New York.\textsuperscript{35}

In addition to its size and similarity to other major jurisdictions, the Northern District was chosen because of its rich supply of data. The court’s judges gave me access to a database\textsuperscript{36} containing images of every filing and judicial order in cases commencing after January 1, 1998. This resource was complemented by another database, maintained by the Illinois Secretary of State, which identifies the founders, founding date, and termination date of most firms in the court’s database.

This study focuses on outcomes in cases filed during 1998, the first year of data made available by the Northern District. For each case, the court’s database offers detail about the troubled firm’s finances (assets, debt), history (including


\textsuperscript{36}The database, Public Access to Court Electronic Records (PACER), is available for a fee at pacer.uscourts.gov. The Northern District waived the fee in my case.
events that led to the bankruptcy petition), and experience in bankruptcy (e.g.,
time in bankruptcy, types of motions filed by the debtor and its creditors, types of
court orders). This data is supplemented by the Secretary of State’s information
about the dates of firm founding and termination. In addition, information about
a firm’s experience after exiting bankruptcy was obtained through telephone
interviews with the firm’s current and former managers, managers of companies
that purchased the troubled firm’s assets, competitor’s managers, newspaper
reporters, and other sources.

During 1998, 184 Chapter 11 petitions were filed in the Northern District.
Not all filings are relevant to this study. As Table 1 shows, 42 filings by
individuals—mostly entrepreneurs running sole proprietorships—were excluded;
these types of filings involve personal bankruptcies and raise distinct social and
economic issues. The study also excluded 22 filings by real estate ventures (e.g.,
firms with a single asset, such as an undeveloped piece of real estate, and a single
creditor, the mortgagee) which also raise distinct economic issues.37 These types
of exclusions have not been made in previous empirical studies.38

Filings by two firms that had already shut down by the time of their
Chapter 11 petition were omitted as well; these firms used the bankruptcy process
merely to fend off secured creditors or to resolve property-ownership disputes
among the shareholders. The study also omitted seven filings by firms about

37See, e.g., Kenneth Klee, One Size Fits Some: Single Asset Real Estate Bankruptcy
Cases, 87 Cornell L. Rev. 1285, 1296-1302 (2002) (discussing arguments for and against
reorganization of single asset real estate ventures).

38See, e.g., Warren and Westbrook, supra note 4; Bufford, supra note 7; Fenning and Hart, supra note 7; LoPucki, supra note 10.
which insufficient information was available and one involuntary petition that was filed at the same time the debtor filed a voluntary petition (the petitions were consolidated by the bankruptcy court). Finally, the study consolidated filings by sister companies (the Court did so as well), which reduced the number of filings by 7. The final sample, then, consisted of 103 filings by 99 firms (three firms filed multiple petitions during 1998 and each petition was counted separately\textsuperscript{40}).

3.2 Firm Characteristics

The firms that sought bankruptcy protection in the Northern District of Illinois during 1998 were very small. See Table 3. Whereas the Small Business Administration defines a “small business” as a firm with fewer than 500 employees,\textsuperscript{41} 81% of the firms in this study had fewer than 20 employees and 96% had fewer than 100 employees. In terms of assets and debts, the firms were similarly small. Nearly 50% of the firms had less than $100,000 in assets; 75% had less than $1 million. Perhaps unsurprisingly for these types of firms, most were young (63% were less than ten years old) and owned and managed by a family or small group of investors (86% of firms fell within this category). The firms represented a broad cross-section of industries.

\textsuperscript{39}For example, the three outlets of a family-run fur retailer (Andriana Furs) filed separate Chapter 11 petitions. The Court consolidated these petitions; so will this study.

\textsuperscript{40}Although counted separately, these petitions were treated as potentially correlated cases in the statistical analysis below. More formally, the analysis computes robust standard errors, allowing for correlation across petitions filed by the same firm.

Although quite small, the firms in this sample resembled small firms generally. Table 3 compares the sample firms to firms surveyed in the Federal Reserve Board’s 1998 Survey of Small Business Finance (SSBF), a nationally representative sample of businesses with 500 or fewer employees. Although the survey includes real estate ventures (which this study excludes) and excludes nonprofits (which this study includes), the SSBF firms and the firms in this study (“sample firms”) are roughly comparable. The primary differences are that sample firms tend to be larger (in terms of employees and assets), slightly younger, and more concentrated in Retail Trade. Some of these differences probably reflect differences in the composition of the samples. SSBF firms, for example, include sole proprietorships (many of which are treated as having zero employees) while all sample firms are corporations (none of which have zero employees). Other differences, especially differences in industrial composition, undoubtedly reflect the relatively high failure rates in some industries (e.g., Retail Trade). But selection effects are also at work here. Only a fraction of all failing firms seek bankruptcy protection and it is unclear whether the firms in this study are representative of all troubled firms in the local economy.


43 During 1998 in Illinois, for example, nearly 30,000 firms were terminated (either by shutting down or by merging with another business) while only 1,500 firms sought bankruptcy protection. See Small Business Administration, Small Business Economic Indicators 2000, Tables 8-9, available at www.sba.gov/advo/stats/sbei00.pdf. In 1997, Dun & Bradstreet reported that bankruptcy petitions were filed by only 65% of firms that
The characteristics of the sample firms are, however, typical of small business bankruptcies throughout the country. As Panel A of Table 4 illustrates, the demographics of firms in this study are remarkably similar to the demographics observed in studies of cases in other jurisdictions. The study by Warren and Westbrook is perhaps the best benchmark because of its recency and comprehensiveness: it gathers data on all bankruptcy filings by business organizations in 23 districts (generally, the largest and smallest districts in each judicial circuit) during 1994. The authors found that about 66% of Chapter 11 filings involved firms with less than $1 million in debt and about 80% involved firms with less than $1 million in assets. The corresponding figures for this study are 67% and 82%. Similarly, Warren and Westbrook found that about 88% of all filings involved firms with less than 20 employees; the corresponding figure for this study is 81%.

Similarly, the industry profile of firms in this study is roughly comparable to the profile of firms found in other studies. This comparison, however, cannot be done using the statistics set forth in Table 3, which classifies firms using the Standard Industrial Classification (SIC) system. Prior studies have not used this system. Instead, they have computed industry demographics using the ten business categories listed on the standardized “face sheet” of most Chapter 11 petitions. The debtor must select one of these categories when it submits a petition. Although this classification method is known to be flawed, it is failed and were unable to creditors in full. Small Business Administration, *Small Business Economic Indicators* 1998, Table 6.1, available at www.sba.gov/advo/stats/sbei98.pdf.

44Because the Chapter 11 face sheets give debtors no instructions and do not define the business categories, similar businesses will often choose different business
commonly used in empirical studies, perhaps because it is a convenient and accessible classification method. Panel B of Table 4 uses the method to recompute the industry demographics for this study. Once filings by individuals and real estate ventures are added back to this study—because they are included in the Warren and Westbrook study, which again is the best comparison—we see many similarities: professional service firms account for 3.5% of the cases in this study and 3.7% of the cases in the Warren and Westbrook study, Retail and Wholesale firms account for 12.7% of this study’s cases and 15.6% of Warren and Westbrook’s cases, and Construction makes up 5.2% of this study’s cases and 7.5% of Warren and Westbrook’s cases. Together, these similarities suggest that the bankruptcy filings in this study may be typical of filings in most jurisdictions, especially those outside of Delaware and the Southern District of New York.

3.3 Petition Characteristics

The Northern District’s case files provide detail about the events leading to a firm’s bankruptcy petition and the firm’s fate in bankruptcy. Most firms sought bankruptcy protection as a last resort—the landlord threatened to evict, a creditor threatened to enforce a judgment lien, or the IRS threatened to seize assets. It is difficult to identify precisely the factors that pushed each debtor into financial distress; Panel A of Table 6 lists the reasons given in the few cases (about a third) in which the debtor explained the causes of its distress. Although the causes of financial distress are unclear, it is easier to understand why debtors resorted to categories. While some restaurants, for example, will choose the “Retail/Wholesale” category, others will choose “Other.” See also Warren and Westbrook, supra note 38, at 529-30.
Chapter 11 to resolve that distress. As Panel A of Table 6 illustrates, in nearly 80% of the cases, the debtor’s shareholder-managers were personally liable for the corporation’s debts. The shareholder had either guaranteed a loan or was a responsible party under the Internal Revenue Code\(^{45}\) and personally liable for payroll taxes not delivered to the federal government. Chapter 11 offered an opportunity to renegotiate with the creditor or the IRS\(^{46}\) and avoid personal liability.\(^{47}\)

A firm’s fate in bankruptcy is only loosely tied to the legal outcome of its petition. Forty-one debtor corporations emerged from bankruptcy intact, but only a fraction emerged via a plan of reorganization.\(^{48}\) As Table 5 illustrates, a plan of

\(^{45}\)26 U.S.C. §6672(a).

\(^{46}\)Indeed, it appears that the IRS will not negotiate payroll tax liability unless the debtor corporation has filed a bankruptcy petition. Interview with Chief Judge Eugene R. Wedoff, United States Bankruptcy Court for the Northern District of Illinois (Dec. 3, 2002).

\(^{47}\)Both creditor and shareholder-guarantor may be better off if the debtor corporation files a Chapter 11 petition than if the corporation files no petition, depletes its assets, and forces the creditor to call on the shareholder’s guarantee. The creditor is better off because the Chapter 11 filing protects the firm’s assets from dissipation, thereby increasing funds available for repayment. See, e.g., Douglas G. Baird, The Initiation Problem in Bankruptcy, 11 Int’l. Rev. L. & Econ. 223, 224 (1991). This will be especially true in cases involving small firms, in which shareholders have often invested most of their personal savings and have little with which to satisfy their personal guarantees. The shareholder is also better off if the firm files a Chapter 11 petition. Because of the personal guarantee, he or she cannot walk away from the firm and start over again. Much like a Chapter 7 discharge, renegotiation within Chapter 11 gives the shareholder-guarantor an opportunity for a “fresh start.”

\(^{48}\)This finding is consistent with observations made by Douglas G. Baird and Robert K. Rasmussen, The End of Bankruptcy, 55 Stanford L. Rev. 751 (2002). They find that traditional reorganizations have become the exception, not the rule, in Chapter 11 cases generally.
reorganization was proposed and confirmed in only 28 cases (27% of the 103 petitions). And in four of these cases the plan was non-traditional: the firm was sold off and the “plan” merely allocated the sale price among the creditors. Another 13 firms exited bankruptcy intact without confirming a plan of reorganization. These firms’ petitions were dismissed after the debtor renegotiated debts with major creditors or arranged a going concern sale to a third party.

In the remaining 63 cases, a bankruptcy judge rendered a “shutdown decision” that created a significant probability that the firm would be shut down. This “shutdown decision” led immediately to the firm’s liquidation in 41 of the 63 cases—19 in which the firm’s petition was converted to Chapter 7 and 22 in which the Chapter 11 petition was dismissed. Operations ceased and the firm’s assets were sold off over a period of weeks or months. In another 22 cases, the judge’s “shutdown decision” exposed the firm to shutdown but did not lead to immediate liquidation. In these cases, the debtor’s petition was dismissed and the firm was exposed to the possibility that creditors would resort to state law remedies and seize its assets. The firms nonetheless survived for weeks or months. In 7 of these cases, the firm shut down within 12 months of dismissal. In another 15 cases, the firm survived at least one year after dismissal, and all but one of these firms is in business today. These firms, it seems, were able to renegotiate with their

49 A bankruptcy judge will dismiss a case in lieu of converting to Chapter 7 if the debtor has no assets unencumbered by liens; with no assets available to unsecured creditors, there is no benefit to a Chapter 7 proceeding, which generates administrative costs. Interview with Chief Bankruptcy Judge Eugene R. Wedoff, supra note 46.

50 The available data does not indicate how long these firms survived; indeed, they may have shut down immediately after dismissal.
creditors after dismissal; it is unclear why they were unable to reach a compromise prior to dismissal.

There are, then, three possible economic outcomes in a Chapter 11 case—a firm may (1) exit intact (but perhaps smaller in scale), (2) be exposed to shut down and then be liquidated immediately, or (3) be exposed to shutdown but survive for months or years before shutting down. A firm’s fate, however, may not be known to the judge when he or she dismisses or converts a petition, and thereby exposes the firm to shutdown. In some cases (e.g., conversions to Chapter 7), the judge may be fairly confident that the firm will be shut down immediately. He or she may be less confident in other cases, especially those involving dismissals.

Because the judge’s level of confidence is not known, the analysis that follows will consider alternative definitions of the judge’s shutdown decision. One definition treats the “shutdown decision” as any decision—either converting a case to Chapter 7 or dismissing a Chapter 11 petition—that exposes the firm to liquidation. Not all “shutdown decisions” lead to death (just as not all patients die when life support is withdrawn), but the judge probably expected that the likelihood of shutdown loomed large. Alternatively, we can define a “shutdown decision” as any decision that not only exposes a firm to shutdown but also causes the firm to shutdown within, say, a year (a firm’s shutdown date was derived from state records and interviews with the firm’s former owners). I call these decisions “effective shutdown decisions.” This restrictive definition accounts for the possibility that judges know when a dismissal or conversion will lead to immediate shutdown. The analysis below will use both definitions to evaluate judicial decision-making.
4. Empirical Analysis

The theory developed in section 2 generated two testable implications. If judicial decision-making resembles the decision-making of rational actors, we should observe (1) that the hazard rate of shutdown is hump-shaped and (2) that quick shutdowns tend to occur in cases in which the uncertainty surrounding the firm’s earnings is relatively low. This Chapter tests these implications using data from the Northern District of Illinois: Section 4.1 analyzes the hazard of shutdown, 4.2 analyzes the correlation between earnings uncertainty and shutdown decisions, 4.3 comments on judicial motivation, 4.4 addresses the generalizability of the findings presented here, and 4.5 discusses extensions.

4.1 The overall likelihood of shutdown

We do observe a hump-shaped hazard rate. Figure 1 (all figures appear in Appendix C) plots the number of shutdown decisions per month; Figure 2 does the same, but looks at “effective shutdown decisions” (those that exposed the firm to shutdown and led to liquidation within 12 months). In both figures, the likelihood of shutdown increases during the first three months of a bankruptcy petition, reaches a maximum around 3 months, and then falls. The likelihood spikes upward again late in the bankruptcy proceedings, but these spikes reflect the paucity of data at these durations (most firms are either shut down or reorganized within the first 12 months of a case). This pattern is repeated in Figures 3 and 4, which plot the hazard of shutdown, i.e., the probability that a judge will exercise the shutdown option in month $t$ given that the option has not been exercised before.

Perhaps more striking is the speed with which failing firms are shut down. A bankruptcy judge rendered a shutdown decision in 63 cases. As Panel C of
Table 6 shows, 46% of these decisions were made within the first three months of the case; 70% were made within the first five months. If we focus exclusively on effective shutdown decisions, we see greater speed: 54% of these decisions were rendered within the first three months of the case; 75% were made within the first five months.

This is rapid decision-making. Decisions may not be made much faster in a bankruptcy regimes that uses market-mimicking mechanisms (such as auctions) to reallocate the assets of troubled firms. In Sweden, for example, where bankrupt firms are auctioned off, the average auction takes 2.4 months (with a standard deviation of 3.4 months). And, as Panel B indicates, over 75% of the shutdown decisions were made on the motion of a creditor or the U.S. Trustee. (The results for immediate shutdowns are similar.) The debtor rarely agreed to shut down; indeed, when the debtor itself moved to shut down, often its hand had been forced by a creditor, whose motion to lift the automatic stay had been granted.

This pattern—quick shutdown on the motion of a creditor or the U.S. Trustee—is in stark contrast to the conventional wisdom of “debtors in full control.” Instead of passive judges and debtors able to run firms as long as they wish, we see judges who respond quickly to information that a firm is failing.

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51See Karin Thorburn, Bankruptcy Auctions: Costs, Debt Recovery, and Firm Survival, 58 J. Fin. Econ. 337 (2000). Since Thorburn’s data is limited to firms with 20 or more employees, and my sample is dominated by firms with fewer than 20 employees, I am assuming that auctions of small firms in Sweden are not significantly faster than auctions of slightly larger firms (most firms in Thorburn’s dataset are still quite small—50% have less than $1.3 million in assets).
4.2 **Determinants of Judicial Decision-Making**

The hump-shaped pattern is suggestive, but we can say more by looking at the factors driving judicial decision-making. The discussion here focuses first on simple tabular comparisons, which reveal important patterns in judicial decision-making, and then on statistical analysis.

### 4.2.1 Tabular Comparisons

Table 7 presents the tabular comparisons; it compares cases in which the judge rendered a shutdown decision within the first four months of the case (“Quick”) against both cases in which she exercised it later in the case (“Slow”) and cases in which no shutdown decision was made (“Continuing Firms”). Panel A shows that Quick shutdown decisions involved firms with significantly fewer workers: while 97% of these firms had fewer than 20 employees, 76% of slow-shutdown firms and 71% of surviving firms had so few workers. Quick shutdowns also involved younger firms: about 53% of them were less than 5 years old; only about 30% of slow-shutdown firms and surviving firms were so young. Quick-shutdown firms were also smaller in terms of assets and debt: 87% had debt under $1 million and 66% had assets under $100,000. The percentages for slow-shutdown firms were 68% and 52% and for surviving firms were 56% and 27%.

Panel B illustrates other differences. Slow-shutdown firms and surviving firms were significantly more likely than quick-shutdown firms to have filed a

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52 The differences between quick shutdowns and surviving firms are statistically significant at the 5% level; the differences between quick and slow shutdowns are only marginally significant or not at all, probably reflecting the small number of slow shutdowns.
motion to use cash collateral or offer adequate protection to creditors (“Cash Collateral Motion Presented”). A motion to use cash collateral is filed by a debtor who wants to use incoming cash that is subject to a security interest. Because the debtor exposes itself to scrutiny by creditors and the court when it files such a motion, it will typically obtain the secured creditor’s blessing prior to filing. The filing of the motion, therefore, is a strong indicator to the judge that both the debtor and the creditor believe the firm is a viable enterprise.

Panel B also shows that slow-shutdown firms (and, of course, surviving firms) were significantly more likely than quick-shutdown firms to have filed a plan of reorganization (“Plan of Reorganization Proposed”), which generally induced the bankruptcy judge to defer exercising the shutdown option. Additionally, surviving firms were significantly less likely than quick-shutdown firms to have engaged in conduct (e.g., multiple filings, not listing a key creditor on schedules) that was deemed an abuse of process by the judge (“Evidence of Abuse of Process”).

Most of these differences are commonsensical. We would expect younger, very small, thinly capitalized, disorganized firms to be the most likely to encounter distress and to be the least likely to reorganize. Other studies have found similar patterns. These patterns do suggest that the quick shutdowns observed here are not random.

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53For reasons discussed below, such a motion is a proxy for firms with prospects as going concerns.

54Interview with Chief Judge Eugene R. Wedoff, United States Bankruptcy Court for the Northern District of Illinois (Dec. 3, 2002).

55See, e.g., LoPucki, supra note 10, at 108-110; Clas Bergstrom, Theodore Eisenberg,
They may also be consistent with the real options model of shutdown decisions. Theory predicts that, ceteris paribus, shutdown decisions should be rendered more quickly in cases involving firms with relatively low levels of earnings volatility. I employ two proxies for earnings volatility. One proxy is industry volatility, as measured by the standard deviation of monthly returns on a portfolio of publicly traded corporations in the industry.\textsuperscript{56} This proxy (“Industry Volatility”) is computed using data from 1995-1997, the three years prior to the bankruptcy filings in this study (a three-year window appears to be a standard time-frame for assessing volatility). Intuitively, this measure accounts for all long-term sources of earnings volatility in each industry.

One problem with this measure, however, is that it is based on stock returns of publicly-traded corporations, which are significantly larger than most firms in this study. Ideally, we should use a proxy that measures the earnings volatility of small privately-held businesses. The only readily-available information on such businesses comes from the SSBF. Although this survey does not offer longitudinal data on small businesses earnings, it does offer cross-sectional data. This is useful because it seems reasonable to assume that industries with relatively high earnings volatility over time are also industries with relatively high earnings volatility across firms. Earnings of biotech firms are relatively volatile both cross-sectionally and longitudinally; earnings of construction firms

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\textsuperscript{56}The stock-return data was taken from the 48 Industry Portfolios maintained by Eugene Fama and Kenneth R. French. See \url{mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html}.
\end{flushright}
are less volatile along both margins. Applying this intuition, I proxy earnings volatility using the standard deviation of profits among firms with both the same 1-Digit SIC code and fewer than 20 employees. (Data limitations make it difficult to use 2-Digit SIC codes.) This proxy is denoted “Small Firm Volatility”.

Panel C of Table 7 shows that quick shutdown decisions involved firms with relatively low Industry Volatility, as theory would predict. The difference between quick- and slow-shutdown firms is significant at the 10% level. The alternative proxy, Small Firm Volatility, gives the opposite result: Profit Volatility is lower among slow-shutdown firms than quick-shutdown firms. While this difference is inconsistent with theory, it is insignificant statistically. (Note also that Profit Volatility is higher among continuing firms than among quick-shutdown firms, which is consistent with theory.)

### 4.2.2 Statistical Tests

Tabular comparisons, however, are only a start. We can examine more closely the determinants of shutdown decisions using duration and discrete choice models. Duration models identify factors reducing or increasing the speed with which judges render shutdown decisions. Discrete choice models (such as a logit) identify factors increasing or decreasing the likelihood of making a shutdown decision. The theory outlined in Section 2 suggests that three factors are important in either model: (1) the uncertainty or volatility surrounding the firm’s earnings, (2) the firm’s going-concern value, and (3) the payoff from liquidation. As the volatility surrounding firm earnings increases (all else constant), the judge’s incentive to render a shutdown decision should fall. The incentive should also fall as going-concern value rises above the payoff from liquidation; the
shutdown option is “out of the money” because the firm is worth more alive than dead.

These variables are difficult to measure. As mentioned earlier, volatility can be proxied using “Industry Volatility” and “Small Firm Volatility.” The payoff from liquidation can be proxied using the debtor’s estimate of the value of its assets (“Log Assets”). Going-concern value is the most difficult to measure. In the analysis below, I use a variety of proxies. The most promising is a dummy variable indicating whether the debtor submitted a motion to use cash collateral (“Cash Collateral Motion”). As noted before, a debtor typically will not submit this type of motion unless the secured creditor consents, and judges interpret the motion as evidence of going-concern value. Table 8 lists and defines each of these variables. The table also lists several other variables that may proxy for going-concern value and will be employed in the duration and discrete choice models presented below.

Table 9 reports the results of a specialized duration model, known as a “cure” or “split population” model, which estimates the amount of time a firm spends in bankruptcy before being shut down. The model is borrowed from the biostatistical literature\(^{57}\) because, unlike traditional econometric “survival” models, it recognizes that only a fraction of all firms that suffer a disease (financial distress) will actually die (be shut down) because of the disease. Some will die;

others will become “cured” (reorganized) and exit bankruptcy intact. A traditional econometric model assumes that all “diseased” firms will eventually be shut down. The biostatistical “cure” model, in contrast, accounts for the probability that some firms will be “cured” and others will “die.” For those that die, the model simultaneously identifies the factors speeding up or slowing down the time to death.

The likelihood function is assembled as follows. Following Schmidt and Witte, let $S$ be an unobservable variable indicating whether a firm would be shut down in bankruptcy if the bankruptcy judge were given sufficient time to gather information about the firm. Let $S$ equal one if a firm would be shutdown and zero otherwise. Assume that the probability that $S$ equals 1 is $\delta$: $\Pr(S = 1) = \delta$ and $\Pr(S = 0) = 1 - \delta$. Next, let $t$ measure the amount of time a firm spends in bankruptcy before being shut down. Assume that $t$ is distributed according to some cumulative distribution function $G$. Thus, the density of firms that are shut down after $t$ months in bankruptcy is $g(t|S = 1)$. Finally, let $C$ be a dummy variable indicating whether information about a firm is “censored,” i.e., we know that the firm exited bankruptcy but do not know whether it would have been shut down had it stayed. Let $C$ equal zero if a firm is shut down in bankruptcy and one if it exits. If a firm exits bankruptcy without being shut down, let $T$ measure the amount of time the firm spent in bankruptcy.

With these definitions in hand, we can write the contribution to the likelihood function by firms (indexed by $i$) that are shut down in bankruptcy:

\[ \text{likelihood function} \]

\[ \text{Supra note 57, at 148-49.} \]
\[ \Pr(S = 1) g(t_i | S = 1) = \delta g(t_i | S = 1). \]

For firms that exit bankruptcy intact (indexed by \( j \)), the contribution to the likelihood function is

\[ \Pr(C = 1) = \Pr(S = 0) + \Pr(S = 1) \Pr(t > T_j | S = 1) = (1 - \delta) + \delta [1 - G(T_j | S = 1)]. \]

Therefore, the likelihood function is

\[ L = \sum_i \delta g(t_i | S = 1) + \sum_j \left\{ (1 - \delta) + \delta [1 - G(T_j | S = 1)] \right\} \]

where \( \sum_i \) sums over firms shut down in bankruptcy (\( C=0 \)) and \( \sum_j \) sums over firms that exited bankruptcy intact (\( C=1 \)). Estimates reported in Table 9 assume that \( G \) is a lognormal distribution, a standard assumption in settings where the hazard rate is non-monotonic, as it is here. The model also assumes that \( \delta \) is a scalar with lognormal distribution.

Column (1) of Table 9 reports the results of a cure model with base-line proxies for earnings volatility, going-concern value, and payoff from liquidation. If a factor leads to slower shutdown decisions (more time in bankruptcy), the model reports a positive coefficient. The coefficients on Industry Volatility and Cash Collateral Motion are both positive and highly significant, indicating that judges are more reluctant to render shutdown decisions when earnings volatility is relatively high and when the firm has probable going concern value. The effect of Small Firm Volatility is also positive, but insignificant. These results are consistent with the theory developed in Section 2: judges are more patient when there is greater uncertainty surrounding firm earnings.
The results in Column (I) are fairly robust. Columns (II) through (IV) of Table 9 gradually add variables that might proxy for going-concern value (or even for earnings volatility). None are significant; their primary effect seems to be to reduce the degrees of freedom and thereby reduce the significance of Industry Volatility. Tables 10 and 11 provide additional robustness checks. Table 10 considers “effective shutdown decisions”—those that exposed a firm to shutdown and led to liquidation within 12 months. This alternative definition has no meaningful effect on the analysis; the results reported in Table 10 are roughly the same as those reported in Table 9. Nor is the analysis sensitive to the types of firms included in the empirical tests. Table 11 uses the same definition of “shutdown decision” as Table 9 but excludes nonprofit organizations, in which shutdown decisions may be affected by community concerns. The results remain the same: earnings volatility reduces the speed with which a judge renders the shutdown decision.

Table 12 looks at the likelihood that a judge exercises the shutdown decision. It reports the results of a logit model in which the dependent variable equals 1 if a firm exited bankruptcy as a going concern. The results here are much less informative. None of the proxies for volatility, going-concern value, and payoff from liquidation is consistently significant, although all have the expected positive sign and Industry Volatility is marginally significant in Columns I through III.

The results of Table 12 are puzzling and suggest that a different dynamic is at work in firms that exit intact than in firms that are shut down. Indeed, many of the firms that exited intact were never at risk of shut down in the first place. Some firms filed Chapter 11 petitions after they had begun a search for a buyer. Chapter
merely offered additional time, insulated from creditor pressure, to find a buyer. Judges are reluctant to consider a creditor’s shutdown motion when a debtor is making progress towards selling its business. Other firms entered Chapter 11 and avoided shutdown by paying strict attention to filing deadlines. If the firm is not bleeding cash and is making progress toward reorganization, a judge is hesitant to shut it down, even if the firm’s earnings volatility is very low and its going concern value is only marginally above the payoff from liquidation. Indeed, preliminary empirical suggests that this effect may be important. If we exclude from the sample every firm that conducted a going-concern sale during its bankruptcy case, the effect of Industry Volatility becomes consistently significant (at the 10 percent level) in the logit model of Table 12.

Together, the results presented here suggest that bankruptcy decision-making, at least in the Northern District of Illinois, is roughly consistent with market decision-making. The hazard of shutdown is hump-shaped, firms are more likely to exit bankruptcy intact if they have significant going concern value (as measured by industry growth rates), and firms are more likely to be shut down quickly if they hail from industries with low volatility in earnings. These results provide strong evidence rebutting the conventional wisdom that the bankruptcy judges display a strong “pro-continuation” bias (relative to market actors). Failing firms are shut down rapidly at the behest of creditors; few debtors are able to operate their businesses as long as they want.

4.3 A Comment on Judicial Motivation

What motivates judges to make quick, perhaps sensible, shutdown decisions? The simple answer is that they have few incentives to make these decisions badly. Their interest in intellectually challenging cases and, more
significantly, their concern for their reputations help ensure that shutdown decisions are made well.

Cases involving small firms, which make up more than 90% of all Chapter 11 filings, tend to be intellectually unexciting. The stakes are small and the issues repetitive. To the extent a judge allows a failing firm to linger in bankruptcy, she is increasing both her workload and the amount of time spent on an uninteresting case. Quick decision-making not only reduces time spent on unexciting cases, but also improves judges’ reputations and attracts larger, more interesting cases to their jurisdiction (e.g., United Airlines and Kmart, which filed Chapter 11 petitions in the Northern District of Illinois during 2002).

Indeed, reputation is probably the most important factor motivating a bankruptcy judge, who has often left a well-paying or prestigious position in private practice or government to join the court. If a judge is known as an indecisive or inexpert decision-maker, he or she is unlikely to be respected by colleagues or the local bar, to be invited to become a member of prestigious organizations (e.g., Chief Bankruptcy Judge Wedoff, a “nationally recognized bankruptcy expert,” is co-chair of the American Bankruptcy Institute’s Consumer

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59See Amy Merrick, Chicago Court Adeptly Attracts Chapter 11 Cases, Wall St. J. B1 (Dec. 10, 2002) (“It may seem odd, even undignified, that federal judges would vie to land the biggest cases, and Judge Sonderby [former Chief Bankruptcy Judge of the Northern District of Illinois] is quick to say that courts don’t outright compete. But a high-profile case does wonders for a judge’s prestige, and it adds welcome variety to a workload of mundane filings by the thousands. ‘I think we have a lot of very intelligent judges on our bench, and we like the challenge,’ Judge Sonderby says.”). See also Robert K. Rasmussen and Randall S. Thomas, Timing Matters: Promoting Forum Shopping by Insolvent Corporations, 94 Nw. U. L. Rev. 1357, 1400-1401 (2000) (noting that bankruptcy judges’ interest in handling complex, interesting cases creates an incentive for them to run more efficient courts).
Bankruptcy Committee\textsuperscript{60}, or to be asked to become a visiting judge on a well-respected bankruptcy court such as the District of Delaware (e.g., two of the fastest decision-makers in this study, Judges Barliant and Katz, visited the District of Delaware during 2002). Indeed, a poor reputation can hurt a judge’s opportunities after his or her 14-year term, 28 U.S.C. §152(a)(1), has expired. The likelihood of reappointment, employment with an elite law firm, or appointment to an Article III judgeship surely falls when a judge is not respected by his or her colleagues or the local bar.

### 4.4 Generalizability of Results

It might be argued that the results presented here are not generalizable because they are based on a study of a particular court during a particular year. Generalizability problems are present here, but they are less important than they might appear.

First, there is little to suggest that the Northern District’s docket or its judges are unique. The court’s jurisdiction covers a large, vibrant regional economy; the same is true for many other jurisdictions, such as the Northern and Central Districts of California. And, as Table 4 illustrates, the demographic characteristics of firms in this study are remarkably similar to the demographics observed in other studies. Similarly, although the Northern District’s judges have significant tenure (9.5 years on average) and many received their law degrees from elite institutions, the same is true for judges in other jurisdictions that cover large metropolitan areas. Average tenure, for example, is 10.1 years in the Central

\textsuperscript{60}See Susan Carey and Thomas M. Burton, \textit{UAL Files For Bankruptcy Protection}, Wall St. J. A3 (Dec. 10, 2002).
District of California, 9.8 years in the Northern District of California, 12.1 in the Northern District of Texas, and 10.1 in the Southern District of Texas.\textsuperscript{61} Indeed, the judges of the Northern District began their tenure with less expertise than judges in other jurisdictions. In response to a scandal during the 1980s (during which bankruptcy judges colluded with members of the bar), the Seventh Circuit appointed bankruptcy judges to the Northern District that lacked connections to the local bankruptcy bar.\textsuperscript{62} This typically meant that the Seventh Circuit chose judges with little or no expertise in bankruptcy law.

On the other hand, the year under study, 1998, may introduce biases. The national economy was booming during 1998 and we might expect to see a different mix of firms file Chapter 11 petitions in 2002 (e.g., large firm such as K-Mart and United Airlines sought bankruptcy protection in 2002; the largest filing in 1998 was tiny compared to these cases). Further empirical work is clearly necessary (especially a comparison of the demographics of firms in this study to demographics of firms that filed bankruptcy petitions in 2002).

Another bias may also be present. In one important respect, the Northern District is different from other courts.\textsuperscript{63} Alone among the bankruptcy courts, the Northern District permits the parties to a case to schedule motions (e.g., a debtor’s motion to use cash collateral, a creditor’s motion to lift the automatic stay).

\textsuperscript{61}These statistics were computed using data from 1 Almanac of the Federal Judiciary (Aspen 1999) (Supp. 1999-1).

\textsuperscript{62}Interview with Chief Bankruptcy Judge Eugene R. Wedoff, supra note 54.

\textsuperscript{63}The information in this paragraph is based on an interview with Chief Bankruptcy Judge Eugene R. Wedoff, supra note 54. See also Judge John Q. Squires’ description of “our peculiar local custom” with respect to motions in www.dcba.org/brief/judpractice/0698.htm.
Additionally, and also uniquely, motions are presented orally to the judge, who typically renders a decision by the end of the hearing. Because only two days notice is required for most motions, a party can file a motion and receive a decision in days. Opposing counsel need not draft a response; he or she may present argument orally to the judge. As a result, the judge’s decision will be based not only on the paper record, but also on open-ended discussion with the parties. Judges can respond quickly to news that a firm is failing. By contrast, in other jurisdictions motions are filed with the court clerk, opportunity is given for opposing counsel to draft a response, and the judge often renders a decision without conducting a hearing. Weeks or months may pass before a motion is considered.

The distinct motions practice of the Northern District may make a difference. We should expect better outcomes when a decision-maker monitors a troubled firm continuously than when he or she visits the firm only periodically. Section 3 of Appendix A shows this formally. To the extent that this practice makes a substantial difference, it has strong implications for law reform. The Northern District’s rules, unlike characteristics of its docket or its judges, can be replicated elsewhere.

And there is some evidence that outcomes are different in the Northern District than they are in other jurisdictions. Although no previous study has

\[64\text{U.S. Bankruptcy Court for the Northern District of Illinois, } \text{Local Rules 9013-1–9013-9 (adopted June 1, 2003). The notice period is enlarged to 20 days for motions proposing the sale of assets outside the ordinary course, conversion to Chapter 7 or dismissal, and other significant events. Fed. R. Bankr. P. 2002 (2003).}

\[65\text{This point is emphasized by Baird and Morrison, } \text{Bankruptcy Decision-Making, supra note 2, at 368-69.} \]
gathered data on the economic outcomes of firms in bankruptcy (i.e., whether a firm exited bankruptcy intact and, if not, what happened to its assets), several studies have gathered data on the formal outcomes of firms in bankruptcy (i.e., whether a petition led to a confirmed plan of reorganization, conversion, or dismissal). Table 13 compares the formal outcomes in this study to those observed elsewhere. A confirmed plan of reorganization is obtained less often, and dismissal and conversion occur more often, in the Northern District than in other studied jurisdictions.

For example, while the rate of confirmation was 27% in this study, it was 39% in Ancel and Markell’s 1996 study of all Chapter 11 filings in three Midwest jurisdictions, 30% in Bermant and Flynn’s 1997 study of all Chapter 11 filings nationwide, and 47% in LoPucki’s 1979-80 study of corporate Chapter 11 filings in the Western District of Missouri. The Northern District’s cases were also decided more quickly. The median time to confirmation, for example, was 256 days in the Northern District; it was 362 days in Ancel and Markell’s study, 432 days in Bermant and Flynn’s study, and 300 days in LoPucki’s study. Similarly, median time to dismissal was 113 days in this study but 186 days in Ancel and Markell’s study and 207 days in Bermant and Flynn’s study. These differences in outcomes and timing may reflect differences in judicial decision-making, or they may reflect differences in the studies. Studies by other scholars have included real estate cases and, sometimes, individual consumer cases. It seems possible that these cases—which make up a significant fraction of Chapter 11 filings⁶⁶—are more likely to

⁶⁶They make up about 7.3% of the filings in Warren and Westbrook’s national study.
lead to confirmed plans of reorganization\textsuperscript{67} and more likely to remain in Chapter 11 for extended periods.

In short, apart from its motions practice, little distinguishes the Northern District from other bankruptcy courts in large metropolitan areas during non-recessionary periods (excluding, of course, the District of Delaware and the Southern District of New York). Courts in small cities may differ; they may, for example, pay closer attention to the effects of corporate bankruptcies on the local community. These observations might help explain why LoPucki reached precisely the opposite conclusion in his study of Chapter 11 filings (most by small firms) in the Western District of Missouri during 1979-1980, a recessionary period.\textsuperscript{68} He found a strong pro-continuation bias among the jurisdiction’s bankruptcy judges. These judges, however, may have been more concerned about community-effects than judges in larger metropolitan areas such as Chicago. It is also plausible that LoPucki’s results are different simply because they are older. LoPucki studied the first cases decided after the effective date (October 1, 1979) of the new Bankruptcy Code. Today’s judges have much greater expertise in applying the Code. Future research will explore these and other factors that might explain why LoPucki’s results differ substantially from those presented here.

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\textsuperscript{67}Klee, \textit{supra} note 37, offers suggestive evidence that this is true for single-asset real estate cases involving highly valuable properties (those worth at least $8 million).

4.5 Extensions

The analysis presented here can be strengthened several ways. First, I assume throughout that the shutdown decision is independent of the capital structure of the firm. Capital structure may matter. If nearly all of a firm’s assets are subject to a bank’s security interest, for example, the bank may have great influence over the shutdown decision. The debtor firm cannot use these assets in its operations without offering “adequate protection” to the bank (i.e., compensation for asset depreciation and assurance that the assets will not waste away). As a result, the debtor cannot operate without the bank’s cooperation. Capital structure may also matter in cases in which the debtor’s owner-manager has personally guaranteed the firm’s debt. If the firm’s assets at the start of a case are sufficient to covered guaranteed debt, the owner-manager may favor early shutdown or, at the very least, will not undertake efforts to prolong the life of a failing firm. By shutting the firm down when it has assets sufficient to cover guaranteed debt, he or she can avoid personal liability.

In addition, this study assumes that the shutdown decision is equally important in all cases. In reality, the shutdown decision is more important in cases involving firms with significant firm-specific capital, which will be lost upon shutdown. We would expect earnings volatility to have a greater influence on shutdown decisions in cases involving firms with relatively high levels of specific capital.

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70 See Guiso and Parigi, *supra* note 18, studying investment decisions by Italian manufacturing firms and finding that volatility (or uncertainty) has a stronger effect on
5. Conclusions, Implications, and Extensions

The evidence gathered here suggests that the costs of Chapter 11 may be much smaller than its detractors claim, at least in cases involving small firms. Not all judges display a pro-continuation bias. Indeed, judges of the Northern District of Illinois appear to behave much like market actors. These findings are consistent with work by Andrade and Kaplan, Maksimovic and Phillips, Gilson, and others who have found low costs (and benefits) associated with Chapter 11. These findings also have implications for the design of bankruptcy reforms.

The low costs of Chapter 11 suggest that we rethink many proposed reforms. Auctions and other market-mimicking reforms have been proposed because they would alleviate the costs associated with Chapter 11 reorganizations. These costs include the risk that a firm’s assets will be misallocated because investment decisions with higher degrees of irreversibility.

71Andrade and Kaplan, supra note 6.
72Maksimovic and Phillips, supra note 6.
74The benefits of Chapter 11 are low for the firms in this study too. See Baird and Morrison, Human Capital Firms and the Irrelevance of Bankruptcy Law, supra note 9. We show that most of these firms are organized around the human capital of the owner-manager. The fate of such a “human capital firm,” we show, is independent of the outcome of the bankruptcy process—whether the firm is reorganized, resold, or liquidated in bankruptcy, the owner-manager will continue running the same type of business when the legal proceedings end. Indeed, among the 63 firms exposed to shutdown, the owner-manager went on to start (or continued to run) a similar business in over 40% of the cases. These findings—that most small businesses are “human capital firms” and that the fate of such a firm is independent of the bankruptcy process—raise important questions about the benefits of Chapter 11 for small firms.
Chapter 11 merges decisions about asset-deployment (should the firm be liquidated or kept intact?) with decisions about capital structure (who gets what?). The evidence presented here, however, suggests that this feature of Chapter 11 may not impose substantial costs. Non-viable firms are liquidated quickly (most within five months of filing a petition), and the least viable firms are liquidated the fastest (within three months of filing). The costs of Chapter 11 do not seem to generate outcomes that are obviously worse or more costly.

The academic proposals, however, have received little attention from lawmakers. Instead, Congress has focused on a set of reforms that seem misguided in light of the evidence presented here. Take, for example, the recent bankruptcy reform bill, “The Bankruptcy Abuse Prevention and Consumer Protection Act of 2003.” Section 437 of the bill would require small businesses (firms with less than $2 million in debt) to file plans of reorganization within 300 days of seeking protection under Chapter 11. Section 438 would require the bankruptcy judge to confirm the plans within 45 days of submission. The judge may override these deadlines only if the debtor “demonstrates by a preponderance of the evidence that it is more likely than not that the court will confirm a plan within a reasonable period of time.” The bill thus attempts to force small businesses in and out of bankruptcy within 345 days, or about 11 months. This artificial deadline has no basis in the reality of Chapter 11 cases.

75 See, e.g., Aghion, Hart, and Moore, supra note 12, at 529, 532-33 (1992); Baird, supra note 1.

76 H.R. 975, 108th Cong. (Feb. 27, 2003), available at thomas.loc.gov.

77 Technically, the plan is due within 300 days of the order for relief.

78 H.R. 975, supra note 76, at §437(e)(3).
Evidence from the Northern District of Illinois suggests that the most important decision in a small-firm Chapter 11 case—whether to shut the firm down—is made long before 345 days have elapsed. Over 50% of failing firms are shut down within 90 days; over 70% are shut down within 150 days. The bill’s 345-day deadline is therefore much too long for failing firms.79

And it is much too short for some viable small firms. Figure 5 (see Appendix C) shows the number of firms exiting bankruptcy intact by month in Chapter 11. Many exited long before 345 days had elapsed, but a non-trivial number (14) exited after more than a year of bankruptcy protection and all of these firms are still in business today. An artificial 345-day deadline might have impaired the efforts of these businesses to remain intact.80

Instead of limiting judicial discretion, as the bankruptcy reform bill would, sensible bankruptcy reforms should consider expanding judicial discretion to respond to information about a firm’s prospects. This seems precisely the effect of the Northern District’s unique motions practice, which allows a creditor or debtor to have a motion heard, and sometimes decided, within two days of submitting it to the court.81 Judges can respond quickly to news that a firm is failing. If the Court’s rules are driving the results in this study, policy implications follow.

Instead of seeking to change the substance of the Code, reforms should focus on

79Indeed, the deadline might even have a perverse effect on judges’ decisions to shut down these firms. Judges might be inclined to defer the shut-down decision until the 300-day deadline for submitting a plan of reorganization has expired.

80The same point is made by Steven H. Ancel and Bruce A. Markell, *Hope in the Heartland: Chapter 11 Dispositions in Indiana and Southern Illinois, 1990-96, S. C. L. Rev. 343, 360 (1999).*

81See Chapter 4, Section 4.4.
procedure and advocate rules, such as the motions practice in the Northern District, that enable judges to respond quickly to news that a firm is failing. Moreover, reforms need not modify the text of the Bankruptcy Code or even the Federal Rules of Bankruptcy Procedure. One of the virtues of the Code is the freedom it gives bankruptcy courts to adopt innovative local rules of procedure.\textsuperscript{82} The evidence presented here suggests that the courts should consider experimenting with rules governing their motions practices.

These conclusions are of course tentative. Additional research, particularly to measure the extent of firm-specific capital in small firms, is clearly necessary. Future research will take up that question as well as the question whether small firms are systematically different from large firms. Do judges exercise the shutdown option differently when they are dealing with large firms? Even if they do, should Chapter 11 be an option for such firms? Future research will also explore the reasons why Chapter 11 is attractive to some troubled firms but not others. Since only a fraction of financially distressed firms resort to Chapter 11, the statute’s attractiveness must vary by firm. We may be able to attack this problem by comparing the characteristics of all firms that fail (about which Illinois State records provide information) with the subset that file Chapter 11 petitions. The data gathered here provide a starting point for addressing these and other open questions in bankruptcy law and corporate finance.

\textsuperscript{82}See, e.g., David A. Skeel, Jr., Lockups and Delaware Venue in Corporate Law and Bankruptcy, 68 Univ. Cin. L. Rev. 1243, 1277 (2000) (arguing that bankruptcy courts have significant discretion in administering the Code’s provisions); David A. Skeel, Jr., Bankruptcy Judges and Bankruptcy Venue: Some Thoughts on Delaware, 1 Del. L. Rev. 1, 25 (1998) (same).
REFERENCES


APPENDIX A
A REAL-OPTIONS MODEL OF BANKRUPTCY DECISION-MAKING

A.1 Introduction

Consider a firm suffering financial distress. It files a Chapter 11 petition and information submitted by the parties reveals that the firm’s earnings ($\pi_t$) are expected to grow at the rate $\mu$ and that the variance in earnings is proportional to $\sigma$. Assuming per-period growth in the firm’s earnings is normally distributed, we can say that changes in the firm’s earnings $d\pi_t$ are related to the growth rate $\mu$ and variance $\sigma$ as follows:

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

(A1)

Here $W_t$ is a normally-distributed Markov process (a Wiener process) with mean $E[dW_t] = 0$ and variance $E[dW_t^2] = dt$, which implies that firm earnings follow a type of random walk.

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84 The representation is also known as geometric Brownian motion with drift, where the changes in the level of profits are lognormally distributed. See id., at 59-132.
Assume that the firm’s assets can be liquidated for a price $L$ at any time\(^\text{85}\) but that, due to bankruptcy procedure and time scarcity, the court can only render a decision every $k$ periods. If the court grants a shutdown motion at time $t$, the one-time payoff to creditors is $L$. If instead the court allows the firm to continue operations, creditors receive a certain payoff $\pi_t \, dt$ immediately\(^\text{86}\) and uncertain payoffs $\pi_{t+i} \, dt$ for $k$ periods, after which the court can reconsider the shutdown decision. The court’s problem is to choose the optimal time to exercise the shutdown option.

This is an optimal stopping problem and can be modeled using dynamic programming tools.\(^\text{87}\) Assuming creditors discount future cash flows at rate $r$, the court must solve the following problem at each decision-making date:

$$V(\pi_t) = \max \left\{ L, \pi(t, t+k) + e^{-rk} E_t \left[ V(\pi_{t+k}) \right] \right\}$$

(A2)

\(^{85}\)To be more precise, if the firm’s assets are liquidated, creditors will receive an asset (a perpetuity) that pays $l$ every period indefinitely. Given the creditors’ discount rate $r$, the present value of this asset is $L = \frac{l}{r}$.

\(^{86}\)We multiply the rate of profit $\pi_t$ by the length of the period $dt$ to obtain the level of profits that the firm generates during the period.

where $\pi_t$ grows according to the process identified in equation (A1). Here $V(\pi_t)$ represents the value of the court’s decision at time $t$, $\pi(t, t + k)$ measures the expected present value of the uncertain stream of earnings between the current decision-making date $t$ and the next date $t+k$, and $E_t$ is the expectation operator, which conditions only on information at time $t$.

### A.2 Active Judicial Decision-Making

For simplicity, consider first a setting where the court can make liquidation decisions at any time. In this case, $k = dt$ and the court keeps its finger on the pulse of the firm continuously. Problem (A1) becomes

$$V(\pi_t) = \max \left[ L, \pi_t \, dt + e^{-rt} E_t \left[ V(\pi_{t+dt}) \right] \right]$$

subject to equation (A1).

Intuitively, we expect the solution to the court’s problem (A3) to be a critical level of earnings, $\pi^*$. When expected earnings $\pi_t$ dip below this threshold value, it is best to liquidate the firm and divide the payoff $L$ among the creditors according to their relative priorities. As long as earnings exceed $\pi^*$,

\[\text{88We are assuming that the creditors’ discount rate } r \text{ exceeds the growth rate of profit } \mu \text{ because the solution would be trivial otherwise: the court would never liquidate the firm since the growth rate of firm profits exceeds the growth rate on any other investment available to the creditors.}\]
however, the court should allow the firm to continue operations until the next
decision-making event, \( k \) periods later.\(^{89} \) Put differently, the payoffs to creditors
have two regions: a “stopping region” and a “continuation region.” In the
stopping region, earnings are below the critical level, \( \pi_t < \pi^* \), it is optimal to
liquidate the firm, and the payoff to creditors is \( L \). In the continuation region,
earnings exceed the critical level, \( \pi_t > \pi^* \), the court should permit the firm to
continue as a going concern, and the payoff is stochastic \( \pi_t dt + e^{-rdt} E_t\left[V(\pi_{t+dt})\right] \).

At the boundary between these two regions, \( \pi^* \), creditors should be
indifferent between liquidating the firm and allowing it to continue, i.e.,
\[
L = \pi_t dt + e^{-rdt} E_t\left[V(\pi_{t+dt})\right].
\]
If we can characterize the value function \( V(\pi_t) \), we
can use this indifference condition to solve for the threshold earnings level, \( \pi^* \).

\(^{89}\)We need to impose more structure on the profit process (A1) and the value
function \( V(\pi_t) \) to ensure that the critical level \( \pi^* \) exists and is unique. The necessary
assumptions are standard in the economics literature and are described in Dixit and
Pindyck, *supra* note 83, at 128-30.
Recall the equation governing earnings growth, (A1). Substituting this expression into the court’s problem (A3), and applying Ito’s Lemma, we obtain a new expression for firm earnings:

\[ \pi_t + \mu \pi_t V'(\pi_t) + \frac{1}{2} \sigma^2 \pi_t^2 V''(\pi_t) - r V(\pi_t) = 0. \]  

(A4)

If we assume that equation (A4) describes all earnings \( \pi_t > \pi^* \) and that \( V(\pi_t) \) is a continuous function when earnings are positive, we can solve this equation using standard tools for second-order, nonhomogeneous differential equations. These tools yield the solution:

\[ V(\pi_t) = A \pi_t^\beta + \frac{\pi_t}{r - \mu}, \]  

(A5)

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90 Substitution yields \( (1 - e^{-rdt}) V(\pi_t) = \pi_t dt + e^{-rdt} E_t[dV(\pi_t)] \), where \( dV(\pi_t) = V(\pi_{t+dt}) - V(\pi_t) \). Note that if \( r \) is small (which we assume is the case), we can use the approximation \( e^{-rdt} = 1 - r dt \).

91 Ito’s Lemma states that

\[ dV(\pi_t) = V'(\pi_t) \mu \pi_t dt + \frac{1}{2} V''(\pi_t) (\sigma \pi_t)^2 dt + V'(\pi_t) \sigma \pi_t dW_t. \]

Substituting this into the equation in the previous footnote, omitting terms that converge to zero faster than the increment \( dt \) as \( dt \to 0 \), and simplifying, we obtain equation (A4).

92 We are using the property \( \lim_{\pi \to \infty} \left( \frac{V(\pi)}{\pi} \right) < \infty \).
where $A$ is a constant (determined below) and $\beta$ is a function of $\mu$ and $\sigma$ (and is always less than zero).\(^{93}\)

To solve for $A$, we need to impose a bit more structure on the problem.

Recall the indifference condition, $L = \pi^* dt + e^{-rdt} \mathcal{E}_t \left[ V(\pi_{t+dt}) \right]$, that the payoff to liquidation is equal to the payoff from continuation at the critical value $\pi^*$.

Assume the derivative of the payoff from liquidation with respect to $\pi_t$ is equal to the derivative of the payoff from continuation with respect to $\pi_t$ — i.e.,

$$V'(\pi_t) = 0$$

— when these derivatives are evaluated at $\pi^*$. This is known as “smooth pasting.”

If we impose the indifference condition on equation (A5), we find that

$$A = \frac{-\left(\pi^*_c\right)^{1-\beta}}{\beta(r - \mu)},$$

and that

$$V(\pi_t) = \left(\frac{1}{r - \mu}\right) \left[ \pi_t - \frac{\pi_t^\beta}{\beta} \left(\pi^*_c\right)^{1-\beta} \right].$$

\(^{93}\beta\) must satisfy the quadratic expression

$$Q(\beta) = \frac{1}{2} \sigma^2 \beta(\beta - 1) + \mu \beta - r = 0,$$

the negative root of which is

$$\beta = \frac{1}{2} - \frac{\mu}{\sigma^2} - \sqrt{\left[\frac{\mu}{\sigma^2} - \frac{1}{2}\right]^2 + \frac{2r}{\sigma^2}}.$$
If we impose the smooth-pasting assumption, we obtain the threshold level of earnings,

$$\pi^*_c = L(r - \mu) \left( \frac{\beta}{\beta - 1} \right), \quad (A6)$$

where the subscript $c$ indicates that this solution applies only when a judge can monitor the firm continuously.

### A.2.1 Comparative Statics

The critical value in equation (A6) has several important features. First, a judge should not liquidate the firm merely because the expected value of its earnings (discounted to present value) is less than its liquidation value. Put differently, negative “net present value” (NPV) is a necessary but not sufficient condition for liquidating a failing firm. NPV is the difference between the expected present value of firm earnings and the liquidation value of those assets:

$$NPV_t = E_t [ \int_0^\infty e^{-r(t+s)} \pi_{t+s} \, ds ] - L.$$

At the critical value $\pi^*,$ this expression becomes:\textsuperscript{94}

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\textsuperscript{94}Notice that $E_t [\pi_{t+z}] = e^{t\mu} \pi_t.$ This follows from the following proof. Given the law of motion $d\pi_t = \mu \pi_t \, dt + \sigma \pi_t \, dW_t,$ we can create the transformation $dy_t = d \ln \pi_t.$
\[ NPV_t = \pi_t^{\infty} e^{-(r-\mu)s} ds - L = L \left( \frac{1}{\beta - 1} \right) \]  

(A7)

Since \( \beta \) is negative,

Using Ito's Lemma \( \left( df(x) = f'(x)dx + \frac{1}{2}(\sigma x)^2 f''(x) \right) \), we have

\[ dy_t = \frac{1}{\pi_t} \left( \mu \pi_t dt + \sigma \pi_t dW_t \right) - \frac{1}{2} \left( \sigma \pi_t \right)^2 dt = \left( \mu - \frac{\sigma^2}{2} \right) dt + \sigma dW_t. \]

This expression is independent of \( \pi_t \). We are ultimately interested in \( E_t \left[ \pi_{t+z} \right] \). Since we now have an expression for the change in \( \ln \pi_t = \ln \pi_{t+z} - \ln \pi_t = \ln \left( \frac{\pi_{t+z}}{\pi_t} \right) = \int dy_s \)

or

\[ \ln \left( \frac{\pi_{t+z}}{\pi_t} \right) = \int_t^{t+z} \left( \mu - \frac{\sigma^2}{2} \right) dt + \sigma dW_t = \left( \mu - \frac{\sigma^2}{2} \right) z + \sigma (W_{t+z} - W_t) \]

Applying the exponential function to both sides, we have

\[ \pi_{t+z} = \pi_t e^{\left( \mu - \frac{\sigma^2}{2} \right) z + \sigma (W_{t+z} - W_t)} \]

(F1)

Finally, when we compute the expectation of \( \pi_{t+z} \), conditioning on information available at \( t \), we obtain the desired result,

\[ E_t \left[ \pi_{t+z} \right] = E_t \left[ \pi_t e^{\left( \mu - \frac{\sigma^2}{2} \right) z + \sigma (W_{t+z} - W_t)} \right] = \pi_t e^{\mu z}, \]

which follows from the fact that \( (W_{t+z} - W_t) \) is a normally distributed random variable with mean zero and variance \( z \). The expected value of the exponential of such a random variable is \( E_t \left[ e^{\sigma (W_{t+z} - W_t)} \right] = e^{\frac{\sigma^2}{2}}. \) Thus \( E_t \left[ e^{\sigma (W_{t+z} - W_t)} \right] = e^{z \frac{\sigma^2}{2}}. \)
\[
\frac{1}{\beta} - 1 < 0.
\]

Hence \( NPV_t \) is negative at the critical value \( \pi^* \). A judge would be acting prematurely, therefore, if he or she exercised the shutdown option merely because the firm’s NPV was zero or only slightly negative.

A second important feature of \( (A6) \) is the effect of changes in the growth rate (\( \mu \)) and in the volatility of earning (\( \sigma \)). As either parameter increases, the magnitude of \( \pi^* \) decreases.\(^{95}\) The higher the growth rate \( \mu \), the higher the likelihood that earnings will rise in the future. If the firm’s NPV drops below zero due to a sudden shock, a high growth rate ensures that the firm will recover in the near term. Courts should therefore more patient, and less willing to exercise the liquidation option, when a firm’s expected growth is relatively high. Similarly, the

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\(^{95}\)Consider first the effect of changes in \( \mu \) on \( \pi^* \). From (5), we know

\[
\frac{\partial \pi^*}{\partial \mu} = \frac{L}{\beta - 1} \left( (r - \mu) \frac{1}{\beta - 1} \frac{\partial \beta}{\partial \mu} \right) \cdot \beta. 
\]

Because \( \beta < 0 \), the sign of this derivative will be negative if \( \frac{\partial \beta}{\partial \mu} < 0 \). To show this is the case, recall that \( \beta \) must satisfy the equation

\[
Q(\beta) = \frac{1}{2} \sigma^2 \beta (\beta - 1) + \mu \beta - r = 0.
\]

Totally differentiating with respect to \( \mu \), we have

\[
\frac{\partial Q}{\partial \beta} \frac{\partial \beta}{\partial \mu} + \frac{\partial Q}{\partial \mu} = 0.
\]

Since \( \frac{\partial Q}{\partial \beta} < 0 \) and \( \frac{\partial Q}{\partial \mu} < 0 \), this equation implies \( \frac{\partial \beta}{\partial \mu} < 0 \). Therefore, \( \frac{\partial \pi^*}{\partial \mu} < 0 \).
greater the volatility $\sigma$, the greater the chance that firm earnings will increase significantly in the future. Although the chance that earnings will fall precipitously also increases, the firm can always be liquidated at price $L$. This liquidation value truncates the downside risk of greater volatility: if volatility leads to higher earnings, all parties benefit; if it leads to lower earnings, the parties will still receive $L$. Hence, there is greater value in waiting as $\sigma$ increases.

A.2.2 Hazard Rate of Shutdown

We can characterize the likelihood that a firm will be shutdown at time $t$, given that it has avoided shutdown up to that point. As the main text notes, this likelihood—the hazard of shutdown—is hump-shaped over time. To show this, we need additional notation. Following Teulings and van der Ende,\textsuperscript{96} let $\pi^0$ be the level of earnings when a firm first files a Chapter 11 petition and assume $\pi^0 > \pi^*$ (i.e., a firm will not file a Chapter 11 petition if it knows that a judge will shut it down immediately). A firm is shut down the first time its earnings $\pi$, fall

\[ \frac{\partial \pi^*}{\partial \sigma} < 0. \]

below the threshold \( \pi^* \). Let \( T \) be the date at which the threshold is reached. Thus, when the firm first files a Chapter 11 petition (at \( t = 0 \)), the expected duration to shutdown is determined by the amount of time \( (T) \) needed for earnings to travel the distance \( \Delta = \pi^0 - \pi^* \). And at any given time \( t \), such that \( 0 < t < T \), the duration to shutdown is determined by the time \( (T-t) \) needed for earnings to travel the distance \( \Delta_t = \pi_t - \pi^* \). Cox and Miller\(^{97}\) show that the probability that shutdown will occur at some point after time \( t \)—i.e., \( \Pr(T > t|t) \)—is a random variable with Inverse Gaussian distribution and density function equal to

\[
f(t) = \left[ \sigma^2 2\pi t^3 \right]^{-\frac{1}{2}} \exp\left\{ -\frac{(\mu t + \Delta)^2}{2\sigma^2 t} \right\},
\]

and distribution function equal to

\[
1 - F(t) = \Phi\left( \frac{\mu t + \Delta}{\sigma \sqrt{t}} \right) - \exp\left\{ \frac{2 \mu \Delta}{\sigma^2} \right\} \Phi\left( \frac{\mu - \Delta}{\sigma \sqrt{t}} \right),
\]

where \( \Phi \) is the Standard Normal distribution function. We are particularly interested in the hazard rate \( \lambda_t = \frac{f(t)}{1 - F(t)} \). Lancaster\(^{98}\) shows that \( \lambda_t \) is concave and positively skewed. The hazard rate increases from zero (at \( t = 0 \)),

reaches a single maximum at $t^{\text{max}}$ in the interval $0 < t^{\text{max}} < \left(\frac{2}{3}\right)\Delta^2$, and then falls gradually either to 0 if $\mu > 0$ or to $\frac{1}{2} \left(\frac{\mu}{\sigma}\right)^2$ if $\mu < 0$. Thus, we have the hump-shaped hazard rate discussed in the main text.

**A.3 A Note on Passive Judicial Decision-Making**

The foregoing discussion assumed that the bankruptcy judge monitored the firm continuously. In practice, judges make liquidation decisions only when asked to do so (i.e., on the motion of a creditor or the U.S. Trustee). Put differently, judges are passive decision-makers who reach the liquidation decision only at discrete points. This Section modifies the analysis to incorporate this reality.

Recall the general problem (A3) facing the judge:

$$V(\pi_t) = \max\left\{L, \pi(t, t + k) + e^{-rk} E_t[V(\pi_{t+k})]\right\}$$

where $k$ measures the interval between decisions. In Section 1 of this Appendix, we assumed that the court could make decisions continuously ($k = dt$). Suppose now that the judge must wait $k = n$ periods between each decision. Thus, if the judge chooses to liquidate the firm at date $t$, the payoff is $L$. But if she chooses to

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keep the firm intact at \( t \), she will be unable to reconsider this decision until date \( t + n \). During the intervening \( n \) periods, the firm will accumulate an uncertain amount of earnings, \( \pi(t, t+n) \). From the vantage point of the judge at date \( t \), the expected value of this uncertain stream of earnings is

\[
\pi(t, t+n) = E_t \int_0^\infty e^{-rz} \pi_{t+z} \, dz,
\]

where \( \pi_t \) follows the usual law of motion, \( d\pi_t = \mu\pi_t \, dt + \sigma\pi_t \, dW_t \). When the next decision-making date arrives, at \( t+n \), the value of the firm will depend on the level of earnings at that date, \( \pi_{t+n} \). Since these earnings are uncertain when the judge makes a decision at date \( t \), the expected value of the firm at the next decision-making date will be \( e^{-rn} E_t \left[ V(\pi_{t+n}) \right] \). Hence, the payoff in the continuation region will be the sum of the expected earnings stream until the next decision-making date plus the expected value of the firm at that date:

\[
E_t \int_0^n e^{-rz} \pi_{t+z} \, dz + e^{-rn} E_t \left[ V(\pi_{t+n}) \right].
\]

We can simplify this by noting that, from the vantage point of the bankruptcy judge at date \( t \), \( \pi_{t+z} = \pi_t e^{\left(\mu - \frac{\sigma^2}{2}\right)(t + z) + \sigma \sqrt{t} (W_{t+z} - W_t)} \). That is, \( \pi_{t+z} \) is a lognormal random variable with mean \( \pi_t e^{\mu t} \) and variance

\[
\pi_{t+z} = \pi_t e^{\left(\mu - \frac{\sigma^2}{2}\right)(t + z) + \sigma \sqrt{t} (W_{t+z} - W_t)}.
\]
\( \pi_t e^{2\mu} \left( e^{\sigma^2 z} - 1 \right) \). The payoff from permitting the firm to continue as a going concern is therefore

\[
\frac{\pi_t}{r - \mu} \left( 1 - e^{-(r - \mu)n} \right) + e^{-rn} E_t \left[ V(\pi_{t+n}) \right].
\]

Thus, the problem facing the bankruptcy judge in a setting of passive decision-making is

\[
V(\pi_t) = \max \left\{ L, \frac{\pi_t}{r - \mu} \left( 1 - e^{-(r - \mu)n} \right) + e^{-rn} E_t \left[ V(\pi_{t+n}) \right] \right\}, \tag{A8}
\]

The solution to this problem is quite difficult and not attempted here.\(^9\) Instead, the solution will be characterized graphically. My goal is to illustrate informally the effect of \( n \) (the length of time between judicial decisions) on the value of the firm \( V(\pi_t) \) and the optimal time to exercise the liquidation option \( \pi^*_d \).

Consider first two limiting cases: \( n = 0 \) and \( n = \infty \). We considered the first case in the continuous time model of Section 2, where we found

\[
V(\pi_t) = \left( \frac{1}{r - \mu} \right) \left[ \pi_t - \frac{\pi^*_c}{\beta} \left( \pi^*_c \right)^{-1 - \beta} \right].
\]

\(^9\)Bertsekas, supra note 87, at 95-102, offers a general framework for solving this problem.
characterized firm value in the continuation region, \( V(\pi_t) = L \) characterized firm value in the stopping region (when the court liquidates firm assets), and

\[
\pi_c^* = L(r - \mu) \left( \frac{\beta}{\beta - 1} \right)
\]

defined the threshold level of earnings. Figure A1 depicts this characterization of judicial decision-making.

Consider the other limiting case, \( n = \infty \), where the court is effectively making a one-time liquidation decision. The court’s problem boils down to the standard NPV calculation: liquidate the firm so long as the expected present value of future earnings is less than or equal to the liquidation value of the assets. More formally, this problem is

\[
V_\infty(\pi_t) = \max \left\{ L, E_t \left[ \int_0^\infty e^{-rz} \pi_t + z \, dz \right] \right\}
\]

subject to the usual characterization of \( d\pi_t \) in equation (A1). The solution to this problem is \( V_\infty(\pi) = L \) for \( \pi_t \leq \pi_{\infty}^* \) and

\[
V_\infty(\pi) = \pi_t \left( \frac{1}{r - \mu} \right)
\]

for \( \pi_t \geq \pi_{\infty}^* \), where \( \pi_{\infty}^* \) is the threshold rate of earnings at which liquidation is optimal. This threshold satisfies the condition \( \pi_{\infty}^* = L(r - \mu) \), at which the NPV of
the firm is zero. That is, there is no liquidation option. Figure A2 depicts the value of the firm under this legal regime.

Two important features of these limiting cases deserve attention. First, the threshold (or liquidation) level of earnings is higher in the case where \( n = \infty \) than when \( n = 0 \): \( \pi^*_\infty \geq \pi^*_c \). The difference reflects the value of the liquidation option. Moreover, the going concern value of the firm – the value when earnings exceeds the threshold rate (\( \pi^*_c \) or \( \pi^*_\infty \)) – is lower when \( n = \infty \) than when \( n = 0 \). Formally, \( V_c(\pi) \geq V_\infty(\pi) \) for all \( \pi \geq \pi^*_c \). Intuitively, the value of the firm is higher when the court can make better liquidation decisions. When \( n = 0 \) and the court can continuously monitor the firm, the court can choose the optimal time to liquidate. But when it must wait \( n > 0 \) periods between each decision date, the court may make the liquidation decision late. During the waiting time between decisions, the value of the firm may fall below the critical threshold but the court will be unable to act.

Figure A3, which illustrates both features, makes clear that the going concern value of the firm will always suboptimal when \( n > 0 \). Consider, for example, some finite waiting time \( n > 0 \). Figure A4 illustrates the value of the firm under this legal regime.
The going concern value of the firm $V_n(\pi)$ will be lower than the value in a world of continuous decision-making $V_c(\pi)$ (but higher than the value in a world with no options $V_\infty(\pi)$). Since the court has potentially lost the option to make liquidation decisions at the optimal time, the value of the firm is lower. Additionally, the threshold level of earnings will be higher than $\pi^*_c$ (but less than $\pi^*_\infty$).

Thus, the value of the firm is highest $V_c(\pi)$ when the bankruptcy judge is free to exercise the liquidation option at the optimal moment. The value of the firm is lowest $V_\infty(\pi)$ when the judge can never exercise this option. And the value is somewhere in between these two extremes when the judge is a passive decision-maker who does possess a liquidation option but may be unable to exercise it at the optimal moment. During the $n$ periods between decision-making dates, the earnings of the firm may fall dramatically and liquidation may be optimal, but the judge will be unable to act. As $n$ increases, it becomes more likely that the judge will be unable to exercise the liquidation option at the optimal time.
Consider a bankruptcy court that receives Chapter 11 petitions by a continuum of firms every period. Some are worth reorganizing; they appear with probability $p$. The rest should be liquidated and appear with probability $1-p$. When a particular firm files a petition, no one knows whether it is a high-value firm ($H$) worth reorganizing or a low-value ($L$) firm that should be liquidated. Information about firm type, however, is revealed over the course of the bankruptcy case. During the first period of the case (period 1), the court will receive a signal $s$ of firm type. The signal is either good ($g$) or bad ($b$). Good signals occur with probability $\pi_g$ and bad with probability $\pi_b$. Additionally, good signals are more likely to arise from $H$ firms than from $L$ firms: $\pi_g | H > \pi_g | L$. Similarly, bad signals are more likely to arise from $L$ firms than $H$ firms: $\pi_b | L > \pi_b | H$. Note that $\pi_g | H + \pi_b | H = 1$ and that $\pi_g | L + \pi_b | L = 1$.

---

$^{100}$This model extends Toshihiko Mukoyama, A Note on Jovanovic’s Model of Job Matching, Working Paper (Concordia Univ. 2002).
After receiving the first-period signal, the judge can either shut the firm
down or allow it to continue. If the firm is shut down, the return to creditors is \( R \).
If it is allowed to continue, the judge will receive an additional signal of firm
quality in the second period of the case (period 2). Again, the signal is either \( g \) or \( b \)
with probabilities \( \left\{ \pi_{g|H}, \pi_{b|H} \right\} \) and \( \left\{ \pi_{g|L}, \pi_{b|L} \right\} \), respectively. And, again, at the
end of period 2 the judge can choose either to liquidate the firm or allow it to
continue. If the judge allows the firm to continue to the third period (period 3),
full information about firm type will be revealed at the end of the period. That is,
the firm will be revealed to be either \( H \) or \( L \) at the end of period 3. If the firm is
revealed to be type \( H \), the firm is worth \( H \) to creditors. If it is revealed to be type
\( L \), it is worth only \( L < R \). There is a cost to waiting, however. The judge applies a
discount factor \( \beta = 1/(1 + r) \) to future payoffs (the judge discounts the future at rate
\( r \) because creditors do).

In this three-period model, the judge has an opportunity to exercise the
shutdown option at the end of each period. Figure B1 illustrates the set-up. What
is the optimal time to exercise the option? We can characterize the optimal
decision by working backwards. At the end of period 3, the decision is trivial. A
firm will be liquidated if it is type \( L \) and kept intact if it is type \( H \); the payoff to
liquidation \((R)\) exceeds the going-concern value of type-\(L\) firms but falls short of the value of type-\(H\) firms. More formally, the judge’s problem is \(\max\{H, R\} = H\) if the firm is type \(H\) and \(\max\{L, R\} = R\) if the firm is type \(L\).

Given the judge’s decision rules at the end of period 3, we can characterize the rules at the end of period 2. Here the judge’s decision will depend on a firm’s history of signals, \(s\). If the firm’s history was \(s = \{g, g\}\), meaning that good signals were received in periods 1 and 2, then the firm’s expected value as a going concern will be

\[
E(V|gg) = \Pr(H|gg)H + \Pr(L|gg)R,
\]

where

\[
\Pr(H|gg) = \frac{\pi_s[H|H] \pi_s[H] P}{\pi_s[H|H] \pi_s[H] P + \pi_s[L|L] \pi_s[L] (1 - P)}
\]

according to Bayes’ Rule. Note that \(E(V|gg)\) incorporates the period 3 decision rules—type \(H\) firms will be kept intact (with payoff \(H\)) and type \(L\) firms will be liquidated (with payoff \(R\)). The judge’s problem is

\[
\max\{\beta E(V|gg), R\}.
\]

A firm will be kept intact only if the discounted expected value of the firm is at least as great as the return to creditors from immediate liquidation: \(\beta E(V|gg) \geq R\).
Simplifying this expression, we can show that the firm is worth liquidating only if the return to creditors is at least equal to \( R^*_g \), such that

\[
R^*_g = \frac{\Pr(H|gg)}{(1 + r) - (1 - \Pr(H|gg))} H = \frac{\left(\pi_{g|H}\right)^2 p}{\left(\pi_{g|H}\right)^2 p(1 + r) + \left(\pi_{g|L}\right)^2 (1 - p)r}. 
\]

Analogous expressions\(^{101}\) characterize the threshold return to creditors—\( R^*_{gb}, R^*_{bg}, \) and \( R^*_{bb} \)—when the judge has received different signals of firm quality in periods 1 and 2.

These thresholds have important characteristics. First, the thresholds are higher for firms with better histories: \( R^*_{gg} > R^*_{gb} = R^*_{bg} > R^*_{bb} \), which follows from

\[
\Pr(H|gg) > \Pr(H|bg) = \Pr(H|gb) > \Pr(H|bb). \quad ^{102}
\]

\(^{101}\)These expressions are \( R^*_{gb} = R^*_{bg} = \frac{\Pr(H|gb)}{(1 + r) - (1 - \Pr(H|gb))} H \) and \( R^*_{bb} = \frac{\Pr(H|bb)}{(1 + r) - (1 - \Pr(H|bb))} H. \)

\(^{102}\)To see this, note that the expression \( \Pr(H|gg) > \Pr(H|bb) \) is equivalent to

\[
\frac{\left(\pi_{g|H}\right)^2 p}{\left(\pi_{g|H}\right)^2 p(1 + r) + \left(\pi_{g|L}\right)^2 (1 - p)r} > \frac{\left(\pi_{b|H}\right)^2 p}{\left(\pi_{b|H}\right)^2 p + \left(\pi_{bg|L}\right)^2 (1 - p)}, \text{ which is equivalent to}
\]

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This simply means that judges are less willing to terminate firms that have generated better signals of quality. More importantly, all of these thresholds are increasing in the variance of firm quality, \( \sigma^2 = p(1-p)(H-L)^2 \). Holding average quality — \( pH + (1-p)L \) — constant, variance in firm quality increases as the difference between \( H \) and \( L \) increases. Consider an increase in \( H \) and decrease in \( L \) that raises variance but holds average quality constant. Since \( \hat{R}^*_{gg} \) and all other thresholds are increasing in \( H \), all thresholds will rise. This property reflects the “option value” of liquidation. Although increases in variance reduce the value of type-\( L \) firms, a judge can always avoid the downside risk by liquidating the firm (for payoff \( R > L \)). Thanks to this “insurance,” an increase in variance can only increase the potential payoff to creditors and the debtor.

Turn now to the judge’s problem at the end of period 1, given the decision rules at the end of periods 2 and 3. The judge’s decision here will depend on the relationship between the firm’s liquidation value (\( R \)) and the period-2 thresholds, \( \hat{R}^*_{gg}, \hat{R}^*_{gb}, \text{ and } \hat{R}^*_{bb} \). The analysis must therefore be divided into the different

\[
\left( \frac{\pi_{b|I}}{\pi_{b|H}} \right)^2 > \left( \frac{\pi_{g|L}}{\pi_{g|H}} \right)^2. \text{ The last inequality is true because } \pi_{g|H} > \pi_{g|L} \text{ and } \pi_{b|H} < \pi_{b|L}.\n\]
cases. Although four cases are possible, only two ($R_{gb}^* < R < R_{gg}^*$ and $R_{bb}^* < R < R_{gb}^*$) are interesting. If $R > R_{gg}^*$, a judge will always liquidate the firm at the end of period of period 2; the history of signals is irrelevant in light of the large payoff from liquidation. If a firm will always be liquidated at the end of period 2, it makes no sense to avoid liquidation in period 1. Hence, the firm will always be liquidated at the end of period 1. Conversely, if $R < R_{bb}^*$, a judge will always keep a firm intact at the end of period 2, regardless of the history of signals, because the payoff to creditors is so low. It may still make sense to liquidate the firm at the end of period 1 (e.g., the interest rate may be sufficiently high to make liquidation profitable in period 1 but not in period 2), but this situation seems fairly unusual.

Similar calculations show that $\Pr(H|gg) > \Pr(H|gb)$ and $\Pr(H|gb) > \Pr(H|bb)$.

To see this, note that if the first-period signal was $g$, the judge solves $\max\{\beta^2 E(V|g), R\}$ at the end of period 1. The firm will be kept intact if the return to creditor is below the following threshold:

$$R_{g}^* = \frac{\Pr(H|g)}{(1 + r)^2 - (1 - \Pr(H|g))} H.$$  

Alternatively, if the first-period signal was $b$, the judge solves $\max\{\beta^2 E(V|b), R\}$ and the threshold is
Thus, consider Case 1: \( R_{gg}^* > R > R_{gb}^* \), which implies that a firm will be kept intact at the end of period 2 only if its history of signals was \( \{g,g\} \). Knowing this, the judge will shut down any firm with a bad first-period signal. For these firms, the threshold return to creditors is \( R_{b1}^* = 0 \). For firms with good first-period signals, on the other hand, the judge’s problem is

\[
\max \{ \beta [ \Pr(g \mid g) \beta E(V \mid gg) + \Pr(b \mid g) R ] R \}
\]

where \( \Pr(g \mid g) \) and \( \Pr(b \mid g) \) are the probabilities of good and bad signals in period 2, given a good signal in period 1. For these firms, continuation is superior unless the return to creditors \( (R) \) exceeds the threshold \( R_{g1}^* \) defined by

\[
R_{g1}^* = \frac{\Pr(H \mid gg)}{\Pr(H \mid g)} \frac{1 + \Pr(g \mid g)}{1 + \Pr(g \mid g) - (1 - \Pr(H \mid gg))(1 + r)} H.
\]

\[
R_b^* = \frac{\Pr(H \mid b)}{(1 + r)^2 - (1 - \Pr(H \mid b))} H.
\]

In either case, then, there exists a positive threshold above which liquidation is preferable, even though liquidation will never be preferable in the future.
For $R^*_g$ to lie between $R^*_{gb}$ and $R^*_{gg}$, the interest rate $r$ must be sufficiently small (if the interest rate is high, it pays to liquidate early and invest the proceeds in the marketplace).\textsuperscript{104}

Now consider Case 2: $R^*_{bb} < R < R^*_{gb}$, which implies that a firm will be kept intact at the end of period 2 if its history of signals is $\{g, g\}$, $\{g, b\}$, or $\{b, g\}$. If the first-period signal was $g$, the judge’s problem is

$$\max \{ \beta^2 E(V \mid g) R \}$$

and the firm will be kept intact so long as $R$ is less than the threshold $R^*_{g2}$, defined by

$$R^*_{g2} = \frac{\Pr(H \mid g)}{(1 + r)^2 - (1 - \Pr(H \mid g))} H.$$

Similarly, if the first-period signal was bad, the judge must solve $\max \{ \beta^2 E(V \mid b) R \}$ and the firm will be kept intact only if the return to creditors is below the threshold $R^*_{b2}$ defined by

\textsuperscript{104}The interest rate must satisfy the inequality $1 + r \leq \left( \frac{\Pr(H \mid gg)}{\Pr(H \mid gb)} - 1 \right) \frac{1}{\Pr(g)}$.

\textsuperscript{105}Again, this threshold imposes limits on the size $r$, which must satisfy the
Given these thresholds, \( \{ R_{b1}^*, R_{b2}^*, R_{gb}^*, R_{g1}^*, R_{g2}^*, R_{gb}^* \} \), we can determine how the probability of liquidation varies over the course of a case. Assume that the going-concern value of a firm seeking Chapter 11 protection is at least equal to its liquidation value \( (R^0) \). That is, \( \beta^3 E(V) \geq R^0 \), or

\[
R^0 \leq \frac{p}{(1+r)^3 - (1-p)} H,
\]

which implies that the probability of liquidation is zero at the beginning of period 1. This assumption also implies that \( R^0 < R_{g1}^* < R_{gg}^* \) because \( p < \Pr(H|gg) \), that \( R^0 < R_{gb}^* \) because \( p < \Pr(H|g) \), and that \( R^0 > R_{bb}^* \) because \( p > \Pr(H|bb) \). It is unclear, however, whether the liquidation value \( R^0 \) is greater or less than the threshold \( R_{gb}^* \) because \( p \) may be greater or less than \( \Pr(H|gb) \).

Suppose first that \( R^0 > R_{gb}^* \). Given that \( R^0 < R_{gb}^* < R_{gg}^* \), a firm will be shut down at the end of period 1 only if the judge received a bad signal, which will
occur with probability \( \Pr(b) = \pi_{b|H}p + \pi_{b|L}(1-p) \). Liquidation will occur at the end of period 2 only if the judge receives a good first-period signal followed by a bad second-period signal. Given that a firm was not liquidated at the end of period 1, the probability that it will broadcast a bad signal in period 2 is

\[
\Pr(b|g) = \pi_{b|H}\Pr(H|g) + \pi_{b|L}(1 - \Pr(H|g)),
\]

which is smaller than \( \Pr(b) \) because \( \Pr(H|g) > p \) and \( \pi_{b|H} < \pi_{b|L} \). A similar argument shows that the probability of liquidation at the end of period three, \( \Pr(b|gg) \), is less than both \( \Pr(b) \) and \( \Pr(b|g) \). Hence the probability of liquidation rises during the first period and falls thereafter.

Now suppose \( R^0 < R^*_b \). We know that \( R^*_b < R^0 < R^*_g \), but \( R^0 \) may be greater or less than \( R^*_g \). Assume first that \( R^0 > R^*_g \). This means that firms with bad first-period signals will be liquidated. Firms with good-period signals will be kept intact at the end of the first period and all subsequent periods. In this case, the probability of liquidation is \( \Pr(b) \) at the end of period 1 and zero thereafter.

\[106\] The interest rate must satisfy the inequality

\[
1 + r \leq \frac{\Pr(H|gb)}{\Pr(H|bb)} - 1 \cdot \frac{1}{\Pr(b)}.
\]
Thus the hazard of liquidation is hump-shaped, rising in the first period and falling thereafter.

Now suppose that \( R^0 < R^*_{b2} \), implying that firms with bad first-period signals will be kept intact. No firm will be liquidated at the end of period 1; all liquidations will occur at the end of the second and third periods. The probability of liquidation at the end of the second period is

\[
\Pr(b|b) = \pi_{b|H} \Pr(H|b) + \pi_{b|L} \left(1 - \Pr(H|b)\right).
\]

For firms that survive past the second period, the probability of liquidation is \( \Pr(L|E) \), where \( E = gg \cup gb \cup bg \). In this case, it is unclear whether \( \Pr(L|E) \) is greater or less than \( \Pr(b|b) \). The hazard of shutdown, then, may not be hump-shaped for firms with very low liquidation values. For these firms, there is a strong incentive to wait until full information is available.

Thus, unless a firm’s liquidation value is very low, the probability (or hazard) of shutdown will be hump-shaped over time and inversely related to the variance (or volatility) in firm quality. These results of a matching model are identical to those of the real options model developed in Appendix A.
Figure 1
Number of Shutdown Decisions per Month

[Bar chart showing number of shutdown decisions per month]

Months in Bankruptcy
Figure 2
Number of Effective Shutdown Decisions per Month

Figure 3
Hazard Rate of Shutdown Decisions
Figure 4
Hazard Rate of Effective Shutdown Decisions

Figure 5
Number of Firms Exiting Bankruptcy Intact per Month
Figure A1
Continuous Decisionmaking

Figure A2
One-Shot Decision-Making
Figure A3
Continuous v. One-Shot Decision-Making

Figure A4
Passive Decision-Making
Figure B1
Three-Period Model of Judicial Decision-Making
## Table 1
Sample Selection

<table>
<thead>
<tr>
<th></th>
<th>Petitions</th>
<th>Firms</th>
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<tr>
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<td></td>
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<td>Deletions or consolidations:</td>
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<tr>
<td>Individual debtors</td>
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<td>Single asset real estate</td>
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<tr>
<td>Sister companies</td>
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<tr>
<td>Dead on arrival</td>
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<tr>
<td>Insufficient information</td>
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<tr>
<td>Simultaneous involuntary petition</td>
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<td></td>
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<tr>
<td>Final sample</td>
<td>103</td>
<td>99</td>
</tr>
<tr>
<td>Name</td>
<td>Law school</td>
<td>Prior employment</td>
</tr>
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<td>------------------</td>
<td>-----------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Ronald Barliant</td>
<td>Northwestern; Stanford</td>
<td>Private practice</td>
</tr>
<tr>
<td>Carol A. Doyle</td>
<td>Loyola Univ., Chicago</td>
<td>Private practice</td>
</tr>
<tr>
<td>Robert E. Ginsberg</td>
<td>Univ. Wash.; Harvard</td>
<td>Government; academia</td>
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<tr>
<td>Erwin I. Katz</td>
<td>Chicago-Kent</td>
<td>Government; private practice</td>
</tr>
<tr>
<td>Joan H. Lefkow</td>
<td>Northwestern</td>
<td>Government; public interest</td>
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<tr>
<td>Jack B. Schmetter</td>
<td>Yale</td>
<td>Government; private practice</td>
</tr>
<tr>
<td>John D. Schwartz</td>
<td>Univ. Chicago</td>
<td>Private practice</td>
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<tr>
<td>Susan Pierson Sonderby</td>
<td>John Marshall</td>
<td>Government</td>
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<td>John H. Squires</td>
<td>Univ. Illinois</td>
<td>Private practice</td>
</tr>
<tr>
<td>Eugene R. Wedoff</td>
<td>Univ. Chicago</td>
<td>Private practice</td>
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</table>

# Table 3

Firm Characteristics: Sample *versus* 1998 Survey of Small Business Finance (SSBF)

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<tr>
<th>Category</th>
<th>% (frequency) of sample</th>
<th>% of SSBF sample</th>
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</thead>
<tbody>
<tr>
<td>Under 20 employees</td>
<td>81.0 (78)</td>
<td>91.8</td>
</tr>
<tr>
<td>Less than 5 years old</td>
<td>35.92 (37)</td>
<td>22.37</td>
</tr>
<tr>
<td>Less than 10 years old</td>
<td>63.11 (65)</td>
<td>45.2</td>
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<tr>
<td>Family-owned</td>
<td>85.4 (88)</td>
<td>85.3</td>
</tr>
<tr>
<td>Nonprofit</td>
<td>3.9 (4)</td>
<td>0.0</td>
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<td>Assets less than ...</td>
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<tr>
<td>$50,000</td>
<td>30.39 (31)</td>
<td>47.29</td>
</tr>
<tr>
<td>$100,000</td>
<td>48.04 (49)</td>
<td>61.23</td>
</tr>
<tr>
<td>$1 million</td>
<td>75.49 (77)</td>
<td>91.82</td>
</tr>
<tr>
<td>$10 million</td>
<td>85.29 (87)</td>
<td>100</td>
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<td>Standard Industrial Classification:</td>
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<tr>
<td>Construction (10-19)</td>
<td>12.62 (13)</td>
<td>11.87</td>
</tr>
<tr>
<td>Primary Manufacturing (20-29)</td>
<td>3.88 (4)</td>
<td>3.66</td>
</tr>
<tr>
<td>Other Manufacturing (30-39)</td>
<td>5.83 (6)</td>
<td>4.68</td>
</tr>
<tr>
<td>Transportation (40-49)</td>
<td>8.74 (9)</td>
<td>3.72</td>
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<tr>
<td>Wholesale Trade (50-51)</td>
<td>1.94 (2)</td>
<td>7.15</td>
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<td>Retail Trade (52-59)</td>
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<td>Insurance Agents and Real Estate*</td>
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<td>(60-69)</td>
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<tr>
<td>Business Services (70-79)</td>
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<tr>
<td>Professional Services (80-89)</td>
<td>15.53 (16)</td>
<td>18.46</td>
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*Sample firms exclude real estate ventures; SSBF firms include such ventures.*
### Table 4
Firm Characteristics Across Select Studies

#### Panel A

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<th>Category</th>
<th>This study</th>
<th>Warren &amp; Westbrook&lt;sup&gt;a&lt;/sup&gt;</th>
<th>LoPucki&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Fenning &amp; Hart&lt;sup&gt;c&lt;/sup&gt;</th>
<th>Jensen-Conklin&lt;sup&gt;d&lt;/sup&gt;</th>
<th>Flynn&lt;sup&gt;e&lt;/sup&gt;</th>
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<td>Debt under $1 million</td>
<td>66.7%</td>
<td>65.7%</td>
<td>66.0%</td>
<td>45.0%</td>
<td>66.0%</td>
<td>50.0%</td>
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<tr>
<td>Assets under $1 million</td>
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<td>80.0%</td>
<td>76.6%</td>
<td>44.0%</td>
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<tr>
<td>Less than 20 employees</td>
<td>81.0%</td>
<td>88.2%</td>
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<td>N.D. Ill.</td>
<td>23 Districts</td>
<td>W.D. Mo.</td>
<td>C.D. Cal.</td>
<td>SDNY (Poughkeepsie)</td>
<td>15 Districts</td>
</tr>
<tr>
<td>Types of cases</td>
<td>Corp. Ch. 11</td>
<td>Business Ch. 11 (debt/assets); Business Ch. 7, 11, or 13 (employees)</td>
<td>Corp. Ch. 11</td>
<td>Ch. 11 assigned to Fenning, J.</td>
<td>Ch. 11</td>
<td>Ch. 11</td>
</tr>
<tr>
<td>Number of cases</td>
<td>103</td>
<td>787-871</td>
<td>47</td>
<td>262</td>
<td>45</td>
<td>2,395</td>
</tr>
</tbody>
</table>

<sup>a</sup>Warren and Westbrook (1999), Tables 2A, 5, 11 (sample size for debt is 841, for assets 871, and for employees 787).

<sup>b</sup>LoPucki (1983), Chart II.

<sup>c</sup>Fenning and Hart (1996), Tables 4-5.

<sup>d</sup>Jensen-Conklin (1996), Tables 4-5.

<sup>e</sup>Flynn (1989).
### Table 4, continued
Firm Characteristics Across Select Studies,

**Panel B**

<table>
<thead>
<tr>
<th>Business category marked on face sheet</th>
<th>This study</th>
<th>This study, with omitted filings</th>
<th>Warren &amp; Westbrook&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Fenning &amp; Hart&lt;sup&gt;b&lt;/sup&gt;</th>
<th>LoPucki&lt;sup&gt;c&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farming</td>
<td>1.6%</td>
<td>5%</td>
<td>15.6%</td>
<td>29.2%</td>
<td></td>
</tr>
<tr>
<td>Professional</td>
<td>5.5%</td>
<td>3.5%</td>
<td>3.7%</td>
<td>8.3%</td>
<td></td>
</tr>
<tr>
<td>Retail/Wholesale</td>
<td>18.3%</td>
<td>12.7%</td>
<td>15.6%</td>
<td>29.2%</td>
<td></td>
</tr>
<tr>
<td>Railroad</td>
<td>.03%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation</td>
<td>1.8%</td>
<td>1.2%</td>
<td>2.3%</td>
<td>8.3%</td>
<td></td>
</tr>
<tr>
<td>Manufacturing/ Mining</td>
<td>3.7%</td>
<td>2.3%</td>
<td>2.5%</td>
<td>7.2%</td>
<td>31.3%</td>
</tr>
<tr>
<td>Stockbroker</td>
<td>.07%</td>
<td></td>
<td>2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commodity Broker</td>
<td>.2%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>7.3%</td>
<td>5.2%</td>
<td>7.5%</td>
<td>2.6%</td>
<td>6.3%</td>
</tr>
<tr>
<td>Real Estate</td>
<td>9.3%</td>
<td>7.3%</td>
<td>47.2%</td>
<td>4.2%</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>31.2%</td>
<td>26.6%</td>
<td>33.9%</td>
<td>6.3%</td>
<td>6.3%</td>
</tr>
<tr>
<td>Unspecified</td>
<td>32.1%</td>
<td>39.3%</td>
<td>25.3%</td>
<td>14.0%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Jurisdictions studied</th>
<th>N.D. Ill.</th>
<th>N.D. Ill.</th>
<th>23 Districts</th>
<th>C.D. Cal.</th>
<th>W.D. Mo.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types of cases</td>
<td>Corp. Ch. 11</td>
<td>All Ch. 11</td>
<td>Business Ch. 7, 11, or 13</td>
<td>Ch. 11 assigned to Fenning, J.</td>
<td>Corp. Ch. 11</td>
</tr>
<tr>
<td>Number of cases</td>
<td>103</td>
<td>184</td>
<td>2981</td>
<td>510</td>
<td>48</td>
</tr>
</tbody>
</table>

<sup>a</sup>Warren and Westbrook (1999), Tables 2A, 5, 11 (sample size for debt is 841, for assets 871, and for employees 787).

<sup>b</sup>Fenning and Hart (1996), Tables 4-5.

<sup>c</sup>LoPucki (1983), Chart II.
Table 5
Case Dispositions

<table>
<thead>
<tr>
<th></th>
<th>Traditional chapter 11 plans</th>
<th>Liquidating chapter 11 plans</th>
<th>Dismissals</th>
<th>Conversions to Chapter 7</th>
<th>Totals by economic outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm exited intact</td>
<td>23</td>
<td>4</td>
<td>13</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>Firm exposed to shutdown …</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and survived over 12 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>after exiting bankruptcy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and survived less than 12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>months after exiting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firm shut down immediately</td>
<td>22</td>
<td>19</td>
<td></td>
<td></td>
<td>41</td>
</tr>
<tr>
<td>Totals by legal outcome</td>
<td>23</td>
<td>4</td>
<td>57</td>
<td>19</td>
<td>103</td>
</tr>
</tbody>
</table>
Table 6
Case Characteristics

Panel A: Causes of bankruptcy filings

<table>
<thead>
<tr>
<th>Category</th>
<th>% (frequency) of sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stated Reasons for Bankruptcy Petitions</td>
<td></td>
</tr>
<tr>
<td>Overexpansion</td>
<td>12.6 (13)</td>
</tr>
<tr>
<td>Failure of primary customer</td>
<td>7.8 (8)</td>
</tr>
<tr>
<td>Tort, securities, or other liability</td>
<td>4.9 (5)</td>
</tr>
<tr>
<td>Weather or other exogenous events</td>
<td>3.9 (4)</td>
</tr>
<tr>
<td>Other Factors Motivating Bankruptcy Petition</td>
<td></td>
</tr>
<tr>
<td>Shareholder guaranteed firm debts</td>
<td>54.3 (50)\textsuperscript{a}</td>
</tr>
<tr>
<td>Shareholder liable for firm’s payroll taxes</td>
<td>44.6 (33)\textsuperscript{b}</td>
</tr>
<tr>
<td>Either of the above categories</td>
<td>80.7 (67)\textsuperscript{c}</td>
</tr>
</tbody>
</table>

Panel B: Party responsible for shutdown motion

<table>
<thead>
<tr>
<th>Category</th>
<th>% of cases involving shutdown decisions (N=63)</th>
<th>% of cases involving effective shutdown decisions (N=48)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creditor made motion</td>
<td>27.0</td>
<td>29.2</td>
</tr>
<tr>
<td>Trustee made motion</td>
<td>46.0</td>
<td>39.6</td>
</tr>
<tr>
<td>Either Party made motion</td>
<td>73.0</td>
<td>68.8</td>
</tr>
</tbody>
</table>

Panel C: Time in Bankruptcy

<table>
<thead>
<tr>
<th>Months until final decision ending the case</th>
<th>% of all cases (N=103)</th>
<th>% of cases with continuing firms (N=40)</th>
<th>% of effective shutdown decisions (N=48)</th>
<th>% of all shutdown decisions (N=63)\textsuperscript{d}</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 month or less</td>
<td>6</td>
<td>0</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>3 months or less</td>
<td>34</td>
<td>15</td>
<td>54</td>
<td>46</td>
</tr>
<tr>
<td>5 months or less</td>
<td>50</td>
<td>20</td>
<td>75</td>
<td>70</td>
</tr>
<tr>
<td>9 months or less</td>
<td>79</td>
<td>60</td>
<td>94</td>
<td>90</td>
</tr>
<tr>
<td>12 months or less</td>
<td>84</td>
<td>68</td>
<td>96</td>
<td>95</td>
</tr>
</tbody>
</table>

\textsuperscript{a}Information was available for only 92 firms. Percentage is based on total firms for which information was available.
\textsuperscript{b}Information was available for only 74 firms. Percentage is based on total firms for which information was available.
\textsuperscript{c}Information on both categories was available for only 83 firms. Percentage is based on total firms for which information was available.


### Table 7
Comparison of cases in which judge rendered a shutdown decision within 4 months (quick), those in which judge rendered a shutdown decision after 4 months (slow), and those in which no such decision was made (continuing firms).

#### Panel A: Firm characteristics

<table>
<thead>
<tr>
<th>Category</th>
<th>% of quick (N=39)</th>
<th>% of slow (N=24)</th>
<th>% of continuing firms (N=40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less Than 20 Workers</td>
<td>97.4 (.026)</td>
<td>76.0** (.087)</td>
<td>70.7** (.072)</td>
</tr>
<tr>
<td>Less Than 5 Years Old</td>
<td>52.6 (.082)</td>
<td>32.0 (.095)</td>
<td>30.0** (.065)</td>
</tr>
<tr>
<td>Debt Under $1 Million</td>
<td>86.8 (.056)</td>
<td>68.0* (.095)</td>
<td>56.1** (.078)</td>
</tr>
<tr>
<td>Assets Under $100,000</td>
<td>65.8 (.078)</td>
<td>52.0 (.102)</td>
<td>26.8** (.070)</td>
</tr>
<tr>
<td>Liabilities Included</td>
<td>61.1 (.082)</td>
<td>76.0 (.087)</td>
<td>73.2 (.070)</td>
</tr>
<tr>
<td>Secured Debt</td>
<td>0.0 (.0)</td>
<td>4.0 (.04)</td>
<td>12.2** (.052)</td>
</tr>
</tbody>
</table>

*Notes: Standard errors in parentheses. The symbol ** indicates that the number (or percentage) is significantly different from the corresponding number (or percentage) in the “Quick” column at the 5% level. The symbol * indicates that the difference is significant at 10% level. Except for Panel B, differences are analyzed using a two-sided t-test, with unequal variances are assumed where appropriate (the assumption of equal variances is rejected if the variances are significantly different, at the 5% level, under an F-test). In Panel B, differences are analyzed using one-sided t-tests. No statistical tests are offered in Panel D because the sample sizes are too small to permit meaningful tests.*
Table 7, Continued
Comparison of cases in which judge rendered a shutdown decision within 4 months (quick), those in which judge rendered a shutdown decision after 4 months (slow), and those in which no decision was rendered (continuing firms).

Panel B: Case characteristics

<table>
<thead>
<tr>
<th>Category</th>
<th>% of quick</th>
<th>% of slow</th>
<th>% of continuing firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Months to Exit</td>
<td>2.17 (.169)</td>
<td>8.01** (.943)</td>
<td></td>
</tr>
<tr>
<td>Cash Collateral Motion Presented</td>
<td>31.6 (.076)</td>
<td>76.0* (.087)</td>
<td>65.9** (.075)</td>
</tr>
<tr>
<td>Evidence of Abuse of process</td>
<td>15.8 (.060)</td>
<td>4.0 (.040)</td>
<td>0.0** (0.0)</td>
</tr>
<tr>
<td>Automatic Stay Lifted</td>
<td>26.3 (.072)</td>
<td>28.0 (.092)</td>
<td>7.3** (.041)</td>
</tr>
<tr>
<td>Managerial Fraud</td>
<td>5.3 (.037)</td>
<td>16.0 (.075)</td>
<td>2.4 (.024)</td>
</tr>
<tr>
<td>Plan of Reorganization Proposed</td>
<td>0.0 (0.0)</td>
<td>56.0** (.101)</td>
<td>70.0** (.077)</td>
</tr>
<tr>
<td>Sale of Firm Proposed</td>
<td>5.3 (.037)</td>
<td>4.0 (.040)</td>
<td>17.1* (.059)</td>
</tr>
</tbody>
</table>

Notes: Standard errors in parentheses. The symbol ** indicates that the number (or percentage) is significantly different from the corresponding number (or percentage) in the “Quick” column at the 5% level. The symbol * indicates that the difference is significant at 10% level.

Except for Panel B, differences are analyzed using a two-sided \( t \)-test, with unequal variances are assumed where appropriate (the assumption of equal variances is rejected if the variances are significantly different, at the 5% level, under an \( F \)-test). In Panel B, differences are analyzed using one-sided \( t \)-tests.

No statistical tests are offered in Panel D because the sample sizes are too small to permit meaningful tests.
Table 7, Continued
Comparison of cases in which judge rendered a shutdown decision within 4 months (quick), those in which judge rendered a shutdown decision after 4 months (slow), and those in which no decision was rendered (continuing firms).

Panel C: Industry characteristics

<table>
<thead>
<tr>
<th>Category</th>
<th>Mean of quick</th>
<th>Mean of slow</th>
<th>Mean of continuing firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry Volatility</td>
<td>4.13</td>
<td>4.37*</td>
<td>4.30</td>
</tr>
<tr>
<td></td>
<td>(.068)</td>
<td>(.151)</td>
<td>(.110)</td>
</tr>
<tr>
<td>Small Firm Profit Volatility</td>
<td>32,656.42</td>
<td>23,378.96</td>
<td>40,957.71</td>
</tr>
<tr>
<td></td>
<td>(9,407.081)</td>
<td>(8,417.036)</td>
<td>(10,272.92)</td>
</tr>
</tbody>
</table>

Panel D: Judge characteristics

<table>
<thead>
<tr>
<th>Name of judge</th>
<th>Cases (share of cases)</th>
<th>Quick shutdowns as % of cases</th>
<th>Slow shutdowns as % of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ronald Barliant</td>
<td>16 (14.7%)</td>
<td>37.5%</td>
<td>6.3%</td>
</tr>
<tr>
<td>Carol A. Doyle</td>
<td>3 (2.8%)</td>
<td>0.0%</td>
<td>33.3%</td>
</tr>
<tr>
<td>Robert E. Ginsberg</td>
<td>8 (7.3%)</td>
<td>37.5%</td>
<td>12.5%</td>
</tr>
<tr>
<td>Erwin I. Katz</td>
<td>17 (15.6%)</td>
<td>52.9%</td>
<td>23.5%</td>
</tr>
<tr>
<td>Joan H. Lefkow</td>
<td>11 (10.1%)</td>
<td>36.4%</td>
<td>27.3%</td>
</tr>
<tr>
<td>Jack B. Schmetterer</td>
<td>10 (9.2%)</td>
<td>50.0%</td>
<td>10.0%</td>
</tr>
<tr>
<td>John D. Schwartz</td>
<td>10 (9.2%)</td>
<td>30.0%</td>
<td>40.0%</td>
</tr>
<tr>
<td>Susan Pierson Sonderby</td>
<td>10 (9.2%)</td>
<td>30.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>John H. Squires</td>
<td>10 (11.0%)</td>
<td>16.7%</td>
<td>41.7%</td>
</tr>
<tr>
<td>Eugene R. Wedoff</td>
<td>10 (11.0%)</td>
<td>25.0%</td>
<td>41.7%</td>
</tr>
</tbody>
</table>

Notes: Standard errors in parentheses. The symbol ** indicates that the number (or percentage) is significantly different from the corresponding number (or percentage) in the “Quick” column at the 5% level. The symbol * indicates that the difference is significant at 10% level.

Except for Panel B, differences are analyzed using a two-sided t-test, with unequal variances assumed when appropriate (the assumption of equal variances is rejected if the variances are significantly different, at the 5% level, under an F-test). In Panel B, differences are analyzed using one-sided t-tests.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry Volatility</td>
<td>Variance of monthly industry stock returns, 1993-97 (firms are assigned to one of 48 industries based on their 4-digit SIC codes). Data taken from Fama/French stock returns database.</td>
</tr>
<tr>
<td>Log Assets</td>
<td>Natural logarithm of assets</td>
</tr>
<tr>
<td>Cash Collateral Motion</td>
<td>Dummy variable equal to one if debtor filed motions to use cash collateral or offer adequate protection</td>
</tr>
<tr>
<td>Prior Chapter 11</td>
<td>Dummy variable equal to one if debtor had filed another Chapter 11 petition within previous six years</td>
</tr>
<tr>
<td>Managerial Fraud</td>
<td>Dummy variable equal to one if debtor’s current management committed pre-petition fraud</td>
</tr>
<tr>
<td>Asset-Debt Ratio</td>
<td>Ratio of Log Assets to natural logarithm of debt</td>
</tr>
<tr>
<td>Less than 20 Employees</td>
<td>Dummy variable equal to one if debtor employed fewer than 20 employees</td>
</tr>
<tr>
<td>Less than 5 Years Old</td>
<td>Dummy variable equal to one if debtor was less than five years old</td>
</tr>
<tr>
<td></td>
<td>(I)</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Industry Volatility</td>
<td>0.567</td>
</tr>
<tr>
<td></td>
<td>(0.006)***</td>
</tr>
<tr>
<td>Small Firm Volatility</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>(0.245)</td>
</tr>
<tr>
<td>Log Assets</td>
<td>0.029</td>
</tr>
<tr>
<td></td>
<td>(0.570)</td>
</tr>
<tr>
<td>Cash Collateral Motion</td>
<td>0.925</td>
</tr>
<tr>
<td></td>
<td>(0.000)***</td>
</tr>
<tr>
<td>Prior Chapter 11</td>
<td>-0.377</td>
</tr>
<tr>
<td></td>
<td>(0.244)</td>
</tr>
<tr>
<td>Managerial Fraud</td>
<td>0.096</td>
</tr>
<tr>
<td></td>
<td>(0.864)</td>
</tr>
<tr>
<td>Asset-Debt Ratio</td>
<td>0.172</td>
</tr>
<tr>
<td></td>
<td>(0.902)</td>
</tr>
<tr>
<td>Less Than 20 Employees</td>
<td>-0.030</td>
</tr>
<tr>
<td></td>
<td>(0.964)</td>
</tr>
<tr>
<td>Less Than 5 Years Old</td>
<td>0.073</td>
</tr>
<tr>
<td></td>
<td>(0.765)</td>
</tr>
<tr>
<td>Constant</td>
<td>-2.132</td>
</tr>
<tr>
<td></td>
<td>(0.037)**</td>
</tr>
<tr>
<td>Observations</td>
<td>102</td>
</tr>
</tbody>
</table>

Notes: Robust p-values in parentheses. The symbol *** indicates significance at 1% level, ** at 5% level, and * at 10% level.
Table 10
Duration to Effective Shutdown Decisions (shutdown decisions that lead to liquidation within 12 months):
Cure Model, Lognormal Distribution

<table>
<thead>
<tr>
<th></th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry Volatility</td>
<td>0.621</td>
<td>0.545</td>
<td>0.602</td>
<td>0.773</td>
</tr>
<tr>
<td></td>
<td>(0.041)**</td>
<td>(0.023)**</td>
<td>(0.038)**</td>
<td>(0.069)*</td>
</tr>
<tr>
<td>Small Firm Volatility</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>(0.247)</td>
<td>(0.400)</td>
<td>(0.445)</td>
<td>(0.926)</td>
</tr>
<tr>
<td>Log Assets</td>
<td>0.031</td>
<td>0.026</td>
<td>-0.040</td>
<td>-0.121</td>
</tr>
<tr>
<td></td>
<td>(0.581)</td>
<td>(0.625)</td>
<td>(0.754)</td>
<td>(0.169)</td>
</tr>
<tr>
<td>Cash Collateral Motion</td>
<td>0.949</td>
<td>0.979</td>
<td>1.035</td>
<td>0.992</td>
</tr>
<tr>
<td></td>
<td>(0.000)***</td>
<td>(0.000)***</td>
<td>(0.000)***</td>
<td>(0.000)***</td>
</tr>
<tr>
<td>Prior Chapter 11</td>
<td>-0.592</td>
<td>-0.640</td>
<td>-0.832</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.084)*</td>
<td>(0.064)*</td>
<td>(0.009)***</td>
<td></td>
</tr>
<tr>
<td>Managerial Fraud</td>
<td>0.175</td>
<td>0.243</td>
<td>1.205</td>
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<td></td>
<td>(0.772)</td>
<td>(0.708)</td>
<td>(0.009)***</td>
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<tr>
<td>Asset-Debt Ratio</td>
<td>1.090</td>
<td>2.037</td>
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<tr>
<td></td>
<td>(0.511)</td>
<td>(0.142)</td>
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</tr>
<tr>
<td>Less Than 20 Employees</td>
<td>0.040</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>(0.976)</td>
<td></td>
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<tr>
<td>Less Than 5 Years Old</td>
<td>0.287</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>(0.342)</td>
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<td></td>
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<tr>
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<td>-2.452</td>
<td>-1.946</td>
<td>-2.402</td>
<td>-3.103</td>
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<td></td>
<td>(0.111)</td>
<td>(0.106)</td>
<td>(0.117)</td>
<td>(0.310)</td>
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<tr>
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<td>102</td>
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<td>102</td>
<td>91</td>
</tr>
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</table>

Notes: Robust p-values in parentheses. The symbol *** indicates significance at 1% level, ** at 5% level, and * at 10% level.
<table>
<thead>
<tr>
<th></th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry Volatility</td>
<td>0.582</td>
<td>0.523</td>
<td>0.522</td>
<td>0.573</td>
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<tr>
<td>(0.006)***</td>
<td>(0.006)***</td>
<td>(0.014)**</td>
<td>(0.056)*</td>
<td></td>
</tr>
<tr>
<td>Small Firm Volatility</td>
<td>0.230</td>
<td>0.396</td>
<td>0.384</td>
<td>0.798</td>
</tr>
<tr>
<td>(0.000)***</td>
<td>(0.000)***</td>
<td>(0.000)***</td>
<td>(0.000)***</td>
<td></td>
</tr>
<tr>
<td>Log Assets</td>
<td>0.026</td>
<td>0.025</td>
<td>0.027</td>
<td>-0.022</td>
</tr>
<tr>
<td>(0.616)</td>
<td>(0.620)</td>
<td>(0.820)</td>
<td>(0.825)</td>
<td></td>
</tr>
<tr>
<td>Cash Collateral Motion</td>
<td>0.974</td>
<td>0.967</td>
<td>0.966</td>
<td>0.972</td>
</tr>
<tr>
<td>(0.000)***</td>
<td>(0.000)***</td>
<td>(0.000)***</td>
<td>(0.000)***</td>
<td></td>
</tr>
<tr>
<td>Prior Chapter 11</td>
<td>-0.452</td>
<td>-0.451</td>
<td>-0.594</td>
<td></td>
</tr>
<tr>
<td>(0.179)</td>
<td>(0.184)</td>
<td>(0.067)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Managerial Fraud</td>
<td>0.127</td>
<td>0.126</td>
<td>0.832</td>
<td></td>
</tr>
<tr>
<td>(0.823)</td>
<td>(0.830)</td>
<td>(0.048)**</td>
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<td>Asset-Debt Ratio</td>
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<td>0.413</td>
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<td></td>
</tr>
<tr>
<td>(0.988)</td>
<td>(0.741)</td>
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<td></td>
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<tr>
<td>Less Than 20 Employees</td>
<td>0.035</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.958)</td>
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<td></td>
</tr>
<tr>
<td>Less Than 5 Years Old</td>
<td>0.156</td>
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<td></td>
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<tr>
<td>(0.546)</td>
<td></td>
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<td>-1.843</td>
<td>-1.836</td>
<td>-1.898</td>
</tr>
<tr>
<td>(0.033)**</td>
<td>(0.044)**</td>
<td>(0.086)*</td>
<td>(0.331)</td>
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</tr>
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<td>Observations</td>
<td>98</td>
<td>98</td>
<td>98</td>
<td>89</td>
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</tbody>
</table>

**Notes:** Robust p-values in parentheses. The symbol *** indicates significance at 1% level, ** at 5% level, and * at 10% level.
Table 12
Probability of Exiting Bankruptcy Intact:
Logit Model (dependent variable equals 1 if firm exited bankruptcy
as a going concern)

<table>
<thead>
<tr>
<th></th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry Volatility</td>
<td>0.690</td>
<td>0.697</td>
<td>0.700</td>
<td>0.707</td>
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<tr>
<td>Small Firm Volatility</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
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<tr>
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<td>0.133</td>
<td>0.097</td>
<td>0.090</td>
<td>-0.075</td>
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<tr>
<td>Cash Collateral Motion</td>
<td>0.540</td>
<td>0.629</td>
<td>0.635</td>
<td>0.409</td>
</tr>
<tr>
<td>Prior Chapter 11</td>
<td>0.383</td>
<td>0.381</td>
<td>0.381</td>
<td>-0.018</td>
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<tr>
<td>Managerial Fraud</td>
<td>-2.185</td>
<td>-2.179</td>
<td>-2.190</td>
<td></td>
</tr>
<tr>
<td>Asset-Debt Ratio</td>
<td></td>
<td></td>
<td></td>
<td>3.017</td>
</tr>
<tr>
<td>Less Than 20 Employees</td>
<td></td>
<td></td>
<td></td>
<td>-0.942</td>
</tr>
<tr>
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<td></td>
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<td></td>
<td>-1.042</td>
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<tr>
<td>Constant</td>
<td>-4.571</td>
<td>-4.309</td>
<td>-4.354</td>
<td>-3.656</td>
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</table>

Observations 102 102 102 91

Notes: Robust p-values in parentheses. The symbol *** indicates significance at 1% level, ** at 5% level, and * at 10% level.
Table 13
Comparison of Outcomes and Time-to-Outcomes Observed in Recent Studies

<table>
<thead>
<tr>
<th>Panel A</th>
<th>This Study</th>
<th>Ancel &amp; Markell(^a)</th>
<th>Bermant &amp; Flynn(^b)</th>
<th>LoPucki(^c)</th>
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</thead>
<tbody>
<tr>
<td>Proportion of cases:</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Confirmed</td>
<td>.27</td>
<td>.39</td>
<td>.30</td>
<td>.47</td>
</tr>
<tr>
<td>Converted</td>
<td>.52</td>
<td>.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dismissed</td>
<td>.21</td>
<td>.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Panel B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median days to:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confirmation</td>
<td>256</td>
<td>362</td>
<td>432</td>
<td>300</td>
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<tr>
<td>Conversion</td>
<td>122</td>
<td>160</td>
<td>285</td>
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<tr>
<td>Dismissal</td>
<td>113</td>
<td>186</td>
<td>207</td>
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<tr>
<td>Conversion or Dismissal</td>
<td>117</td>
<td></td>
<td></td>
<td>150</td>
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<tr>
<td>Types of cases</td>
<td>Corp. Ch. 11</td>
<td>Ch. 11</td>
<td>Ch. 11</td>
<td>Corp. Ch. 11</td>
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<td>Number of cases</td>
<td>103</td>
<td>205</td>
<td>N/A</td>
<td>41</td>
</tr>
</tbody>
</table>

\(^{a}\)Ancel and Markell (1999), Tables 4-6.
\(^{b}\)Bermant and Flynn (1998).
\(^{c}\)LoPucki (1983), Charts II-III.