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Bankruptcy Decision Making: An Empirical Study of Continuation Bias in Small-Business Bankruptcies

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Abstract

Many small businesses attempt to reorganize under Chapter 11 of the U.S. Bankruptcy Code, but most are ultimately liquidated instead. Little is known about this shutdown decision. It is widely suspected that the bankruptcy process exhibits a continuation bias, allowing failing businesses to linger under the protection of the court, which resists liquidation even when it is optimal. This paper examines the shutdown decision in a sample of Chapter 11 bankruptcy cases filed in a typical bankruptcy court over the course of a year. The presence of continuation bias is tested along several dimensions—the extent of managerial control over the bankruptcy process, the accuracy and speed with which viable and nonviable businesses are distinguished, and the characteristics of the hazard of shutdown compared with the predictions of a formal model. Contrary to conventional wisdom, the paper finds that continuation bias is either absent or empirically unimportant.

1. Introduction

Many critics argue that Chapter 11 of the U.S. Bankruptcy Code is an inefficient mechanism for reorganizing financially distressed corporations. Chapter 11 is federal law. It gives managers of distressed corporations a nonwaivable right to file a bankruptcy petition and thereby halt all creditor collection efforts for months (or years) as the managers draft and then negotiate a plan of reorgan-

ization. The process of drafting and negotiating a plan is costly. Bris, Welch, and Zhu (2006) find that it generates direct administrative costs ranging from 2 to 10 percent of firm value. The process also generates significant indirect costs, as Hotchkiss (1995), Opler and Titman (1994), and others have emphasized. Businesses that should be liquidated are allowed to linger indefinitely under the protection of the court. Chapter 11 prevents or retards the reallocation of the assets even when a failing business's assets may have greater value in the hands of another owner. Rent-seeking competition among secured and unsecured creditors dominates a process overseen by judges who lack business training and are biased in favor of preserving businesses that should be liquidated (see, for example, Bris, Welch, and Schwartz 2005; Bebchuk and Chang 1992; Baird 1986). These ex post inefficiencies are as evident in large-business cases (Weiss and Wruck 1998) as they are in small-business cases (Aghion, Hart, and Moore 1994, p. 871; LoPucki 1983), and as Schwartz (1997) argues, these inefficiencies increase the cost of capital ex ante.

That is the traditional view of Chapter 11. In this paper, I present evidence that challenges the traditional view as it applies to small-business Chapter 11 cases.[1] Using a sample of all corporate Chapter 11 filings in the Chicago area during 1998,[2] I find that the direct and indirect costs of small-business Chapter 11 cases are small. Nearly 60 percent of these businesses were shut down. The court either dismissed the Chapter 11 case, permitting liquidation under state law, or converted it to a Chapter 7 proceeding under the U.S. Bankruptcy Code, which mandates automatic liquidation. Among businesses that were shut down, the decision to dismiss or convert the case came quickly. For 50 percent of these businesses, the shutdown decision was made within 3 months of filing. For 70 percent, it was made within 5 months. For the businesses that failed, then, the Chapter 11 process was remarkably short. As a general matter, it took no more time than did rival procedures.[3]

Moreover, the Chapter 11 process appears to sort effectively between businesses that are viable and those that are not. Biases commonly ascribed to the system are largely absent from the data. Neither creditors nor debtors (managers or equity holders) dominate the bankruptcy process. Instead, bankruptcy judges play a major role in filtering failing businesses from viable ones, and they appear to be able to do this job well. The businesses that are liquidated quickly exhibit

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[1] Small businesses make up the vast majority of the filings. Other recent empirical work, although not focusing on small-business Chapter 11 cases, reinforces the view that the costs of reorganization are not as large as usually thought (see, for example, Maksimovic and Phillips 1998; Andrade and Kaplan 1998; Gilson 1997).

[2] The filings were lodged in the United States Bankruptcy Court for the Northern District of Illinois, Eastern Division, whose jurisdiction encompasses Chicago and outlying areas.

[3] A mandatory auction regime would likely take between 2 and 9 months (see the sources cited in footnote 20). Thorburn (2000) finds that Swedish auctions take between 1.5 months (for the median business) and 2.4 months (for the mean business). Other commonly proposed alternatives to Chapter 11—see, for example, Aghion, Hart, and Moore (1992)—contemplate a process that takes several months to run.

markers of economic distress, such as an inability to pay ongoing expenses even after obtaining bankruptcy protection. In contrast, reorganized businesses exhibit markers of financial distress, such as overexpansion.

Finally, patterns characterizing the duration to shutdown—especially the non-monotonicity of the hazard rate and the inverse correlation between the hazard rate and the volatility of earnings—are consistent with an economic model of optimal decision making developed by Morrison (2003) and Baird and Morrison (1999, 2001). Taken together, these findings suggest that the small-business Chapter 11 process has significantly lower cost and displays significantly less bias than is commonly thought.

Because the paper's findings are based on data from small-business bankruptcies, I cannot, of course, generalize to cases involving large corporations, such as Conseco, Kmart, and United Airlines.[4] The data are, however, well suited to studying the costs of and potential bias in the Chapter 11 process generally. Small businesses have relatively simple operations and capital structures, and the probability of shutdown in bankruptcy exceeds 50 percent (shutdown is a relatively rare event in large corporate bankruptcies). In addition, according to the National Bankruptcy Review Commission (1997), small businesses make up at least 85 percent of all Chapter 11 filings.[5] The findings presented here shed light on the bankruptcy process in the vast majority of cases.

The paper is organized as follows. Section 2 describes the data set and presents summary statistics. Section 3 shows that the data are inconsistent with conventional accounts of continuation bias. Section 4 examines the same data again, using a formal model of the shutdown decision, and again finds little evidence of bias. Section 5 concludes.

2. Data Sources

The data are drawn primarily from case files of the Northern District of Illinois, Eastern Division (hereafter, Northern District), and from records of the Secretary of State of Illinois. The Northern District was chosen because of the size of its jurisdiction, its similarity to other courts, and the availability of data. The Northern District's jurisdiction encompasses Chicago, Cook County, and outlying counties within the Chicago-Naperville-Joliet metropolitan division—the third largest in the United States (see U.S. Census Bureau 2003). Like most bankruptcy courts, the Northern District receives Chapter 11 filings from predominantly small businesses. During the 1990s, filings by large publicly traded corporations were generally filed in the District of Delaware and Southern District

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[4] These cases, like those studied in this paper, were filed in the Northern District of Illinois.
[5] A "small business" is defined as one with $5 million or less in debt. See National Bankruptcy Review Commission (1997, p. 631).

of New York (see, for example, Ayotte and Skeel 2006; Rasmussen and Thomas 2000).[6]

I accessed the Northern District's case files using an online database, Public Access to Court Electronic Records (PACER),[7] which contains images of every filing and judicial order in cases filed after January 1, 1998. I supplemented this database with another, ILREC, an Illinois public records database available on Lexis-Nexis. It identifies the founders, founding dates, and (where applicable) termination dates of most businesses in PACER.

This study focuses on outcomes in cases filed during 1998, the first year of available data. For each case, I used PACER to obtain information about the business's finances (assets, debt, cash flow, and the like), history (including events that led to the bankruptcy petition), and experience in bankruptcy (time in bankruptcy, types of motions filed by the debtor and its creditors, types of court orders, and so on). The ILREC database was used to obtain information about the dates of business founding and termination.

2.1. Sample Selection

According to Northern District records,[8] 184 Chapter 11 petitions were filed during 1998 by corporations and individual debtors. Not all filings are relevant to the analysis here. This paper is concerned with the effect of Chapter 11 on the reallocation of assets, especially the decision to reorganize or liquidate a distressed business. Chapter 11 filings by corporations outside the real estate sector present the simplest context in which to study this decision. Individuals may file Chapter 11 petitions, but their filings involve two separate issues—a fresh start for the individual and, sometimes, the continuation of a business. Only a fraction of all individual filings involve businesses. Some are submitted by individuals who want to avoid liquidation of nonexempt assets under Chapter 7 of the Bankruptcy Code. The code offers individual debtors an opportunity to keep these assets by filing a Chapter 13 bankruptcy petition, but this type of bankruptcy proceeding is available only to debtors with sufficiently small debts (see 11 U.S.C. sec. 109(e)). Thus, an individual may file a Chapter 11 petition if he or she wants to avoid a Chapter 7 liquidation but fails the Chapter 13 eligibility requirements. Even among Chapter 11 filings in which an individual seeks to preserve a sole proprietorship, it is difficult to study the effect of the

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[6] Matters have changed substantially in recent years. As LoPucki (2007) shows, three of the largest corporate bankruptcies in U.S. history (Conseco, Inc., UAL Corp., and Kmart Corp.) were filed in the Northern District of Illinois during 2002.

[7] The database, Public Access to Court Electronic Records (PACER), is available for a fee (http://pacer.uscourts.gov). The Northern District waived the fee in my case.

[8] The original list of filings was prepared at my request by the staff of the Northern District. The list includes 185 filings, but one is actually a 1997 filing, which was dropped. The list also excludes four creditor-initiated, involuntary Chapter 7 cases that were later converted to Chapter 11 cases.

Table 1

Sample Selection

	Petitions
Initial sample	184
Deletions or consolidations:	
Business filings by individual debtors	30
Single-asset real estate cases	22
Nonbusiness filings by individuals	12
Firms using Chapter 11 to sell assets or settle a dispute	8
Sister companies	7
Firms dead on arrival	5
Publicly traded companies	2
Insufficient information	2
Simultaneous involuntary petition	1
Final sample	95

Note. There were 91 firms in the final sample.

code on asset reallocation. An individual's right to a fresh start may prevent liquidation of assets that would be sold off in a wealth-maximizing process.[9]

Corporations operating in the real estate sector are excluded because, like individuals, their Chapter 11 filings are subject to special legal provisions, as Klee (2002, pp. 1296–1302) explains. In addition, asset reallocation decisions are often not at issue in cases involving real estate ventures. The owner of a piece of real estate (often an office building) will use Chapter 11 to renegotiate debt owed to a single creditor, a mortgagee. Whether the negotiations are successful or not, the use of the real estate will not change. An office building, for example, will generally continue to be used as an office building, regardless of the outcome of the bankruptcy case.

As Table 1 shows, 42 filings by individuals and 22 filings by real estate ventures were excluded from the sample. In addition, the sample omits eight filings by businesses that entered Chapter 11 with the sole purpose of shutting down, selling off assets, or resolving a dispute with a particular creditor. In each case, the fate of the business was largely determined before it entered bankruptcy. In one case, for example, a business entered Chapter 11 after sexual and racial discrimination lawsuits were filed by two former employees. When it proposed a plan of reorganization in which the employees would receive a small fraction of their claims, they agreed to settle. With settlement in hand, the business had its case dismissed (Chapter 11 debtors are free to seek dismissal at any time).

The sample also excludes filings by five businesses that had shut down before filing their Chapter 11 petitions, two businesses about which insufficient information was available, and one involuntary petition that was filed days before the debtor filed its own voluntary petition (the petitions were consolidated by

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[9] To be sure, many corporations are privately held, and the owner-manager has personally guaranteed the business's debt. The outcome of the corporate Chapter 11 case therefore affects the owner's personal wealth. The effect, however, is indirect. Because there is no fresh-start policy at issue here, it is meaningful to think about shutting down a business by liquidating its assets.

Table 2

Firm Characteristics for the Northern District and the 1998 Survey of
Small Business Finance (SSBF) Samples

	Northern District		SSBF	
<20 employees, %	83.9		83.1	
Age in years, median (mean)	6.9	(12.6)	13.0	(13.7)
Assets in dollars, median (mean)	114,160	(664,540)	320,971	(713,102)
Debt in dollars, median (mean)	511,752	(2,429,858)	191,660	(462,848)
Debt/assets, median (mean)	3.37	(16.82)	.59	(.65)
Standard Industrial Classification number, %:				
Construction (15–17)	12.6		11.2	
Primary manufacturing (20–39)	10.5		11.7	
Transportation (40–46, 48)	4.2		3.3	
Wholesale trade (4813, 50–51)	3.2		11.3	
Retail trade (52–59)	11.6		15.2	
Eating and drinking places (58)	16.8		3.6	
Insurance agents and real estate (60–69)	3.1		2.7	
Business services (47, 49, 70–79)	21.1		23.9	
Professional services (80–89)	16.8		17.1	

Note. The samples exclude farming, mining, and real estate. Reported means for the SSBF sample are estimates of population averages and were computed using survey weights. Reported medians are the 50th percentile of the raw, unweighted data.

the bankruptcy court). The sample also consolidates filings by sister companies (the court did so as well), which reduced the number of filings by seven.[10] After making these exclusions, the sample consists almost entirely of small, privately held businesses. To preserve the homogeneity of the sample, filings by two large publicly traded businesses were excluded as well. The final sample consists of 95 filings by 91 businesses (three businesses filed multiple petitions during 1998; although each petition was counted separately,[11] the analysis here would not change in a meaningful way if the repeat filings were dropped).

2.2. Summary Statistics

The sample businesses are generally quite small, as Table 2 shows. While the U.S. Small Business Administration (2001, p. 18 n. 1) defines a small business as one with fewer than 500 employees, 81 percent of the businesses in this study had fewer than 20 employees, and 96 percent had fewer than 100 employees. In terms of capital structure, the businesses were similarly small. Nearly 50 percent had less than $100,000 in assets; 75 percent had less than $1 million. Perhaps unsurprisingly for these types of businesses, most were young; in 63 percent of the cases, the business was less than 10 years old. They were also

[10] For example, three outlets of one retailer filed separate Chapter 11 petitions. The court consolidated these petitions; so does this study.

[11] Although counted separately, these petitions are treated as potentially correlated cases in the statistical analysis, which computes robust standard errors that permit correlation across petitions filed by the same business.

owned and managed by a family or fewer than six investors (86 percent fell within this category).

Although small, the businesses in this sample are not markedly different from small businesses generally. Table 2 compares the Northern District sample to the Federal Reserve Board's 1998 Survey of Small Business Finances (SSBF), a nationally representative sample of businesses with 500 or fewer employees (see Bitler, Robb, and Wolken 2001).[12] In over 80 percent of the cases in the SSBF sample and in the Northern District sample, the businesses have fewer than 20 employees. The industrial composition of both samples is also roughly comparable, the only noticeable differences being a smaller number of eating and drinking places and a larger number of wholesale trade establishments in the SSBF. These differences surely reflect the relatively high failure rates in some industries, such as restaurants. They may also reflect the small size of the sample studied here (95 filings by 91 businesses). Other important differences include age (the median SSBF business is twice as old), asset size (sample businesses are half as large), and leverage (five times as large in sample businesses). These differences reflect, in part, the distressed condition of the sample businesses. Most small businesses fail within the first 4–6 years of existence (Knaup 2005; Bates and Nucci 1989); cash and other assets diminish and debt burdens mount as they descend into bankruptcy.

The characteristics of the Northern District cases are typical of small-business bankruptcies throughout the country. Table 3 compares the Northern District sample to businesses in two recent surveys—the Warren and Westbrook (1999) study of bankruptcy filings in the most and least active court in every judicial circuit in 1994 and the Federal Judicial Center (FJC) database of all Chapter 11 cases closed during 1998 (see Federal Judicial Center 1998). Debt, asset, and employment levels are similar across all surveys. For example, 68.4 percent of businesses in the Northern District had less than $1 million in debt; the percentages from the Warren and Westbrook and FJC surveys are 65.7 percent and 73.4 percent, respectively. Industry demographics are somewhat comparable across the surveys as well. Instead of the Standard Industrial Classification system, Table 3 uses the industry classifications listed on the "face sheet" of the bankruptcy petition.[13] After sample selection (described in Table 1), Table 3 shows that the sample employed here is roughly comparable, with a few exceptions,[14] to those in other studies.

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[12] The survey excludes businesses operating in the agricultural, financial, and government sectors. The 1998 Survey of Small Business Finances data can be downloaded from the Federal Reserve Board Web site (http://www.federalreserve.gov/pubs/oss/oss3/ssbf98/ssbf98home.html).

[13] This classification is seriously flawed, both because it is quite crude and because debtors are frequently unsure about the appropriate classification for their businesses. Nevertheless, it is used in the vast majority of studies, including Warren and Westbrook (1998, pp. 529–30). It is the only benchmark available.

[14] As Table 3 shows, the Northern District survey contains fewer transportation and real estate businesses and more professional and unclassified businesses than both the Warren and Westbrook (1999) and Federal Judicial Center (1998) surveys. These differences, however, are largely a product

Table 3

Industry Demographics across Select Studies

	Northern District	Northern District, before Sample Selection	Warren and Westbrook (1999)	Federal Judicial Center (1998)
Debt < $1 million	68.4		65.7	67.1
Assets < $1 million	81.1		80.0	71.4
<20 employees	83.9		88.2	84.1
Farming	. . .	. . .	1.6	1.7
Professional	5.3	3.5	3.7	3.6
Retail/wholesale	20.0	12.8	15.6	18.4
Railroad	. . .	. . .	.03	
Transportation	1.1	1.2	2.3	2.7
Manufacturing/mining	4.2	2.3	2.5	6.5
Stockbroker	. . .	. . .	.07	.2
Commodity broker	. . .	. . .	.2	. . .
Construction	7.4	5.2	7.5	5.6
Real estate	. . .	9.3	7.3	13.7
Other or unspecified	62.1	65.7	59.2	47.7
Jurisdictions studied	Northern District of Illinois	Northern District of Illinois	23 Districts	All districts
Types of cases	Corporation Chapter 11	Business Chapter 11	Business Chapter 11 (assets/debt); business Chapters 7, 11, or 13 (other)	Corporation Chapter 11
Number of cases	103	173	787–2,981	23,671
Study year	1998	1998	1996	1998

Note. Data are percentages, unless otherwise specified.

2.3. Outcomes of Chapter 11 Cases

Thirty-six corporations—38 percent of the sample—emerged from bankruptcy intact, either through a debt restructuring or a going-concern sale. As Table 4 illustrates, these continuations included 27 businesses that exited with a new capital structure, either through a formal plan of reorganization or informal renegotiation with key creditors (in which case, the business sought dismissal of the Chapter 11 proceeding after achieving the renegotiation). Another nine businesses underwent going-concern sales. Some sales were accomplished in the context of a plan of reorganization; others were consummated under section 363 of the Bankruptcy Code (which allows sales of a business's assets), and the debtor sought dismissal or conversion to Chapter 7 when the sale was complete.

In 59 cases—62 percent of the sample—the business was shut down or forced to exit Chapter 11 without a new capital structure, which in most cases resulted in the corporation's liquidation. As Table 4 shows, these shutdowns included 29 cases in which the debtor corporation was shut down and its assets distributed to creditors, either in a Chapter 7 proceeding or in state law proceedings after the case was dismissed. In the remaining 30 cases, the bankruptcy judge dismissed the corporation's bankruptcy petition and thereby exposed it to potential liquidation under state law. The judge dismissed these cases for a variety of reasons, including the corporation's failure to file financial schedules, pay fees, hire an attorney, or show that it had a reasonable chance of reorganizing successfully. In each case, the business exited without a new capital structure and was vulnerable to suit by creditors in state courts. As Table 5 illustrates, most businesses suffered liquidation either immediately or soon after exiting bankruptcy. This table assumes that a business operated for an entire year if any evidence—drawn from Web sites, newspapers, public records maintained by the Illinois Secretary of State, or subsequent bankruptcy petitions by the business or its owners— suggests that the corporation operated at any point during that year.[15]

Most businesses ceased operations immediately or within 1 year of exiting Chapter 11. Thus, for the majority of businesses, dismissal of a Chapter 11 petition is accompanied by a high probability of liquidation, much like a conversion to Chapter 7. A judge will often dismiss a case, instead of converting it to Chapter 7, if the debtor has no assets unencumbered by liens.[16] With no assets available to unsecured creditors, there is no benefit to a Chapter 7 proceeding, which generates administrative costs.

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of the sample selection methodology used here. The second column shows that, if Chapter 11 filings by real estate enterprises and individuals are added back to the sample, the differences across the samples decrease substantially.

[15] If, for example, Illinois records indicate that a business dissolved during the second year after exiting bankruptcy, I assumed the business was active both years. If state records indicate that the business dissolved in the same year that it exited bankruptcy, I assumed the business was active during that year only if other data sources confirmed the activity. Otherwise, I assumed the business dissolved immediately after exiting.

[16] Eugene R. Wedoff, former chief judge of the United States Bankruptcy Court for the Northern District of Illinois, personal interview with the author, December 3, 2002.

Table 4

Case Dispositions, Sample Data

	Legal Outcomes			
	Reorganization	Dismissal	Conversion to Chapter 7	Total
Economic outcomes (Northern District sample):				
Continuations:				
Exited with new capital structure	23	4		27
Going-concern sale	4	4	1	9
Totals	27	8	1	36
Shutdowns:				
Shut down before exiting bankruptcy		10	19	29
Exited without new capital structure		30		30
Totals	0	40	19	59

Note. Jurisdiction statistics are derived from data on voluntary Chapter 11 cases that terminated in 1998 and involved corporations that had assets worth less than $10 million and were not classified as farming, real estate, or stockbroker.

The outcomes observed in the Northern District are not atypical among bankruptcy courts. This can be verified using the FJC databases, which contain information on outcomes in all bankruptcy courts. Table 6 shows that the likelihood of reorganization in the Northern District is nearly identical to the national average for small businesses.[17]

2.4. Duration of Chapter 11 Cases

It takes time for the Chapter 11 process to separate businesses that should be continued from those that should be shut down. The longer this process takes, the greater the cost to debtors and creditors. Among businesses that are ultimately continued, Chapter 11 generates direct administrative costs, such as fees paid to attorneys, trustees, and other professionals, most of which will be paid from the debtor's assets. These costs increase with the duration of the case.[18] Among businesses that are ultimately shut down, Chapter 11 generates both direct administrative costs and indirect resource allocation costs. The longer it takes to shut down an economically distressed business, the greater the delay in reallocating the business's assets to a third party who can put them to better use. This lost value decreases returns to creditors. Case duration, then, is an important benchmark for the costliness of the Chapter 11 process.

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[17] Relative rates of dismissal or conversion do differ significantly, however, with the Northern District dismissing more cases and converting fewer.

[18] Direct costs could be assessed more directly by gathering data on fees incurred by professionals. I look only at case duration in this paper because fee data are generally unavailable or highly incomplete in cases that result in dismissal (42 percent of the sample) or conversion to Chapter 7 (20 percent).

Table 5

Postbankruptcy Experience of Firms That Exited without a
New Capital Structure ($N = 30$)

	Frequency (%)
Evidence of shutdown:	
No evidence of postexit operations	12
No evidence of operations more	
than 1 year after exiting	7
Total	19 (63.3)
Evidence of continuation:	
Survived more than 1 year	10
Sold off as going concern within 1	
year of exiting	1
Total	11 (36.7)

Case duration is remarkably short in the Northern District, as Table 7 illustrates. Among the 36 businesses that were continued, nearly two-thirds exited in less than 1 year. More surprisingly, the Chapter 11 process identified over 70 percent of nonviable businesses within 6 months; 44 percent were identified within 3 months. Only 8.5 percent of cases involving nonviable businesses (five cases) were still ongoing after 1 year. Relative to any reasonable benchmark, a process that determines the fate of a business within 5 months is quick. Various business brokerages, for example, report that a period of between 4 and 9 months is typically needed to sell a business.[19] Auctions in other contexts, such as Federal Communications Commission spectrum auctions (Cramton 1997), typically require a similar amount of time.

The Northern District's speed may be atypical among bankruptcy courts generally. Table 8 uses FJC (1998, 1999) data to compare case duration in the Northern District with the duration in other jurisdictions. Unlike Table 7, which measures duration from case filing to confirmation, dismissal, or conversion, Table 8 measures duration from filing to case closure. This is the only way to measure duration in the FJC data. Case closure, however, typically occurs months or even years after confirmation or conversion. The delay is caused by efforts to determine the claims and relative priority of creditors (especially in cases resulting in confirmation), sell assets, and recover preferential transfers.[20] These efforts may be an important part of determining how the value of the business is divided among claimants, but they have no bearing on the key economic decision about how the business's assets are deployed. That decision is made

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[19] Some examples include Sunbelt, Sell a Business: FAQ (Frequently Asked Questions) (http://www.sunbeltnetwork.com/sell-business/faq.jsp), which reports that a period of 60–180 days is often needed to conduct a liquidation, and Brookmoor Adams Advisors, Frequently Asked Questions (http://www.brookmooradams.com/faq.htm), which reports a duration of 6–9 months.

[20] For example, in a separate study of Northern District cases, Baird and Morrison (2005a, p. 968) found that most adversary proceedings were brought after confirmation or conversion. An adversary proceeding is a bankruptcy procedure for recovering prebankruptcy payments to favored creditors or other parties, disputing the validity or dischargeability of debt, and other limited purposes. An adversary proceeding can greatly delay case closure.

Table 6

Case Dispositions, %: Federal Judicial Center (1998, 1999) Data

Jurisdiction	Reorganization	Dismissal	Conversion to Chapter 7
Northern District ($N = 470$)	33.2	43.6	23.2
All jurisdictions ($N = 13,457$)	30.7	29.9	39.4

Note. Statistics are derived from data on voluntary Chapter 11 cases that terminated in 1998 and involved corporations that had assets worth less than $10 million and were not classified as farming, real estate, or stockbroker.

when the court confirms, dismisses, or converts the case. Nonetheless, no comprehensive studies have looked closely at the duration to these events. They have instead looked at the duration to case closure.

Using data on duration to case closure, Table 8 shows that, among cases resulting in confirmation, the median duration in the Northern District was significantly shorter (at the 1 percent level) than the median duration nationally. The opposite, however, is true for cases resulting in dismissal. In contrast to both of these figures, the median duration to conversion does not differ significantly between the Northern District and the rest of the nation. Taken together with the statistics on outcomes by jurisdiction in Table 4, these observations suggest that, relative to other jurisdictions, the Northern District reorganizes about as many businesses but does so more quickly, dismisses more businesses but does so more slowly, and converts fewer cases but does so in about the same amount of time. Overall, decision making in the Northern District is faster than that in other jurisdictions. The analysis that follows should be viewed with these differences in mind.[21]

3. Continuation Bias in Chapter 11 Cases

Traditional accounts of Chapter 11, such as LoPucki (1983), argue that the bankruptcy process is biased in favor of preserving businesses that are econom-

[21] Among the possible reasons for faster decision making in the Northern District, the most likely seems to be its motion practice, which is different from other courts. The Northern District permits the parties to a case to schedule motions (for example, a debtor's motion to use cash collateral or a creditor's motion to lift the automatic stay). In addition, motions are presented orally to the judge, who typically renders a decision by the end of the hearing (Eugene R. Wedoff, former chief judge of the United States Bankruptcy Court for the Northern District of Illinois, personal interview with the author, December 3, 2002; Squires 1998). Because only 2 days' notice is required for most motions, a party can file a motion and receive a decision in days. (U.S. Bankruptcy Court for the Northern District of Illinois [2003, rules 9013-1–9] explains that 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. See also Fed. R. Bankr. P. 2002[a]). Opposing counsel need not draft a response; he or she may present an 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 business 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 decided.

Table 7

Duration to Confirmation, Conversion, or Dismissal of Chapter 11 Cases
in the Northern District Sample

Duration	% All Cases ($N = 95$)	% Continuations ($N = 36$)	% Shutdowns ($N = 59$)
≤1 month	4.2	.0	6.8
≤3 months	31.6	11.1	44.1
≤6 months	51.6	19.4	71.2
≤9 months	76.8	58.3	88.1
≤12 months	81.1	63.9	91.5
Median duration (months)	5.7	8.3	3.4

ically distressed and should be liquidated immediately. This continuation bias, it is thought, arises from the control incumbent managers exercise over the bankruptcy process. The opposite bias could, of course, arise if creditors control the bankruptcy process. Seeking immediate payment, creditors could push the process toward liquidation of viable businesses.

Data from the Northern District offer three methods for testing whether the Chapter 11 process exhibits either bias. One is based on the procedural history of the bankruptcy case: if managers exercise significant control over the Chapter 11 process, creditors should have little success in terminating a case—through dismissal, conversion to Chapter 7, or lifting the automatic stay—without incumbent managers' consent. If, instead, creditors control the bankruptcy process, we should see frequent, successful motions to terminate a case. A second test is based on the postbankruptcy history of reorganized businesses: if a substantial number fail and subsequently reenter bankruptcy, managers may have sufficient control over the process to prevent liquidation of nonviable businesses.[22] A third test is based on a comparison of businesses that are shut down in bankruptcy with those that exit intact: if these businesses are indistinguishable, the bankruptcy process may be catering to creditors (who force shutdown of viable businesses) or debtors (who force continuation of nonviable businesses). The following sections implement each test. As applied to the Northern District data, none of the tests points to the presence of significant continuation bias.

3.1. A Test Based on Procedural History

Continuation bias might be inferred from one party's dominance of the process. LoPucki (1983), for example, found in his 1981 study of Chapter 11 cases filed in St. Louis that the debtor was "in full control" because bankruptcy judges were passive and prevented creditors from exercising any meaningful influence

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[22] Hotchkiss (1995) and LoPucki and Kalin (2001) apply a similar test to study bias in the Chapter 11 cases of large, publicly traded corporations. An even better test is one that tracks the assets of troubled businesses (including businesses that do not resort to Chapter 11) and evaluates their productivity before and after the distress is resolved (either in or outside of a bankruptcy proceeding). Maksimovic and Phillips (1998) develop such a test. Data limitations make it impossible to implement it here.

Table 8

Duration in Months to Case Closure in the Federal Judicial Center Data, 1998–99

Jurisdiction	All Cases	Case Outcome		
		Reorganization	Dismissal	Conversion
Northern District:				
Median duration	18.9	21.4	12.0	51.1
Closed within 12 months (%)	31.1			
Closed within 24 months (%)	57.9			
All cases:				
Median duration	27.6	29.4	9.4	49.7
Closed within 12 months (%)	23.4			
Closed within 24 months (%)	45.1			

Note. Statistics are derived from data on voluntary Chapter 11 cases that closed in 1998 and involved corporations that had assets worth less than $10 million and were not classified as farming, real estate, or stockbroker.

over the process. There is no evidence of similar control—either by debtors or creditors—in the Northern District data. As Tables 9 and 10 illustrate, a party other than the debtor was responsible for nearly 68 percent of all shutdowns. Here a shutdown motion is defined narrowly as a motion to dismiss or convert a case to Chapter 7. Under this definition, about one-third of all shutdowns are voluntary decisions by the debtor, who moved to dismiss or convert its own Chapter 11 filing. But this number is an overestimate because in nine cases (15.3 percent of shutdowns) the debtor filed a shutdown motion after the court granted creditor motions to lift the automatic stay and seize core assets of the business. For these debtors, there was no meaningful choice other than to file a motion to convert or dismiss their petitions. These motions then arguably reflect creditor control over the bankruptcy process. If we add them to the motions actually filed by creditors and trustees, we find that a party other than the debtor was actually or effectively responsible for 83 percent of all shutdowns. Thus, debtors did not dominate the process.

Nor did creditors or the U.S. trustee dominate the bankruptcy process. Courts frequently denied creditors' motions to lift the automatic stay, dismiss or convert a case to Chapter 7, or achieve other relief that would lead to shutdown. For example, creditors filed these motions in 67.7 percent of shutdowns (40 cases; see Table 10), but judges granted them in only 42 percent of the cases (25 cases; see Table 9). More strikingly, creditors filed at least one shutdown motion in 58.4 percent of continuations (21 cases; see Table 10). Obviously, all of these motions were denied; the debtor business exited intact. The U.S. trustee filed similar, unsuccessful motions in 22.3 percent of continuations. These statistics strongly suggest that no party with a predictable bias—debtors or creditors—completely dominates the bankruptcy process; to the contrary, bankruptcy judges appear to play an important role in determining when a business should be shut down.

Table 9

Party Filing Final, Successful Shutdown Motion

Party Filing Motion	% Shutdowns ($N = 59$)
Debtor:	
Filed after court granted creditor's lift-stay motion	15.3
Other cases	17.0
Total	32.3
U.S. trustee:	
Filed after court granted creditor's lift-stay motion	20.3
Other cases	40.7
Total	61.0
Creditors:	
Filed successful shutdown motion	6.8
Filed lift-stay motion, inducing another party's	
shutdown motion	35.6
Total	42.4
U.S. trustee or creditors	67.7
U.S. trustee or creditors, including cases in which debtor	
acted in response to successful lift-stay motion	83.1

3.2. A Test Based on Postbankruptcy History

A bias might be present if the Chapter 11 process preserved businesses that failed soon after exiting bankruptcy. Table 11 addresses this possibility; it presents data on the postbankruptcy experience of the 27 businesses that exited Chapter 11 as independent entities with new capital structures (going-concern sales are excluded).[23] In 23 of these cases, the business exited after confirming a plan of reorganization; in the remaining cases, the businesses voluntarily dismissed their Chapter 11 petitions after settling disputes with creditors or identifying new investors. Among the 27 businesses that exited intact, 12 eventually failed. Only six, however, failed within 1 year, and seven within 2 years. These percentages may seem large, but they are fairly typical of small businesses. Holmes and Schmitz (1995) find that the annual hazard of discontinuing a business is around 20 percent even for businesses over 10 years old. Thus, nothing in the (admittedly small) sample here offers compelling evidence that the Chapter 11 process erroneously preserved any of these businesses.

3.3. A Test Based on the Characteristics of Shutdowns versus Continuations

Continuation bias might be present if the Chapter 11 process indiscriminately shut down businesses that were clearly worth saving. Tables 12 and 13 address

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[23] Data for Table 11 are based primarily on Illinois public records. If these records indicated that a business dissolved during a particular year, I assumed the business shut down in that year. If Illinois records indicated that a business was still in operation, or if the records were incomplete, I called the business and verified that it was still in operation.

Table 10

Motions Filed by Trustees and Creditors

Party Filing Motion	≥2	At least 1
Trustee:		
% Shutdowns	5.1	61.0
% Continuations	5.6	22.3
% All cases	5.3	46.3
Creditors:		
% Shutdowns	35.5	67.7
% Continuations	25.1	58.4
% All cases	31.6	63.9

Note. For shutdowns, $N = 59$; for continuations, $N = 36$; for all cases, $N = 95$.

this possibility.[24] A business should be preserved if it suffers financial, not economic, distress. Because financial and economic distress are hard to distinguish empirically, Table 12 reports the frequency with which certain markers of economic distress were observed in the sample businesses. A business in economic distress cannot rescue its business in Chapter 11. Nonetheless, the business may enter bankruptcy in order to delay liquidation, extract concessions from creditors, or gamble on the business's resurrection (see Baird and Morrison 2005b). To accomplish these goals, a business in economic distress will often ignore procedural requirements, suspend payment for ongoing expenses, and try to divert value to insiders. I call these markers of economic distress.

Table 12 reports the frequency with which businesses exhibited these markers. Here I code a business as exhibiting a particular marker only if, in response to the marker, the court dismissed the case or converted it to Chapter 7.[25] Among businesses that were shut down, about 79 percent exhibited obvious markers of economic distress. It appears then that the Chapter 11 process is generally liquidating businesses that merit liquidation.

A similar story is told by Table 13, which reports the frequency with which markers of financial distress were observed in the sample businesses. A business suffering financial, not economic, distress would be profitable but for its debt burden, which it shoulders as a result of unexpected shocks or past mistakes. Unexpected shocks include cash shortages from the bankruptcy of a major customer; past mistakes include overexpansion, cost overruns, malfeasance of former managers, and torts.[26] Among businesses that exited bankruptcy intact, 71 percent exhibited these indicators of financial distress. Forty percent were recovering from overexpansion; about 9 percent suffered temporary cash shortages from

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[24] Here the sample is limited to the 91 unique businesses in the sample; of these, 56 were shut down.

[25] Baird and Morrison (2005b) present additional detail on the methodology for coding the cases.

[26] These data were obtained from documents filed by the debtor business. Typically, a motion to use cash collateral, disclosure statement, or other filing would contain at least a paragraph describing the reasons for the debtor's distress.

Table 11

Postbankruptcy Experience of Firms That Exited with
New Capital Structures

Postbankruptcy Experience	Reorganizations ($N = 23$)		Reorganizations and Dismissals ($N = 27$)	
	%	Frequency	%	Frequency
Failed within 1 year	17.4	4	22.2	6
Failed in 1–2 years	4.3	1	3.7	1
Failed 2+ years later	17.4	4	18.5	5
Total failures	39.1	9	44.4	12

the loss of customers who had gone bankrupt or breached significant contracts; another 9 percent suffered cash shortages because they had underestimated the costs of reconfiguring assets (converting a restaurant to a lounge would be an example). These indicators of financial distress also characterized about 25 percent of businesses that were shut down.[27] But most of these businesses exhibited markers of both financial and economic distress. Only about 10 percent of shutdowns exhibited markers of financial distress but no markers of economic distress. Together, these figures suggest that the Chapter 11 process in the Northern District did not systematically preserve nonviable businesses or liquidate viable ones.

4. A Formal Test of Continuation Bias

A basic task of the Chapter 11 process is to distinguish—filter—viable businesses worth reorganizing from nonviable businesses that should be shut down (see White 1994). As Table 4 illustrates, the debtor exited bankruptcy intact in only 36 of the 95 Chapter 11 petitions filed in the Northern District—less than 40 percent. The bankruptcy process therefore filters the bulk of filings into liquidation. Filtering is typically accomplished by granting the motion of a creditor or the U.S. trustee to lift the automatic stay and allow seizure of core assets, to dismiss the case and allow creditors to resort to their state law remedies, or to convert the case to Chapter 7 and commence liquidation. As Tables 9 and 10 illustrate, these motions are made repeatedly during a Chapter 11 case before a judge finally grants one. In this section, I develop a model of optimal filtering

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[27] This percentage understates the frequency with which shutdowns exhibited markers of financial distress. Case files are much less extensive for businesses that are shut down than for businesses that exit intact. The document with the most detailed information about the business—the disclosure statement—is filed only when the debtor has assembled a plan of reorganization. But a plan of reorganization is rarely assembled in cases that result in shutdown. In these cases, markers of financial distress must instead be inferred from motions filed by the debtor (for example, motions to use cash collateral). If motions are not filed, or if they do not contain adequate information about the business's financial history, it is impossible to determine whether the business exhibited markers of financial distress.

Table 12

Evidence of Economic Distress

	%	Frequency
Ignored procedural requirements	62.5	35
Failed to pay ongoing expenses	26.8	15
Using Chapter 11 to favor insider creditors	1.8	1
Any evidence of economic distress	78.6	44

and use its implications as a benchmark for evaluating outcomes in the Northern District.

4.1. A Simple Model of the Shutdown Decision

The process of filtering is analogous to a matching problem: the goal of the bankruptcy system is to identify good matches between businesses and the opportunity to reorganize under Chapter 11 of the Bankruptcy Code. As conventionally understood, good matches involve businesses whose going-concern value exceeds their liquidation value (this is called going-concern surplus). Going-concern surplus could derive from asset specificity, although Baird and Morrison (2005b) argue that this is unlikely because most small businesses have few specialized assets other than the human capital of the owner-manager. Suplus could instead derive from synergies between the owner-manager's human capital and the business's physical capital. Or it could derive from the transactions costs that would be incurred if the physical assets were reallocated. These costs might exceed the additional return the assets would generate in another owner-manager's hands. Baird and Morrison (2005a) do not rule out these possibilities, and this paper takes no position on the source of going-concern surplus in small businesses. This paper assumes, instead, that judges are trying to preserve businesses with going-concern surplus, however defined. This may not be the socially optimal goal, especially if surplus is absent from all businesses, but it is the goal that the Bankruptcy Code directs judges to pursue.[28] If data show that judicial behavior is in fact consistent with pursuit of this goal, the data provide additional evidence that judges do not display a systematic bias in favor of continuing or liquidating small businesses.

A business's going-concern value will be uncertain at the outset of a bankruptcy case. This uncertainty will gradually decline as information is retrieved. As uncertainty declines and the parties update their beliefs regarding the value of the business, they must decide whether reorganization efforts should continue or terminate. If termination is most attractive, creditors and the U.S. trustee will file motions to dismiss the case, convert to Chapter 7, or lift the automatic stay

[28] See, for example, *United States v. Whiting Pools* (462 U.S. 198, 202 [1983]): "By permitting reorganization, Congress anticipated that the business would continue to provide jobs, to satisfy creditors' claims, and to produce a return for its owners. . . . Congress presumed that the assets of the debtor would be more valuable if used in a rehabilitated business than if 'sold for scrap.'"

Table 13

Evidence of Financial Distress

	Shutdowns (N = 59)		Continuations (N = 36)	
	%	Frequency	%	Frequency
Overexpansion	8.5	5	40.0	14
Prepetition fraud or malfeasance	3.4	2	8.6	3
Cash shortages from loss of customers	10.2	6	8.6	3
Cost overruns from reconfiguring business	3.4	2	11.4	4
Asbestos liability	.0	0	2.9	1
Any evidence of financial distress	25.4	15	71.4	25
Any evidence of financial distress, excluding cases exhibiting economic distress	10.2	6	71.4	25

to permit seizure of core assets. A debtor too may realize that its prospects are poor and voluntarily seek dismissal or conversion. This is likely when neither outside lenders nor existing creditors will offer additional financing. A judge will generally grant a debtor's motion to dismiss or convert; under the code, a debtor can initiate or terminate a case at will, with some exceptions. A creditor's motion will be granted only after the judge independently assesses the value of the business.

This process can be studied formally using a simple matching model[29] drawn from the optimal stopping and job search literatures[30] and set out in the Appendix. This model allows us to identify characteristics of an ideal bankruptcy process that optimally filters good from bad matches as information about business quality is updated over time. For analytic convenience, the model assumes that a wealth-maximizing planner (called, for convenience, the judge) runs the process. In reality, of course, the outcomes of the bankruptcy process are determined by negotiation and bargaining among debtors, creditors, trustees, and judges. The model merely provides a theoretical benchmark against which we can evaluate bankruptcy outcomes and test for the presence of continuation bias.

Two important implications emerge from this model. First, if a business's estimated going-concern value at filing (G) is not significantly above or below its liquidation value (L), the outcome of its Chapter 11 case should be correlated with the degree of uncertainty (U) surrounding the going-concern value. The greater the uncertainty, the longer the bankruptcy process should continue before the shutdown option is exercised. This is an options effect and reflects the

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[29] The process could also be analyzed using a real options model. The implications are roughly the same, as Baird and Morrison (1999) show. Chen and Sundaresan (2003) develop a more general model of the shutdown decision and extend it to consider debtor-in-possession financing.

[30] These literatures study the optimal time to terminate an ongoing process; applications include a business's decision to abandon a troubled project (Dixit and Pindyck 1994), a worker's decision to discontinue job search (Jovanovic 1979), and a counterparty's decision to repudiate an ongoing contract (Triantis and Triantis 1998).

asymmetric effect of uncertainty in this context. The greater the uncertainty, the greater the probability the business will prove to be a good match tomorrow. There is, of course, a higher probability that the business will prove to be a bad match, but the business's assets can be sold if this happens. The business's liquidation value offers a hedge against the downside risk from waiting to liquidate.[31] All else equal, then, the greater the uncertainty surrounding business value, the longer a business should spend in Chapter 11.

This options effect, however, will be absent in cases in which the business's going-concern value G is significantly above or below its liquidation value L. If G is significantly above L, it is virtually certain that the business will be reorganized or restructured in bankruptcy. The probability of shutdown will be zero or close to it, and the business will exit bankruptcy quickly. Conversely, if G is significantly below L, the business will be shut down immediately.

The second implication of the model is that the probability (or hazard rate) of exercising the shutdown option should be hump shaped over time—low initially, then rising, and ultimately declining.[32] The probability should be low when a business first enters the bankruptcy process because uncertainty is high. As information is obtained and uncertainty resolved, the parties (debtor, creditors, judge) should have stronger incentives to exercise the option. The probability of shutdown will 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 (for them, the shutdown option is "out of the money") or those with highly uncertain profitability. Some of these businesses will never be shut down; others will be shut down only after a delay, during which the decision maker gathers information about the businesses' viability. Thus, the probability of shutdown should fall gradually over time. This is a selection effect.[33]

These two implications—the options effect and the selection effect—provide simple yet theoretically coherent benchmarks for evaluating existing practice in bankruptcy courts.

4.2. Evidence of the Selection Effect

The selection effect is evident in Figure 1, which shows a hump-shaped probability of shutdown. The likelihood of shutdown (displayed in black bars) in-

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[31] Guiso and Parigi (1999) show that this implication can be reversed under certain conditions, although they find the options effect in their empirical work. The effect has also been observed in other studies, including Moel and Tufano (2002) and Ghosal and Loungani (2000).

[32] Technically, the hump shape will characterize the probability (or hazard) of shutdown only if the value of the venture (going-concern value) is at least as great as its liquidation value when the decision maker first considers whether to exercise the shutdown option. Otherwise, the business will be shut down immediately. In the context of Chapter 11, this means that a hump-shaped pattern will be observed if most businesses file petitions only when their value as going concerns is at least as great as their liquidation values (that is, few businesses file petitions when they are destined to be shut down immediately by the bankruptcy judge).

[33] This effect has been verified empirically in work applying matching models to labor markets (see, for example, Lane and Parkin 1998).
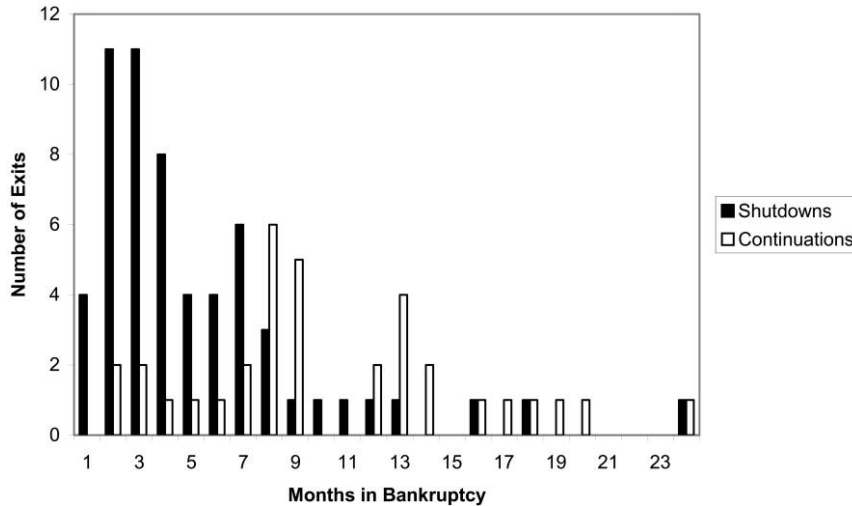
Figure 1. Months to exit: frequencies for shutdowns and continuations

creases during the first 3 months of a bankruptcy petition, reaches a maximum around 3 months, and then falls. Using a normal approximation to the binomial, as suggested by Chapman and Southwick (1991), the increase from months 1 to 3 and the decrease from months 3 to 9 are both significant at the 5 percent confidence level. Figure 2 plots the monthly hazard rate of shutdown, which is computed as the ratio of the number of businesses shut down to the number of businesses not yet shut down in each month.[34] Here, the increase from months 1 to 3 is significant at the 5 percent level; the decrease from months 3 to 9 is significant at the 10 percent level.

The hump-shaped pattern suggests an absence of continuation bias. This evidence must, of course, be seen in conjunction with the rest. By itself, the hump-shaped pattern is not conclusive; processes could produce it as well. Suppose, for example, that Northern District bankruptcy judges flip coins to determine a business's fate and that, for some reason, most judges flip their coins when the case reaches the 3-month mark but some flip it earlier and some later. A decision-making rule of this sort would yield a similar hump-shaped pattern. But this sort of rule is inconsistent with the evidence presented in the previous sections, which shows that Northern District judges sort effectively between viable and nonviable businesses. Viewed in light of this evidence, the hump-shaped patterns in Figures 1 and 2 offer additional reason to believe that continuation bias is absent in the Northern District.

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[34] I code a business as not yet shut down even if it has left the sample because it has been reorganized. I am implicitly assuming that such a business, which was cured of its financial distress, would not have been shut down even if it remained in bankruptcy for an extended period.
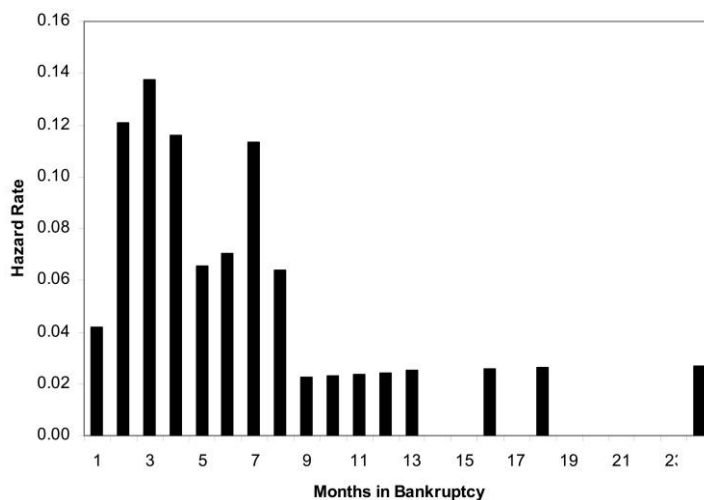
Figure 2. Months to exit: hazard rate for shutdowns

4.3. Evidence of the Options Effect

Three variables drive the options effect: a business's estimated going-concern value (G), the uncertainty surrounding that estimate (U), and the liquidation value of the business's assets (L). If the difference between G and L is not large, an increase in U should increase the amount of time that a business spends in Chapter 11. It could also increase the probability that a business exits bankruptcy intact, but only if the business is reorganized or sold off at a point when significant uncertainty about its viability remains. This might occur, for example, if the parties to the bankruptcy process believe that it is cheaper to monitor the business's viability outside of Chapter 11.

4.3.1. Proxies for Key Variables

The variable L can be estimated using a debtor's financial schedules, which offer rough estimates (usually book value) of the value of its assets. We can, however, develop only rough proxies for G and U. The bankruptcy filings provide only cursory information about the prepetition financial performance of these privately held businesses. Proxies for U can be derived from the observed volatility surrounding earnings of businesses in the same industry. One such proxy is the standard deviation of monthly returns on a portfolio of publicly traded businesses in the same industry.[35] This variable (Stockmarket Volatility) assumes

[35] The proxy is computed using data from 1995–97, the 3 years prior to the bankruptcy filings in this study (a 3-year window appears to be a standard time frame for assessing volatility). The stock return data were taken from (French 2006).

a (weak) correlation between the volatility surrounding the earnings of publicly traded businesses and those of privately held businesses in the same industry.

Another proxy for U is the cross-sectional variation in profitability among small businesses in the same industry (and the same metropolitan area), which can be derived from the 1998 SSBF data. Because it uses data on small businesses—the focus of this paper—this measure (SSBF Volatility) has advantages relative to stock market volatility. On the other hand, the latter measure is theoretically more attractive because it is based on variation in profitability within businesses over time, not profitability across businesses at a single point in time.

A final proxy for U is the proportion of small businesses within a particular industry that "die" each year (Industry Attrition Rate). The U.S. Census Bureau offers dynamic data tracking the births and deaths of small businesses over time.[36] Deaths are defined as closures, which could result from liquidation or from merger with another business. Using these data, we can derive an average probability (over the period 1995–97) that a business within a particular industry will die over the course of a year. This measure is a useful proxy for U because it offers a rough measure of the relative risk of shutdown across industries.

Proxies for going-concern value (G) are harder to find. If we assume that a business's going-concern value is correlated with industry conditions, one proxy for a business's G is the growth rate of earnings, employment, or number of businesses in the same industry. If an industry is growing relatively fast, businesses in that industry may have relatively high going-concern values.

An alternative measure of G is whether the sample business entered bankruptcy as a result of overexpansion. As noted before, such a business is likely suffering financial distress and may have going-concern surplus if it scales back its operations. Another, similar measure is whether the sample business, after entering bankruptcy, filed a motion to use cash collateral. Many businesses have given lenders security interests in cash and accounts receivable. To access these sources of liquidity, the businesses must obtain permission from either the lenders or the court. In practice, courts are reluctant to grant permission over the objection of lenders.[37] Knowing this, debtor businesses rarely file motions to use cash collateral without first obtaining the lenders' permission. The filing of a motion to use cash collateral, then, offers some evidence that both the debtor and its primary creditors believe that the business has value as a going concern.

The difficulty with these proxies is that not all sample businesses with significant going-concern surplus will have suffered overexpansion problems or need to file motions to use cash collateral. Thus, these proxies identify only some of the businesses with relatively high values for G.

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[36] Dynamic data on establishment births and deaths are constructed by the U.S. Census Bureau for the United States Small Business Administration. See United States Small Business Administration, Office of Advocacy, Firm Size Data (http://www.sba.gov/advo/research/data.html). For more information, see Armington (1998).

[37] Eugene R. Wedoff, former chief judge of the United States Bankruptcy Court for the Northern District of Illinois, personal interview with the author, December 3, 2002.

These variables—*L, G,* and *U*—are not the only plausible factors affecting the likelihood of shutdown in bankruptcy. Another factor is the business's liquidity, as measured by cash holdings at the beginning of the case. Businesses with significant cash holdings are less dependant on outside sources of liquidity and may be able to survive longer in Chapter 11. Another factor is the degree of creditor control, which can affect the amount of time a business spends in bankruptcy. I use several proxies for creditor control: leverage (debt divided by assets), the extent to which the business's assets are encumbered by security interests, and whether the owner personally guaranteed the business debts. Other factors that may affect the shutdown decision are business characteristics (age, prior bankruptcy experience) and whether the business complied with bankruptcy procedures (by, for example, filing the requisite schedules).

4.3.2. Univariate Tests

An initial look at these variables is set out in Tables 14 and 15. Table 14 compares businesses that exited before and after the median case duration. The median duration for shutdowns was 4 months. The median duration for the full sample was 6 months. Table 15 compares shutdowns with businesses that exited intact.

The proxies for *U* offer mixed results. Table 14 shows that two proxies—stockmarket volatility and SSBF volatility—are larger among cases where the duration to shutdown or exit exceeded the median (I call these "slow shutdowns" and "slow exits"). This is consistent with the options effect, but the results are only marginally significant. The same pattern is evident in Table 15. The third proxy for *U*—industry attrition—is larger among slow shutdowns than among quick shutdowns, which is also consistent with the options effect. In the full sample, we see the opposite pattern: industry attrition is larger among quick than among slow exits (Table 14) and among shutdowns than among continuations (Table 15). The differences, however, are not statistically significant.

The proxies for *G* are somewhat mixed as well. Industry growth—the average annual increase in the number of businesses, by industry, during 1995–97—does not vary significantly between quick and slow shutdowns or between quick and slow exits (see Table 14) but is significantly larger among shutdowns than among continuations (see Table 15). The same pattern emerges when we analyze the average annual increase in employment, by industry, for the same period. This may suggest that industry growth is a poor proxy for *G,* or it may reflect the possibility that industries with high growth rates also have high earnings volatility (the correlation with stockmarket volatility is .35). The other proxies for *G*—overexpansion and motion to use cash collateral—exhibit patterns more consistent with the matching model: they are larger on average in cases that resulted in slow shutdown, slow exit, and continuation.

The remaining summary statistics in Tables 14 and 15 exhibit interesting patterns. Table 14, for example, shows that quick shutdowns involved business

Table 14

Differences between Cases Terminating before and after Median Case Duration

Category	Shutdowns		All Cases	
	Quick Shutdowns (≤4 Months)	Slow Shutdowns (>4 Months)	Quick Exits (≤6 Months)	Slow Exits (>6 Months)
Stock market volatility (U)	4.124 (.085)	4.248 (.121)	4.213 (.102)	4.289 (.093)
SSBF volatility (U)	.177 (.003)	.180 (.003)	.177 (.002)	.183^ (.003)
Industry attrition rate (U)	10.042 (.260)	10.524# (.244)	10.123 (.212)	10.094 (.236)
Industry growth rate (G)	1.328 (.201)	1.480 (.214)	1.211 (.171)	.975 (.180)
Overexpansion problems (G)	.118 (.056)	.24* (.087)	.224 (.060)	.478** (.074)
Cash collateral motions (G)	.235 (.074)	.640** (.098)	.285 (.065)	.761** (.064)
Log assets (L)	11.079 (.311)	11.928** (.333)	11.117 (.244)	12.491** (.271)
Log cash holdings	6.206 (.608)	7.636^ (.669)	6.560 (.492)	8.183* (.488)
Leverage (log debt/log assets)	1.166 (.026)	1.143^ (.027)	1.169 (.026)	1.118 (.017)
Secured debt ≥ 75% of assets	.618 (.085)	.560+ (.101)	.673 (.068)	.304** (.069)
Debt personally guaranteed	.903 (.054)	.96 (.040)	.933 (.038)	.848# (.054)
Under 5 years old	.529 (.087)	.240* (.054)	.490 (.072)	.174** (.057)
Without lawyer	.088 (.049)	.0^ (.0)	.061 (.035)	.022 (.022)
Prior bankruptcy within 6 years	.176 (.066)	.160 (.075)	.163 (.053)	.130 (.050)
Prior bankruptcy in 1998	.059 (.041)	.040 (.040)	.062 (.035)	.022 (.022)
Incomplete financial schedules	.206 (.070)	.0* (.0)	.163 (.053)	.0* (.0)

Note. Standard errors are in parentheses. Within each group (Shutdowns and All Cases), the differences between quick and slow cases are tested. Symbols indicate the statistical significance of the differences.
^ Significant at the 15% level, two-tailed t-tests.
# Significant at the 10% level, one-tailed t-tests.
+ Significant at the 10% level, two-tailed t-tests.
* Significant at the 5% level, two-tailed t-tests.
** Significant at the 1% level, two-tailed t-tests.

Table 15

Differences between Shutdowns and Continuations

	Shutdowns	Continuations
Stock market volatility (U)	4.177 (.070)	4.369# (.140)
SSBF volatility (U)	.178 (.002)	.182 (.003)
Industry attrition rate (U)	10.246 (.183)	9.885 (.286)
Industry growth rate (G)	1.393 (.146)	.611** (.201)
Overexpansion problems (G)	.119 (.042)	.472** (.084)
Cash collateral motions (G)	.407 (.065)	.694** (.078)
Log assets (L)	11.458 (.232)	12.341* (.387)
Log cash holdings	6.819 (.457)	8.187+ (.542)
Leverage (log debt/log assets)	1.155 (.019)	1.126 (.027)
Secured debt ≥ 75% of assets	.593 (.065)	.333* (.080)
Debt personally guaranteed	.929 (.035)	.829^ (.065)
Under 5 years old	.407 (.065)	.222+ (.070)
Proceeding without lawyer (pro se)	.051 (.029)	.028 (.028)
Prior bankruptcy within preceding 6 years	.169 (.049)	.111 (.053)
Prior bankruptcy in 1998	.051 (.029)	.028 (.028)
Incomplete financial schedules	.102 (.040)	.0* (.0)

Note. Symbols indicate the statistical significance of the differences in means between shutdowns and continuations. Standard errors are in parentheses. SSBF = 1998 Survey of Small Business Finances.
^ Significant at the 15% level, two-tailed t-tests.
# Significant at the 10% level, one-tailed t-tests.
+ Significant at the 10% level, two-tailed t-tests.
* Significant at the 5% level, two-tailed t-tests.
** Significant at the 1% level, two-tailed t-tests.

that were relatively young, had smaller cash holdings, had larger secured debt levels, and were more likely to have violated court rules (by not filing financial schedules or by proceeding without a lawyer).

4.3.3. Multivariate Tests

Simple summary statistics offer some evidence supporting the existence of an options effect. Multivariate analysis, displayed in Table 16, allows us to test this effect with greater care.

Columns 1–7 of Table 16 analyze the duration of cases resulting in shutdown. Columns 1 and 2 present a simple Cox model of the hazard rate, defined as the probability of shutdown at time t conditional on avoiding shutdown until t. Formally, the hazard rate $h(t, X)$ is defined as $h(t, X) = h(0)e^{x'\beta}$, where X is a vector of regressors and β is a vector of estimated coefficients. A negative coefficient implies that a regressor reduces the hazard of shutdown or, equivalently, increases the duration until shutdown. The Cox model is attractive largely because it makes no assumption about the shape of $h(0)$, the baseline hazard rate. Column 1 presents the results of a simple model in which the only covariates are proxies for U, G, and L. Consistent with the univariate analysis in Table 15, the coefficients on the proxies for U are uniformly negative, which implies that an increase in uncertainty is correlated with longer case duration. The negative coefficient is marginally significant for stock market volatility and industry at-

trition. The third proxy—SSBF volatility—appears to have no independent predictive value. Column 2 shows that little or nothing changes in the model when this variable is dropped (it is dropped in the remaining analysis as well). Overall then, shutdown occurs later in time for businesses with relatively high indexes of U. Columns 1 and 2 show also that various measures of going-concern surplus are negatively correlated with the hazard rate, which is again consistent with the theoretical model.

Column 3 augments the Cox model by adding other variables that may affect the hazard of shutdown. The proxies for uncertainty remain negative but increase in significance. Among the newly added variables, cash holdings and leverage are strongly correlated with reductions in the hazard rate. Conversely, an increase in the hazard rate is likely when a business proceeds without a lawyer or has filed a bankruptcy petition in the preceding 6 years. These observations are unchanged when we eliminate repeat filings by the same business during the sample period (column 4).

Columns 5–7 test the robustness of these results by varying the underlying distribution of the baseline hazard rate, $h(0)$. Each column assumes a different distribution: exponential (column 5), Weibull (6), and lognormal (7). The models applying the exponential and Weibull distributions are models of the hazard rate, so a negative coefficient implies that an increase in the regressor reduces the hazard rate and increases case length. In contrast, the model applying the lognormal distribution is a model of case length itself. Here the coefficients have the opposite interpretation: a positive coefficient implies that an increase in the regressor is correlated with a longer case length. Thus, the positive coefficients in column 6 are consistent with the negative coefficients in the other columns.

Note that that the results in Columns 1–7 are based on the subset of cases involving shutdowns ($N = 59$). Among these cases, the results show that the greater the uncertainty surrounding business viability (U), the longer the business is allowed to continue operations in Chapter 11. The downside of these models is that they ignore cases in which the business exited bankruptcy intact.

Column 8 remedies this defect using a "cure," or split-population, model (for applications, see Berkson and Gage 1952; Schmidt and Witte 1989; Bandopadhyaya and Jaggia 2001). This model assumes that all sample businesses—even those that ultimately exited intact—were at risk of shutdown. Businesses that exited intact—via a plan of reorganization or a going-concern sale—might have been shut down had they lingered in Chapter 11. The cure model simultaneously estimates the probability that a business will be shut down and the duration to shutdown.

Formally, the likelihood function for the cure model is assembled as follows. Following Schmidt and Witte (1989, pp. 148–49), let S be an unobservable variable indicating whether a business will be shut down in bankruptcy if the bankruptcy judge is given sufficient time to gather information about it. Let S equal one if a business will be shut down and zero otherwise. Assume that the probability that S equals one is δ: $\Pr(S = 1) = \delta$ and $\Pr(S = 0) = 1 - \delta$. Next,

Table 16
Models of the Shutdown Decision in Chapter 11

	Hazard						Duration (7)	Duration-Cure (8)	Logit (9)
	(1)	(2)	(3)	(4)	(5)	(6)			
Stock market volatility (U)	−.332	−.359^	−.514$^+$	−.565$^+$	−.229^	−.435^	.300$^+$	.380*	−1.797*
	(.170)	(.129)	(.099)	(.067)	(.102)	(.101)	(.087)	(.017)	(.028)
SSBF volatility (U)	−4.574								
	(.647)								
Industry attrition rate (U)	−.191$^+$	−.174*	−.384**	−.354**	−.142**	−.389**	.115*	.095$^+$	.285
	(.056)	(.046)	(.001)	(.002)	(.002)	(.001)	(.038)	(.092)	(.284)
Industry growth rate (G)	−.034	−.038	−.182	−.168	−.095	−.232	.084	.020	1.472**
	(.809)	(.787)	(.395)	(.433)	(.286)	(.241)	(.381)	(.844)	(.000)
Overexpansion problems (G)	−.409	−.469	−.589	−.629	−.316	−.528	.392$^+$	.525*	−2.095**
	(.292)	(.240)	(.239)	(.200)	(.133)	(.283)	(.070)	(.020)	(.008)
Cash collateral motions (G)	−.847*	−.838*	−.745$^+$	−.556	−.344$^+$	−.608	.413*	.502*	−2.644**
	(.024)	(.024)	(.086)	(.169)	(.078)	(.149)	(.028)	(.011)	(.003)
Log assets (L)	−.162	−.157	−.425	−.460$^+$	−.147	−.442$^+$	.119	.117	.024
	(.168)	(.175)	(.125)	(.099)	(.131)	(.051)	(.208)	(.233)	(.935)
Log cash holdings			−.155*	−.145*	−.071*	−.148*	.076**	.078**	−.107
			(.021)	(.024)	(.012)	(.028)	(.006)	(.009)	(.403)
Leverage (log debt/log assets)			−4.586*	−4.801*	−1.498	−4.456*	1.006	1.061	−5.216$^+$
			(.031)	(.023)	(.118)	(.019)	(.349)	(.320)	(.062)

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Secured debt ≥ 75% of assets			.625	.509	.294	.603	−.283	−.379[+]	1.860*
			(.224)	(.299)	(.166)	(.227)	(.180)	(.071)	(.019)
Debt personally guaranteed			−.070	−.008	−.084	−.222	.021	.035	1.297
			(.937)	(.993)	(.806)	(.788)	(.948)	(.919)	(.269)
Under 5 years old			.735	.688	.267	.579	−.276	−.290	.334
			(.101)	(.120)	(.164)	(.132)	(.198)	(.200)	(.689)
Without lawyer			2.342[+]	2.574	1.042**	2.427*	−1.075**	−1.097**	−2.458
			(.064)	(.107)	(.007)	(.023)	(.002)	(.003)	(.160)
Prior bankruptcy within preceding 6 years			.988*	.927*	.432[+]	1.078**	−.489	−.471	−1.124
			(.015)	(.027)	(.060)	(.004)	(.145)	(.189)	(.185)
Prior bankruptcy in 1998			.838		.359	.770	−.251	−.191	.597
			(.276)		(.316)	(.306)	(.534)	(.645)	(.672)
Incomplete financial schedules			.352	.451	.027	.116	−.000	−.032	
			(.661)	(.624)	(.936)	(.897)	(1.000)	(.927)	
Including repeat filings	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
N	59	59	54	51	54	54	54	89	86
Distribution	Cox	Cox	Cox	Cox	Exponential	Weibull	Lognormal	Lognormal	Logistic

Note. Parentheses contain robust *p*-values, clustering on firm identity. SSBF = 1998 Survey of Small Business Finances.
^ Significant at the 15% level.
+ Significant at the 10% level.
* Significant at the 5% level.
** Significant at the 1% level.

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let t measure the amount of time a business spends in bankruptcy before being shut down. Assume that t is distributed according to some cumulative distribution function G. Thus, the density of businesses that are shut down after t months in bankruptcy is $g(t|S = 1)$. Let C be a dummy variable equal to one if the business exits bankruptcy intact and zero otherwise. The term C indicates whether information about a business is censored: we know that the business exited bankruptcy, but we do not know whether it would have been shut down had it remained in bankruptcy. If a business exits bankruptcy without being shut down, let T measure the amount of time the business spent in bankruptcy.

With these definitions in hand, we can assemble the likelihood function. We observe two kinds of firms in the data: shutdowns (indexed by i) and continuations (indexed by j). The probability of shutdown at time t is

$$\Pr(S = 1)g(t_i|S = 1) = \delta g(t_i|S = 1).$$

The probability of continuation 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

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

where $\sum_i$ sums over businesses shut down in bankruptcy ($C = 0$) and $\sum_j$ sums over businesses that exited bankruptcy intact ($C = 1$). Estimates reported in column 8 assume that G is a lognormal distribution, a standard assumption in settings where the hazard rate is nonmonotonic, as it is here. The model also assumes, for simplicity, that δ is a scalar with logistic distribution.[38]

Column 8 shows that the estimates derived from this cure model are roughly identical to those generated by a simple duration model with a lognormal baseline hazard. Combined with the results in columns 1–7, these results offer suggestive evidence in favor of the options effect.

Instead of studying the duration to shutdown, column 9 analyzes the probability of shutdown using a standard logit model. Here the subset of cases resulting in shutdown is compared with the subset resulting in continuation. The coefficients in column 9 measure the effect of changes in the control variables on the probability of shutdown. The dependent variable equals one if a case resulted in shutdown and zero otherwise. Interestingly, only one of the proxies for uncertainty—stockmarket volatility—has the predicted negative effect. The other proxy has a positive, but insignificant, coefficient. As in Table 15, proxies for going-concern surplus also have mixed coefficients. An increase in industry growth is strongly correlated with an increase in the probability of shutdown.

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[38] This simple model is estimated using Mario Cleve's "lncure" program for STATA (http://www.stata.com/users/mcleves/lncure/).

The opposite is true for the other proxies, overexpansion problems and cash collateral motion. The logit model then offers only mixed support for the options effect. These results are unsurprising because it is hard to predict the effect of uncertainty (U) in this model. The effect occurs only when the going-concern value (G) is close to liquidation value (L). If G far exceeds L, a business will be kept intact, regardless of U. In the sample, however, continuations include both businesses in which G was close to L (where the options effect operates) as well as those in which G far exceeded L (where the options effect is absent). This heterogeneity may explain the mixed results in column 9.

Together, the patterns reported here are generally consistent with the hypothesis that bankruptcy judges decide cases in order to identify and preserve firms with going-concern surplus. The hazard of shutdown is hump shaped, a business is more likely to exit bankruptcy intact if it has significant going-concern value, and a business is more likely to be shut down quickly if there is relatively little uncertainty about its value as a going concern. The conclusion does not imply that the behavior of bankruptcy judges is optimal. Few, if any, businesses in bankruptcy may have significant going-concern surplus worth saving (in the form of specialized physical capital), as Baird and Morrison (2005b) have argued. The results presented here show, instead, that judges act as if they are seeking out and preserving going-concern surplus.

5. Conclusion

Evidence gathered from the Northern District of Illinois supports the hypothesis that current practice in the bankruptcy courts exhibits no systematic bias in favor of saving nonviable businesses. The debtor's managers are not in control, and businesses destined to fail are identified quickly. Viewed through the lens of a formal matching model of the bankruptcy process, the data again suggest that bias commonly ascribed to the Chapter 11 process is either absent or empirically unimportant. The costs of small-business Chapter 11 cases are smaller than commonly thought. Whether the benefits of Chapter 11 are large enough to justify even these costs, however, is far from self-evident. A careful examination of the benefits of Chapter 11 is also needed.[39]

[39] Another paper, Baird and Morrison (2005b), uses data from the Northern District to address this question as well. There we argue that the benefits of small-business Chapter 11 cases, like the costs, are quite low, even when the business survives as a going concern.

Appendix

A Matching Model of Chapter 11

Consider an idealized bankruptcy court that receives Chapter 11 petitions by a large number of businesses every period. When a case begins, the business's liquidation value (R) is observable, but its going-concern value (V) is not. The parties know only that a fraction, p, of the businesses have high going-concern value (H) and are worth reorganizing. The remaining businesses are low-value businesses (L) that should be liquidated.

Although going-concern value is unobservable at the outset, information is revealed over the course of the case, which lasts two periods. During period 1, the court receives a signal of business type. The signal is either good (g) or bad (b). Good signals occur with probability π_g, bad with probability π_b. Assume that good signals are more likely to arise from type H than from type L businesses: $\pi_{g|H} > \pi_{g|L}$. The reverse is true for bad signals, which are more likely to arise from type L than from type H businesses: $\pi_{b|L} > \pi_{b|H}$. Note that $\pi_{g|H} + \pi_{b|H} = 1$ and $\pi_{g|L} + \pi_{b|L} = 1$.

At the end of period 1, after receiving the signal, the judge must decide whether to liquidate the business or allow it to continue in operation, at least until the next period. If the business is liquidated, the return to creditors is R. If it is allowed to continue, the judge will receive an additional signal of business quality in period 2. Again, the signal will be either g or b. After receiving this signal, the judge has a final opportunity to liquidate the business. If the business is not liquidated, it exits bankruptcy and operates for one more period, at the end of which its true value (H or L) is revealed. If it is type H, the business is sold off as a going concern and the payoff to creditor is H. If it is type L, the business is liquidated, with a payoff $R > L$ to creditors.

There is a cost to waiting. Every period, the parties incur administrative and other costs equal to c. The judge fully internalizes these costs in his or her decision-making calculus.

There is an opportunity, then, to liquidate a Chapter 11 debtor at the end of each period. What is the optimal time to exercise this shutdown option? We can characterize the optimal decision via backward induction.

Start with period 2. The judge's decision depends on the signals received to date. If the signals in periods 1 and 2 were {g, g}—meaning that good signals were received in both periods—the best estimate of the business's going concern is

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

where

$$\Pr(H|gg) = \frac{\pi_{g|H}^2 p}{\pi_{g|H}^2 p + \pi_{g|L}^2 (1-p)}$$

and

$$\Pr(L|gg) = \frac{\pi_{g|L}^2(1-p)}{\pi_{g|H}^2 p + \pi_{g|L}^2(1-p)},$$

using Bayes's rule. Given this estimate of business value, the judge must decide whether to liquidate the business immediately or allow it to continue to period 3. If it is liquidated, the return to creditors is $R - 2c$; if it is allowed to continue, the expected return to creditors next period is $E(V|gg) - 3c$. More formally, the judge's problem is

$$\max\{E(V|gg) - c, R\}.$$

There is a threshold liquidation value $R_{gg}^\star$ such that the judge is indifferent between liquidating and permitting continuation. If a business's liquidation value R exceeds $R_{gg}^\star$, the business will be liquidated; if it is below $R_{gg}^\star$, the business will be preserved, at least temporarily. This threshold is equal to

$$R_{gg}^\star = H - \frac{1}{\Pr(H|gg)}c.$$

Analogous expressions[40] characterize the threshold liquidation value—$R_{gb}^\star$, $R_{bg}^\star$, and $R_{bb}^\star$—when the judge has received different signals of business quality in periods 1 and 2.

These period 2 thresholds have important characteristics. First, the thresholds are larger for businesses with better histories: $R_{gg}^\star > R_{gb}^\star = R_{bg}^\star > R_{bb}^\star$, because $\Pr(H|gg) > \Pr(H|bg) = \Pr(H|gb) > \Pr(H|bb)$.[41] This means that judges are less willing to terminate businesses that have generated better signals of quality. More important, these thresholds are increasing in the variance of business quality, $\sigma^2 = p(1-p)(H-L)^2$. Holding average quality—$pH + (1-p)L$—constant, variance in business 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 $R_{gg}^\star$ 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 businesses, a judge can avoid the downside risk by liquidating the business for payoff $R > L$. Thanks to this insurance, an increase in variance can only increase the potential payoff to creditors.

Turn now to period 1. At the end of the period, after observing a signal, the

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[40] $R_{gb}^\star = R_{bg}^\star = H - [1/\Pr(H|gb)]c$ and $R_{bb}^\star = H - [1/\Pr(H|bb)]c$.

[41] If $\Pr(H|gg) > \Pr(H|bb)$, then $[(\pi_{g|H})^2 p]/[(\pi_{g|H})^2 p + (\pi_{g|L})^2(1-p)] > [(\pi_{b|H})^2 p]/[(\pi_{b|H})^2 p + (\pi_{b|L})^2(1-p)]$, which is equivalent to $(\pi_{b|L}/\pi_{b|H})^2 > (\pi_{g|L}/\pi_{g|H})^2$. The last inequality holds because $\pi_{g|H} > \pi_{g|L}$ and $\pi_{b|H} < \pi_{b|L}$. Similar calculations show that $\Pr(H|gg) > \Pr(H|gb)$ and $\Pr(H|gb) > \Pr(H|bb)$.

judge has his or her first opportunity to liquidate the business. His or her problem is

$$\max\{E(V|s) - c, \ R\},$$

where s denotes the signal broadcast in period 1. The optimal decision depends on the relationship between the period 2 thresholds $R^{\star}_{gg}$, $R^{\star}_{gb}$, and $R^{\star}_{bb}$ and the business's liquidation value R. We need to consider four cases.

Case 1: $R > R^{\star}_{gg}$.   This implies that, even if the business generates good signals in both periods 1 and 2, its liquidation value will still exceed its expected going-concern value. Under these conditions, it makes sense to liquidate the business immediately at the end of period 1. It makes no sense to permit continuation because the judge will always liquidate the business at the end of period 2. The history of signals will be irrelevant in light of the large payoff from liquidation.

Case 2: $R < R^{\star}_{bb}$.   Here the liquidation value of the business is so small that it almost always makes sense to permit continuation. Suppose the judge permits continuation. At the end of the next period—period 2—the judge will permit continuation again, regardless of the history of signals, because the payoff to creditors is so low. Given that continuation will be permitted at the end of period 2, it is optimal to permit continuation at the end of period 1 unless the liquidation value R is close to the threshold $R^{\star}_{bb}$.[42] If it is close, the cost of waiting, c, swamps the gains.

Case 3: $R^{\star}_{gb} < R < R^{\star}_{gg}$.   Under these conditions, a judge will liquidate a business at the end of period 2 if it broadcast a bad signal at any time. Knowing this at the end of period 1, the judge will liquidate any business with a bad period 1 signal. Suppose, then, that the business had a good period 1 signal. The judge's problem is

$$\max\{\Pr(g|g)[E(V|gg) - c] + \Pr(b|g)R - c, \ R\},$$

where $\Pr(g|g)$ and $\Pr(b|b)$ are the probabilities of good and bad signals in period 2, respectively, given a good signal in period 1. In this problem, liquidation is optimal if R exceeds the threshold

$$R^{\star}_{g3} = H - \left[\frac{1}{\pi_{g|H}\Pr(H|g)} + \frac{1}{\Pr(H|gg)}\right]c,$$

which can be derived through repeated application of Bayes's rule. This threshold is clearly less than $R^{\star}_{gg}$. It will also be greater than $R^{\star}_{gb}$ if the first term in brackets is not too large.

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[42] Suppose, for example, that the period 1 signal is b. Given that continuation will be permitted in period 2, the judge's problem is $\max\{E(V|b) - 2c, \ R\}$. The threshold liquidation value for this problem is $R^{\star}_{b2} = H - [2/\Pr(H|b)]c$. If $R < R^{\star}_{b2}$, continuation will be permitted in both periods 1 and 2. By assumption, $R < R^{\star}_{bb}$. As long as there is an R such that $R^{\star}_{b2} < R < R^{\star}_{bb}$, then liquidation may be optimal in period 1, even though it is not in period 2. Such a region exists if $\Pr(H|b) - 2\Pr(H|bb) < 0$.

Case 4: $R_{bb}^\star < R < R_{gb}^\star$.   Here the business will be kept intact at the end of period 2 if it broadcasts a good signal at any time. Liquidation is optimal only when a business broadcasts consistently bad signals. Knowing this at the end of period 1, the judge will permit continuation of any business with a good period 1 signal, provided per-period costs are not too high.[43] Suppose then that the period 1 signal is *b*, which implies that the business will be preserved in period 2 only if the second signal is *g*. The judge solves

$$\max \{ \Pr(g|b)[E(V|gb) - c] + \Pr(b|b)R - c, R \},$$

which yields the threshold

$$R_{b4}^\star = H - \left[\frac{1}{\pi_{g|H} \Pr(H|b)} + \frac{1}{\Pr(H|gb)} \right] c.$$

Thus, a business will avoid liquidation, even with a bad first-period signal, if *R* is less than $R_{b4}^\star$. Note that $R_{b4}^\star < R_{g3}^\star$.

Given these thresholds, we can determine how the probability (and hazard) of liquidation varies over the course of a case. To illustrate, assume that liquidation is never optimal at the outset of the case, before any information has been gathered. Recall that liquidation is optimal at the end of period 1, regardless of the signal, if *R* exceeds $R_{gg}^\star$ or $R_{g3}^\star$. To avoid immediate liquidation at the start of the case, assume that *R* falls below these thresholds (ruling out case 1 and part of case 3). Assume, in addition, that *R* is not so low that liquidation is never optimal; we are interested in cases where liquidation is a real possibility. Recall that liquidation is never optimal if *R* is less than $R_{bb}^\star$ or $R_{b4}^\star$, provided per-period costs are not large. Assume that *R* exceeds both thresholds and that costs are low (ruling out case 2 and part of case 4).

These assumptions imply that the probability of liquidation is zero at the beginning of period 1. The assumptions also imply that *R* falls within two possible ranges: $R_{b4}^\star < R < R_{gb}^\star$ or $R_{gb}^\star < R < R_{g3}^\star$.

Consider region 1: $R_{b4}^\star < R < R_{gb}^\star$. Here a business will be liquidated if the period 1 signal is bad, which occurs with probability $\Pr(b) = \pi_{b|H}p + \pi_{b|L}(1 - p)$. This means that, at the end of period 2, the only businesses will be those with good period 1 signals and either good or bad period 2 signals. None of these businesses will be liquidated, because *R* is less than $R_{gb}^\star$. The probability of liquidation is therefore zero in period 2.[44] Thus, the hazard of liquidation is hump shaped when *R* lies in region 1: the hazard is zero at the start of period

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[43] More formally, the judge's problem is $\max \{E(V|g) - 2c, R\}$. The business will be kept intact so long as *R* is less than the threshold $R_{g4}^\star$, defined by $R_{g4}^\star = H - [2/\Pr(H|g)] c$. If *c* is small, it will never be optimal to liquidate if the period 1 signal is good.

[44] At the end of period 3, the business will be liquidated if it is revealed to be type *L*, the probability of which is $\Pr(L|g)$. Thus, if $R_{b4}^\star < R < R_{gb}^\star$, the hazard of shutdown will rise again in the final period, when full information is available.

1, rises to $\Pr(b)$ at the end of the period, and then falls again to zero at the end of period 2.

Turn now to region 2: $R^\star_{gb} < R < R^\star_{g3}$. Once again, a business will be liquidated at the end of period 1 if the judge received a bad signal, which occurs with probability $\Pr(b) = \pi_{b|H}p + \pi_{b|L}(1-p)$. Liquidation will occur at the end of period 2 only if a second bad signal was received. Thus, the period 2 probability of liquidation 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 $\pi_{b|H} < \pi_{b|L}$. Again we have a hump-shaped hazard: it is zero at the start of period 1, rises to $\Pr(b)$ at the end of that period, and then falls to $\Pr(b|g)$ at the end of period 2.[45]

These conclusions rest, of course, on the assumption that a business's liquidation value R is neither too large nor too small relative to its expected going-concern value. If its liquidation value is high (relative to its going-concern value), the judge will order liquidation immediately after it enters bankruptcy (that is, at the beginning of period 1). The probability of liquidation, and the hazard rate, would decline monotonically over time. Alternatively, if the business's liquidation value is very low, the probability of liquidation might be low (or zero) throughout the case. It would only rise in period 3, after the firm has exited bankruptcy and the parties have full information about business value.

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[45] The hazard will also be positive at the end of period 3. The judge will liquidate type L businesses that had good signals in periods 1 and 2. The probability of liquidation is therefore $\Pr(L|gg)$, which may be larger or smaller than $\Pr(b|g)$.

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