The Welfare Consequences of a Bankruptcy Reform - Evidence from the 2020 Small Business Reorganization Act*

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Abstract

Chapter 11 reorganization in the U.S. Bankruptcy Code was designed to rehabilitate efficient but financially distressed businesses. Using novel bankruptcy data, I show that direct bankruptcy costs are higher under Chapter 11 than Chapter 7. However, I find no evidence of relatively higher Chapter 11 costs for small businesses, as measured by their liabilities. Using a general equilibrium model with bankruptcy decisions of firms, I evaluate a recent business bankruptcy reform, called the Small Business Reorganization Act, which reduces the bankruptcy costs in Chapter 11 for small businesses. I find that the bankruptcy reform has small but positive impact on aggregate welfare, while output and productivity decrease. A lower Chapter 11 cost helps distressed firms to reorganize, but also prompts firms that would not declare bankruptcy absent the reform to reorganize. Despite this unintended consequence, welfare of the economy improves.

JEL Codes: E22, E65, G33, G38.

Keywords: Corporate Bankruptcy; Firm Dynamics; Small and Medium Enterprises; Bankruptcy Reform.

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1 Introduction

Chapter 11 reorganization in the U.S. Bankruptcy Code was designed to rehabilitate operationally efficient but financially insolvent businesses. Legal experts have long argued that Chapter 11's high costs lead small but viable businesses to instead choose Chapter 7 liquidation (American Bankruptcy Institute (2014)). In response to this argument, Congress amended the existing Bankruptcy Code by passing the Small Business Reorganization Act (SBRA) to reduce the costs of Chapter 11 for small business debtors. This law became effective on February 19, 2020. This recent policy reform raises an interesting economic question: what are the impacts of a *size-dependent* bankruptcy reform such as the SBRA on aggregate consumption, output, and productivity? This paper answers this question using a quantitative general equilibrium model in which heterogeneous firms make bankruptcy decisions.

Before exploring the quantitative implications of the SBRA, I introduce novel data to study (direct) bankruptcy costs in Chapter 7 and 11. By combining the U.S. Trustee Chapter 7 Final Reports, Lexis Public Records, and Federal Judicial Center's Integrated Database, I establish two empirical facts. First, direct bankruptcy costs, measured as a ratio of monthly administrative expenses to total assets or total liabilities, are higher in Chapter 11 than Chapter 7, after correcting for potential selection biases due to endogeneity of the choice of bankruptcy chapter. Second, I find no evidence that the gap between the costs under Chapters 7 and 11 is higher when debtors have a smaller *debt*. This result casts doubt on the rationale for the SBRA. However, the gap between Chapters 7 and 11 is higher when debtors have smaller *assets*. Thus, the definition of firm size matters for whether Chapter 11 is relatively more costly than Chapter 7 for small businesses.

By further utilizing Federal Judicial Center's Integrated Database, I investigate how the composition of bankruptcy filing changed after the SBRA. Using 2019 Chapter 11 share as counterfactual to control for any seasonal variations, I find that Chapter 11 share is higher for small businesses after the SBRA effective date and before mid-March while Chapter 11 share does not change significantly for large businesses for the same period. However, after the national emergency had been declared in mid-March, Chapter 11 share for small businesses significantly dropped. As this pandemic period brings a number of factors that affect business bankruptcy margin, it would be hard to identify the pure effect of the SBRA on bankruptcy Chapter composition. Thus, the results before mid-March might say the SBRA worked as intended, but we need more evidences from data that is going to be generated in a normal economy.

Armed with these facts, I use a general equilibrium model with heterogeneous firms that have bankruptcy options to quantitatively explore the impact of the SBRA on aggregate consumption, output, and productivity. I study the effects of the SBRA in the model of Corbae and D'Erasmo (2020), but I made three important modifications. First, I re-formulate the bankruptcy costs to depend on the level of debt and allow small and large businesses (in terms of their debts) to have different cost functions. Second, I assume that bankruptcy costs are transfers from bankrupt firms to households, so there is no direct deadweight loss from bankruptcy costs. This assumption allows me to focus on the impact of changing bankruptcy costs on aggregate consumption only through indirect equilibrium effects, by not treating the lower bankruptcy costs from the SBRA as a direct reduction in deadweight losses in the economy. Lastly, I calibrate the model parameters with data moments that come from samples including small operating and bankrupt firms.

I conduct a counterfactual analysis to quantify the impact of the SBRA. The SBRA has important implications on bankruptcy decisions and aggregate variables. First, the SBRA expands the range of firms that file for Chapter 11 reorganization as bankruptcy costs fall. Interestingly, both firms that choose Chapter 7 liquidation and firms that would not declare bankruptcy absent the SBRA change their decisions to choose Chapter 11 reorganization under the SBRA.

Second, the SBRA *increases* average debt financing costs for firms. The interest rate of defaultable debt is determined by expected payoffs to lenders. Two countervailing forces are at play. The SBRA decreases the interest rates by raising payoffs to lenders. This comes from the fact that some previously liquidated firms now choose to reorganize. However, at the same time, the SBRA increases the interest rate by prompting otherwise solvent firms to choose reorganization, in which the lenders are worse off. In addition, the reform affects lenders' recovery rates in Chapter 11. Under the calibrated parameter values in this paper, we observe a higher debt financing cost for firms on average.

Lastly, the SBRA increases aggregate consumption (welfare) (+0.10%), while it decreases aggregate output (-0.01%) and aggregate productivity (-0.02%). Lower Chapter 11 costs cause both otherwise-solvent firms and those in Chapter 7 liquidation to choose Chapter 11. Reorganizing inefficiently liquidated firms makes the economy better off, while reorganizing otherwise-solvent firms moves the economy away from the efficient allocation. In addition to these channels, changes in the investment decisions of firms in normal operation and Chapter 11 could also change welfare, as investment decisions are generally inefficient in the model due to financial frictions. The decrease in aggregate output is caused by less entry due to the higher debt financing costs. Aggregate productivity decreases as less entry and exit shifts the productivity composition toward low productivity firms.

This paper proceeds as follows. In Section 2, I provide some background on the U.S. Bankruptcy Code and the SBRA, and review the existing literature. In Section 3, I describe the novel data and document summary statistics. In Section 4, I discuss my methodology to correct for potential selection biases and present empirical results. In addition, I investigate how composition of bankruptcy filings changed after the SBRA. In Section 5, I outline a general equilibrium model with bankruptcy choices. Section 6 presents the calibration, bankruptcy cost estimates, and the quantitative impacts of the SBRA. Section 7 concludes.

2 Background

2.1 Chapter 7 liquidation vs. Chapter 11 reorganization

Under current U.S. law, businesses have two bankruptcy options: Chapter 7 liquidation and Chapter 11 reorganization. The main difference between Chapter 7 and Chapter 11 concerns whether a bankrupt firm can maintain its operations. Under Chapter 7 liquidation, a trustee is appointed to sell the company's assets to pay off debt. The company stops all of operations and goes out of business. In contrast, a firm that files under Chapter 11 intends to reorganize existing debts and continue in business, with the hope of returning to normal operations in the future.

It is worthwhile to note that Chapter 11 in general is better for creditors. First, debt recovery rates are higher in Chapter 11 than Chapter 7 for both secured and unsecured creditors (Bris et al. (2006)). Second, there is a "best interest of creditors" test in Chapter 11 in which debtors must guarantee to repay at least the amount that creditors would get if the case were converted to Chapter 7. One might wonder why creditors do not voluntarily waive Chapter 11 provisions such as creditors committees, which are costly to debtors, to encourage debtors to choose Chapter 11. The answer is that creditors committees "(1) consult with the debtor in possession on administration of the case (2) investigate the debtor's conduct and operation of the business and (3) participate in formulating a plan," so they are important safeguards to creditors.[1] Therefore, if

[1] Source: https://www.uscourts.gov/services-forms/bankruptcy/bankruptcy-basics/chapter-11-

creditors were to waive such a provision, the high recovery rates observed in Chapter 11 might no longer be guaranteed to creditors.

2.2 The SBRA

Chapter 11 was designed for complex debt reorganization. Legal commentators have long argued that Chapter 11's high costs and complexities make it difficult for small businesses to choose Chapter 11 reorganization over Chapter 7 liquidation (American Bankruptcy Institute (2014)). To address this concern, Congress amended the existing Bankruptcy Code by passing the SBRA, which became effective on February 19, 2020.

The SBRA includes several key provisions that are applicable to firms filing for Chapter 11 with debt below a threshold level. Under the SBRA, a creditors committee need no be formed, and a disclosure statement is not required. Second, under the SBRA, only debtors may file a reorganization plan. In a typical Chapter 11 case, the debtor's exclusive right to file a reorganization plan is guaranteed only for an exclusivity period. The SBRA's elimination of potential competing plans from creditors prevents conflicts that prolong the reorganization process and increase costs for debtors. I note that the "best interest of creditors" still applies under the SBRA. Lastly, the SBRA relaxes the requirements to confirm a reorganization plan. In a typical Chapter 11 case, it is usually hard to confirm a reorganization plan over creditors' objections. However, the SBRA makes confirmation easier. A reorganization plan will be confirmed so long as it earmarks all of the small business debtor's projected disposable income to make payments under the plan for a period of 3 to 5 years.

Interestingly, under the CARES Act of March 2020, Congress increased the debt threshold for applying the SBRA from \$2,725,625 to \$7,500,000 until March 27, 2021, to alleviate the negative economic shock from the pandemic. Although bankruptcy judges sometimes exercise discretion and take employment effects of a business bankruptcy into account, the increase in the debt ceiling for SBRA eligibility is the first instance of an explicit bankruptcy policy change adopted to counteract a recession.[2] It might be worthwhile to think about whether bankruptcy policy could be used more generally as a macro-stabilization policy in other recessions.[3] However, in this paper I consider only the long-run implications of the SBRA and use only pre-SBRA data.

bankruptcy-basics

[2]For more discussion of judges' discretion, see Liscow (2016).

[3]See Auclert et al. (2019) for the possibility of using time-varying consumer bankruptcy policy as a macro-stabilization tool.

In this draft, I model the SBRA as a lower fixed cost of filing Chapter 11 for small businesses. However, some provisions, such as making it harder for creditors to object to a reorganization plan, could be modeled as an increase in debtor's bargaining power in in the reorganization process. I will consider this channel in a later draft, but the economic impacts of a lower fixed cost and a higher bargaining power for debtors in Chapter 11 should be similar, as both channels lead debtors to choose Chapter 11 more often.

2.3 Contributions and Literature Review

This paper contributes to the scarce literature studying how firm dynamics are affected by bankruptcy institutions.[4] Corbae and D'Erasmo (2020) study a hypothetical bankruptcy reform suggested by Aghion et al. (1992) and the American Bankruptcy Institute (2014) using a firm dynamics model with both Chapter 7 and Chapter 11 bankruptcy options.[5] They show that the hypothetical reform increases aggregate productivity and welfare. Although Corbae and D'Erasmo (2020) provide a good benchmark, one assumption of their model makes it inconvenient to analyze a size-dependent bankruptcy reform. The cost of filing bankruptcy in their model is a function of a firm's productivity, which is a primitive of the model. This makes it hard to decrease the cost of bankruptcy filing specifically for small firms, as small firms can either be firms with low productivity or firms with high productivity that are small due to adjustment costs. In this sense, their model is not well-suited to experiment with a size-dependent bankruptcy reform as long as the cost is linked to exogenous productivity. In addition, their model parameters are calibrated by large firms data, which is inappropriate to study a bankruptcy reform focusing on small businesses. Peri (2020) studies the impact of pro-creditor bankruptcy reform on firm dynamics when a Chapter 11 filing firm can reorganize not only its debt but also its labor contracts. He shows that the change in expected recovery rates to creditors from a pro-creditor bankruptcy reform depends on the degree of labor market imperfections. Tamayo (2017) studies firm dynamics and alternative bankruptcy institutions with financial

[4]The literature is broadly connected to the vast literature that studies the impact of financial frictions on firm dynamics and aggregate productivity. See Cooley and Quadrini (2001), Arellano et al. (2012), D'Erasmo and Boedo (2012), and Midrigan and Xu (2014).

[5]The hypothetical bankruptcy reform analyzed by Corbae and D'Erasmo (2020) proposes a fresh start for a firm. This means that existing debt is discharged, and the new all-equity firm is distributed to former claim holders by absolute priority rules. The hypothetical reform is different from Chapter 11 as (1) Chapter 11 discharges only part of existing debt and (2) creditors who forgive their debt are not assigned equity in Chapter 11.

constraints that are micro-founded from the assumptions of limited commitment and asymmetric information. I contribute to the literature by studying the impact of a size-dependent bankruptcy reform on firm dynamics and aggregate productivity using a quantitative general equilibrium model that is calibrated by small and large bankrupt firms data.

This paper is also related to the finance literature documenting direct bankruptcy costs in Chapter 7 and 11. Measuring bankruptcy costs is a first-order issue in the corporate finance literature. According to the trade-off theory of capital structure, firms balance the tax shield benefits and bankruptcy costs of issuing debt to determine their optimal capital structure. For example, if bankruptcy costs are small, firms should have a large amount of debt. Bris et al. (2006) provide a comprehensive study of the costs of Chapter 7 and Chapter 11 in a sample of 300 public and private businesses between 1995 and 2001 in the Federal Bankruptcy Courts of Arizona (AZ) and Southern New York (SNY). Although their data cover both public and private firms, there are two weaknesses in their sample. First, Chapter 11 comprises 80% of their sample, while in the U.S. Courts statistics the fraction of Chapter 11 business bankruptcies was roughly 26.5% for the year 2001.[6] Second, SNY is well-known as a venue in which many large firms file for Chapter 11 reorganization. Besides, some of the Chapter 7 cases in their sample originally filed for Chapter 11 and later converted. Therefore, it is likely that their sample is biased toward large firms. I contribute to the literature by estimating direct bankruptcy costs using a much larger sample with broader coverage of small firms, using novel data combining the U.S. Trustee Program Chapter 7 Final Report, Lexis Public Records, and the Federal Judicial Center's Integrated Database.

Lastly, this project is potentially related to the literature studying how the COVID crisis affected small and medium-sized enterprises (SMEs). Gourinchas et al. (2020) estimate the impact of the COVID-19 crisis on business failures among SMEs, and they document a 9% increase in SMEs failure rate for firms without government support. Greenwood et al. (2020) project that bankruptcy filing increased by 140% in 2020 compared with the previous year. They argue that restructuring subsidies and payment deferrals could be suitable options for small businesses, as court congestion and excessive liquidation will be severe problems. Hanson et al. (2020) discuss the Federal Reserve's Main Street Lending Program for small and medium-sized businesses and why the government needs to intervene using business credit programs. Drechsel and Kalemli-Özcan (2020) propose direct cash transfers to SMEs experiencing

[6]Source: https://www.uscourts.gov/statistics/table/f-2/statistical-tables-federal-judiciary/2001/12/31.

liquidity shortfalls. As eligibility for the SBRA was expanded under the CARES Act, the structural framework in this paper could shed light on the effectiveness of countercyclical policy that helps insolvent SMEs, if the framework is properly modified to include business cycle aspects.

3 Novel Data on Business Bankruptcy

3.1 Bankruptcy Costs Data

I obtain data on bankruptcy costs from the U.S. Trustee Program (USTP) Chapter 7 Final Report.[7] USTP is the component of the Department of Justice that supervises private trustees across the U.S. In a Chapter 7 bankruptcy case, a private trustee is appointed by the USTP representative. The private trustee's role is to liquidate the debtor's assets and distribute them to creditors.

When a Chapter 7 case with distributable assets is closed, the private trustee has to file a report that accounts for the distribution of the debtor's assets to creditors and administrative expenses. In each Chapter 7 asset case, I observe the total administrative fees paid. These *direct* bankruptcy costs include court, legal, and accounting fees and expenses paid to the trustee and other professionals.

Interestingly, for Chapter 7 cases that converted from other bankruptcy chapters (e.g., Chapter 11), the final report has information about *unpaid* administrative fees and expenses from the prior chapter. This information allows me to estimate a *lower bound* of direct bankruptcy costs during Chapter 11. In doing so, we should keep in mind that a converted case usually spends a shorter time in Chapter 11 than a case that starts and closes in Chapter 11. Based on the sample, which will be introduced below, I confirm that, on average, cases that start and close with Chapter 11 last 716.7 days, while converted cases spend only 349.3 days in Chapter 11 bankruptcy. If we do not consider the shorter duration of Chapter 11 in converted cases, we would *under-estimate* bankruptcy costs in Chapter 11 using this data. From now on, I am going to call firms that file and close with Chapter 11 as pure Chapter 11 firms, firms that file Chapter 11 but convert to Chapter 7 as converted Chapter 11 firms, and firms that file and close with Chapter 7 as pure Chapter 7 firms. I note that some firms convert from Chapter 7 to Chapter 11, but they are very rare.

[7] Antill (2020) uses the USTP to analyze if trustee fees in Chapter 7 are excessively high.

3.2 Detailed Bankruptcy Cases Data

I gather unique data on Chapter 7 and Chapter 11 bankruptcy filings from Lexis Public Records (hereafter Lexis), which compiles bankruptcy filing information from the U.S. court system.[8] The data contains legal information about each filing, including the date the case was filed, the court in which it was filed, the judge assigned to the case, an indicator for whether the filing was involuntary, the Employer Identification Number (EIN) of the filing firm, and status updates on the case. According to Bernstein et al. (2019b), the Lexis bankruptcy data covers essentially 100% of all court cases across all bankruptcy districts from 1995. To the best of my knowledge, this is unique data covering the universe of bankrupt firms excluding sole proprietorships.

This comprehensive coverage is the main strength of the Lexis bankruptcy data. Previous empirical studies on business bankruptcy mostly rely on The UCLA-LoPucki Bankruptcy Research Database (BRD), BankruptcyData from New Generation Research, and Compustat. These data only cover large public firms, while the Lexis bankruptcy data also includes small and medium-sized enterprises. It might be problematic to analyze firm dynamics or business cycle implications of various bankruptcy institutions based on samples of mostly large firms, as large bankrupt firms mostly file for Chapter 11 reorganization.

There are two caveats regarding Lexis. First, Lexis does not include much firm-level information. Therefore, it has to be linked to other data such as Compustat, BvD Orbis, or the Census Longitudinal Business Database (LBD) through various firm identifiers. Second, businesses in the Lexis data are either partnerships or corporations. The Lexis bankruptcy data does not include sole proprietorships. According to the 2018 County Business Patterns (CBP), individual proprietorship firms comprise 3.7% and 10.8% of the total number of employees and establishments, respectively. Therefore, insufficient coverage of sole proprietorships might not be a first-order issue when analyzing the macroeconomic consequences of bankruptcy institutions.

In this draft, I utilize Lexis to extract information on filing, conversion, and closing dates of bankruptcy cases, which are used to compute monthly bankruptcy costs.

[8] Iverson (2018), Bernstein et al. (2019b), and Bernstein et al. (2019a) use Lexis. However, their data set contains only Chapter 11 bankruptcy cases.

3.3 Bankruptcy Filers Data

I obtain data on bankruptcy filers from the Federal Judicial Center Integrated Database (hereafter, FJC). The FJC includes all bankruptcy petitions filed after October 1, 2007 and any petitions filed before October 1, 2007 that were still pending on that date.

As FJC contains the universe of bankruptcy cases filed or continuing after October 1, 2007, it is comparable with Lexis. Some advantages and disadvantages make both data sets useful. First, FJC has information about the debtor's total assets, total liabilities, and secured and unsecured debt claims, while Lexis does not. Second, FJC does not have information to identify debtors such as EIN and debtor name, while Lexis has those debtor identifiers. Lastly, FJC does not have data about conversion dates for converted cases, while Lexis has detailed date information.

Figure 1 illustrates the procedure for merging the three data sets. First, I merge USTP into Lexis using four identifiers (case number, state, firm name, and closing date), as there is no unique identifier encompassing both data sets. The case number is a unique identifier within a very detailed court office, e.g., California Eastern - Sacramento. USTP does not have detailed court information. Instead, it has information about the state of the USTP regional office that oversees a Chapter 7 bankruptcy case. The state of the USTP regional office could be different from the state of the bankruptcy court in which a debtor files. For example, some bankruptcy cases from DC are handled by the USTP regional office in Virginia. Therefore, I complement the merging procedure by utilizing fuzzed matching with the firm name and closing date.[9]

Having merged USTP and Lexis data, I combine them with FJC. The USTP-Lexis merged data has more detailed information about bankruptcy courts than FJC. For example, we know from FJC that a bankruptcy case is filed at California Eastern, but only Lexis would report that it is filed at California Eastern - Sacramento. Therefore, I utilize case number, filing court district, and the bankruptcy filing date to merge USTP and Lexis with FJC.

I further clean the data by excluding pre-packs, dismissed, and open cases and some cases without any status information.[10] In addition, I exclude cases involving subsidiaries of the same company. Thus, an observation represents a firm, not

[9] The fuzzed matching procedure for firm names is done using the *matchit* function in Stata.

[10] Some Chapter 11 cases are "pre-packaged" in the sense that a plan of reorganization is confirmed by creditors prior to bankruptcy filing.

a single case. These procedures are consistent with Bris et al. (2006). Lastly, I exclude observations that have internal inconsistency. For example, the variable *easst* categorizes a filing firm's assets with some ranges, and the variable *totassts* presents an actual asset value. I drop all observations in which the actual asset value does not belong to the reported range in *easst*. The same consistency check is also done for liabilities. I treat zero liabilities and bankruptcy costs as missing and winsorize all variables at the 3% and 97% level.[11]

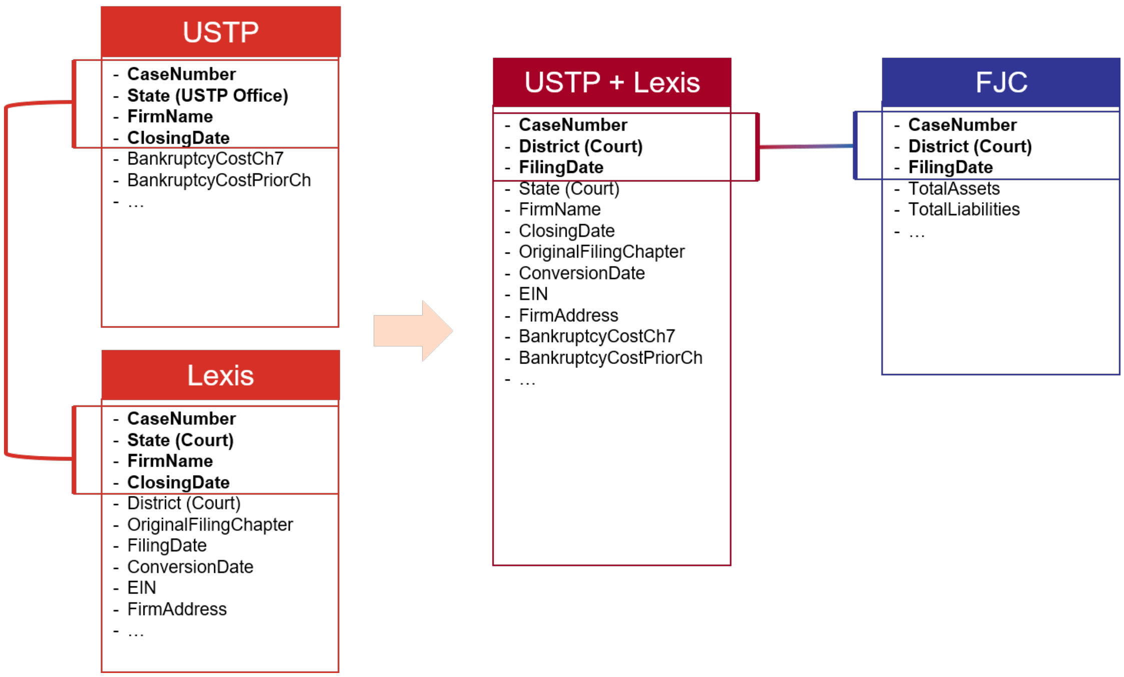


Figure 1: Data Merge Diagram

3.4 Summary Statistics

Table 1 presents summary statistics for pure Chapter 7 firms, converted Chapter 11 firms, and pure Chapter 11 firms.[12] The average number of creditors is higher for firms filing Chapter 11, and is higher for firms staying in Chapter 11 than for firms converting to Chapter 7. Chapter 11 firms have a higher share of secured debt, and pure Chapter 11 firms have a higher share of secured debt than converted Chapter 11 firms. Differences in indebtedness are surprising. Chapter 7 firms, on average,

[11]Zero liabilities and bankruptcy costs do not make sense as we study "bankruptcy" cases, so I treat them as mis-reported.

[12]Note that the number of observations for monthly bankruptcy costs is lower than the number of observations for other variables as (i) we have bankruptcy costs data only for asset cases and (ii) we do not have information about bankruptcy costs for cases closed after 2015.

have a much higher leverage ratio than Chapter 11 firms. This fact is in contrast to Bris et al. (2006) and Corbae and D'Erasmo (2020), which found a modestly higher level of indebtedness for Chapter 11 firms than Chapter 7 firms.[13] Total assets and liabilities are larger for firms in Chapter 11 than Chapter 7, and for pure Chapter 11 firms than converted Chapter 11 firms. On average, monthly bankruptcy costs are four times larger in Chapter 11. Similarly, the monthly bankruptcy costs scaled by total liabilities are higher for Chapter 11 firms. However, monthly bankruptcy costs scaled by total assets are higher for Chapter 7 firms. This is because firms in Chapter 7 have a much higher leverage ratio. We have to be careful in interpreting these facts at face value. Chapter choice and conversion decisions are endogenous, so further in-depth analysis correcting for selection bias is crucial. I formally confront this issue below. As mentioned above, duration in Chapter 7 is shorter than in pure Chapter 11, while converted Chapter 11 cases spend much less time prior to conversion than pure Chapter 11 cases. Thus, we have to account for the shorter duration of the converted Chapter 11 cases when comparing bankruptcy costs.

One might wonder if the coverage of small firms in the data is broad enough, as this paper intends to study a bankruptcy reform targeting small businesses. Calibrating a model with data that only contains large firms such as Compustat would be inappropriate. However, Table 1 indicates that many firms in my sample are smaller than the SBRA threshold. To further illustrate this point, Figure 2 shows the distribution of (log) total assets and liabilities. Separate distributions are drawn for all observations and for observations with a non-missing ratio of bankruptcy cost / total liabilities, as we only use the observations with non-missing bankruptcy cost data to run the (second-stage) regression in the later section.

We see that a substantial portion of firms are below the SBRA threshold. In the full sample, 90.7% and 82.3% of firms have assets and liabilities below $2,725,625, respectively.[15] In the sample with non-missing data on the bankruptcy cost ratio, 93.0%

[13] It is worth noting that the model of Corbae and D'Erasmo (2020) implies a higher leverage ratio for Chapter 7 firms, which is inconsistent with their findings from the Compustat sample. This is possible as they did not target the differences in indebtedness between Chapter 7 and 11 firms when calibrating their model parameters. However, the result from their model is consistent with the summary statistics in this paper.

[14] The number of creditors comes from the variable *ecrdtrs* in FJC. This variable categorizes the number of creditors. For example, "A" in *ecrdtrs* represents that the number of creditors is between 1 and 49. I take the median value for each category. This explains why the values at the 10th and 90th percentiles are identical.

[15] The $2,725,625 threshold is in terms of 2019 dollars. When I compute the share of the firms below the SBRA threshold, I deflate the threshold to 2005 dollars.

A. Pure Chapter 7	N	Mean	SD	P10	P50	P90
Number of Creditors / 100[14]	39,622	0.819	21.505	0.250	0.250	0.745
Secured Liabilities / Total Liabilities	35,090	0.181	0.299	0.000	0.000	0.731
Total Liabilities / Total Assets	29,360	245.897	699.626	1.261	10.712	536.611
Total Assets (2005 $mil.)	40,039	0.203	0.778	0.000	0.006	0.377
Total Liabilities (2005 $mil.)	35,090	0.921	2.049	0.048	0.289	2.019
Monthly Bankruptcy Costs (2005 $)	6,299	728.510	1,330.041	44.891	263.029	1,759.548
Monthly Bankruptcy Costs / Total Assets (%)	6,270	1.959	4.858	0.036	0.450	3.563
Monthly Bankruptcy Costs / Total Liabilities (%)	6,215	0.157	0.242	0.007	0.064	0.413
Time Spent (days)	40,039	503.071	538.550	70	298	1,216

B. Converted Chapter 11	N	Mean	SD	P10	P50	P90
Number of Creditors / 100	4,038	1.013	3.879	0.250	0.250	1.495
Secured Liabilities / Total Liabilities	3,626	0.538	0.366	0.000	0.597	0.984
Total Liabilities / Total Assets	3,576	20.352	191.637	0.576	1.576	10.997
Total Assets (2005 $mil.)	4,071	1.882	2.461	0.000	0.718	6.708
Total Liabilities (2005 $mil.)	3,626	3.339	4.145	0.246	1.665	9.852
Monthly Bankruptcy Costs (2005 $)	583	3,002.166	2,953.786	154.087	1,697.226	7,790.595
Monthly Bankruptcy Costs / Total Assets (%)	577	0.954	3.008	0.009	0.160	1.866
Monthly Bankruptcy Costs / Total Liabilities (%)	567	0.229	0.328	0.005	0.082	0.792
Time Spent (days)	4,069	349.261	329.316	73	257	719

C. Pure Chapter 11	N	Mean	SD	P10	P50	P90
Number of Creditors / 100	6,784	3.525	43.056	0.250	0.250	1.495
Secured Liabilities / Total Liabilities	6,692	0.621	0.356	0.000	0.744	0.993
Total Liabilities / Total Assets	6,684	21.915	212.295	0.564	1.416	8.289
Total Assets (2005 $mil.)	6,845	2.597	2.811	0.063	1.319	7.885
Total Liabilities (2005 $mil.)	6,692	4.129	4.846	0.269	2.001	15.001
Time Spent (days)	6,845	716.746	483.991	288	586	1,325

Table 1: Firm-Level Summary Statistics

and 83.3% of firms have assets and liabilities below the SBRA threshold, respectively.

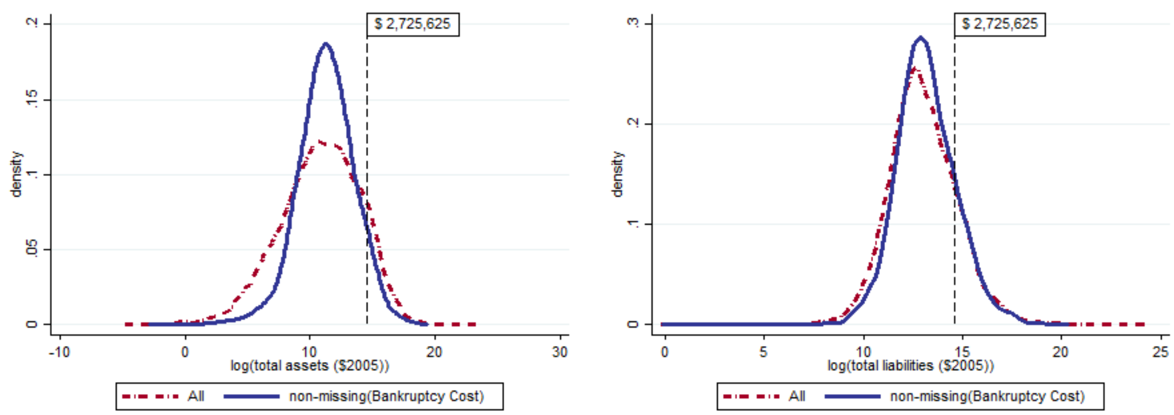


Figure 2: Distribution of Assets and Liabilities

4 Empirical Analysis

Armed with the data described above, this section explores empirically (i) whether Chapter 11 reorganization is more costly than Chapter 7 liquidation, especially for small businesses, and (ii) how composition of bankruptcy chapters changes after the SBRA.

4.1 Is Chapter 11 More Costly than Chapter 7 for Small Businesses?

There has been an argument from the legal side that Chapter 11 reorganization is particularly costly for small businesses, but there is no formal empirical evidence to support this argument. A naive approach would be to compare bankruptcy costs for firms in Chapter 7 and Chapter 11, and looking at how the gap in bankruptcy costs between Chapter 7 and 11 varies by firm size. However, the choice of bankruptcy chapter is endogenous, so firms that go through Chapter 7 might be different from firms in Chapter 11. Therefore, bankruptcy costs in Chapter 11 might be higher not because Chapter 11 is inherently more expensive but because larger firms file Chapter 11. In addition, the bankruptcy costs for Chapter 11 in this sample come from firms that initially file Chapter 11 but convert to Chapter 7 later. Just as Chapter 11 firms can be very different from Chapter 7 firms, converted Chapter 11 firms can be different from pure Chapter 11 firms. Thus, it is important to deal with this two-layer selection issue to correctly estimate how the difference in bankruptcy costs for Chapter 7 and 11 varies by firm size.

4.1.1 Framework

Ideally, what I want to do is to compare the bankruptcy costs for firms that file and close in Chapter 11 and Chapter 7. Unfortunately, due to data limitations, I only have bankruptcy cost information for firms that start and end in Chapter 7 and firms that start with Chapter 11 and convert to Chapter 7. However, I can compare some observables between pure Chapter 11 firms and converted Chapter 11 firms.

To grasp what I can do given the limitations, I start with the most ideal case. If I had information on bankruptcy costs for pure Chapter 11 firms and pure Chapter 7 firms, I would run the following regression:

$$Y = \beta' X + \eta_1 Q + \eta_2 (Q \times log(size)) + \epsilon,$$

$$Q = \begin{cases} 1, & \text{if a firm files and closes with Chapter 11,} \\ 0, & \text{if a firm files and closes with Chapter 7,} \end{cases}$$

where Y is the monthly bankruptcy cost divided by firm size, as measured by total assets or total liabilities, X is a set of controls, and $size$ is the level of assets or liabilities.[16] As bankruptcy chapter is endogenously chosen by firms, we need to deal with potential selection bias. By using conventional methods for correcting selection bias, such as Heckman 2-stage correction, I can estimate η_1 and η_2 consistently.

As mentioned above, I do not have bankruptcy cost data for pure Chapter 11 firms. Therefore, I cannot estimate η_1 and η_2, and comparing bankruptcy costs for pure Chapter 11 firms and pure Chapter 7 firms is impossible. Instead, I can analyze differences in bankruptcy costs for firms that file Chapter 11, including both pure and the converted Chapter 11 cases, and Chapter 7. I now lay out an econometric strategy to accomplish this task.

My regression specification is as follows,

$$Y = \beta' X + \delta_1 Q_{11} + \delta_2 (Q_{11} \times log(size)) + \epsilon, \tag{1}$$

$$Q_{11} = \begin{cases} 1, & \text{if a firm initially files for Chapter 11,} \\ 0, & \text{if a firm initially files for Chapter 7,} \end{cases}$$

where Y, X, and $size$ are the same as the previous notation.

I model the endogenous choice of initial chapter as a function of latent variables:

$$Q_{11} = \begin{cases} 1, & S_1^* = \gamma_1' X_{sub} + u_1 \geq 0, \\ 0, & S_1^* < 0. \end{cases}$$

I apply a similar model to the conversion decision $Q_c : \Omega_c = \{\omega \in \Omega : Q_{11}(\omega) = 1\} \to \{0, 1\}$ where Ω is the original sample space,

$$Q_c = \begin{cases} 1, & S_2^* = \gamma_2' X_{sub} + u_2 \geq 0, \\ 0, & S_2^* < 0, \end{cases}$$

where $Q_c = 1$ represents conversion from Chapter 11 to Chapter 7. Note that X_{sub} is a subset of X including the number of creditors, the share of secured liabilities, the leverage ratio, and the logarithm of total assets or liabilities. I pick the set of variables following Bris et al. (2006). Given Q_{11} and Q_c, I define a variable for sample selection,

[16] The set of controls includes a dummy variable for a bankruptcy case filed by creditors (forced petition), the number of creditors, the share of secured debt, and a dummy for a debt-to-asset ratio greater than 1. I follow Bris et al. (2006) in my choice of control variables for comparison.

s, to match the regression model (1) to my sample,

$$s = \begin{cases} 1, & (Q_{11} = 1, Q_c = 1) \text{ OR } (Q_{11} = 0), \\ 0, & (Q_{11} = 1, Q_c = 0), \end{cases}$$

where $s = 1$ represents converted Chapter 11 or pure Chapter 7 firms, and $s = 0$ represents pure Chapter 11 firms, which are not observed in my bankruptcy cost sample.

Multiplying s by the regression model (1) allows us to identify potential selection bias in my sample,

$$sY = s\beta' X + \delta_1 s Q_{11} + \delta_2 s(Q_{11} \times log(size)) + s\epsilon. \tag{2}$$

If $E(s\epsilon|sQ_{11}) = 0$, the errors in Equation (2) are orthogonal to sQ_{11}, so there is no bias from the sample selection. To check this condition, I have to determine $E(s\epsilon|Q_{11} = 1, Q_c = 1)$ and $E(s\epsilon|Q_{11} = 0)$, which represent the conditional expectations of errors for converted Chapter 11 and pure Chapter 7 firms, respectively.

(ϵ, u_1, u_2) follows a trivariate normal distribution,

$$\begin{pmatrix} \epsilon \\ u_1 \\ u_2 \end{pmatrix} \sim N(\begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_\epsilon^2 & \rho_1\sigma_\epsilon & \rho_2\sigma_\epsilon \\ \rho_1\sigma_\epsilon & 1 & 0 \\ \rho_2\sigma_\epsilon & 0 & 1 \end{pmatrix}).$$

I assume that the correlation between u_1 and u_2 is zero. This assumption means that the unobserved characteristics that affect the chapter choice and the conversion decision are uncorrelated. I assume this for tractability, but it could be reasonable as the decisions regarding initial chapter choice and conversion might be made separately. It is worth noting that the variances of u_1 and u_2 cannot be estimated, as the latent variables S_1^* and S_2^* are not directly observed. Therefore, I normalize the variances to one, following the standard approach (Greene (2018)).

Lemma 1 *Under Assumption 4.1.1,*

$$E(s\epsilon|Q_{11} = 1, Q_c = 1) = \rho_1\sigma_\epsilon \frac{\phi(\gamma_1' X_{sub})}{\Phi(\gamma_1' X_{sub})} + \rho_2\sigma_\epsilon \frac{\phi(\gamma_2' X_{sub})}{\Phi(\gamma_2' X_{sub})},$$

$$E(s\epsilon|Q_{11} = 0) = \rho_1\sigma_\epsilon \frac{-\phi(\gamma_1' X_{sub})}{1 - \Phi(\gamma_1' X_{sub})},$$

where $\phi(\cdot)$ and $\Phi(\cdot)$ are the PDF and CDF of the standard normal distribution.

Proof. By Assumption 4.1.1,

$$E(\epsilon|u_1, u_2) = \rho_1\sigma_\epsilon u_1 + \rho_2\sigma_\epsilon u_2.$$

By the law of iterative expectations,

$$\begin{aligned}
E(s\epsilon|Q_{11} = 1, Q_c = 1) &= E(E(\epsilon|u_1, u_2)|Q_{11} = 1, Q_c = 1) \\
&= E(\rho_1\sigma_\epsilon u_1 + \rho_2\sigma_\epsilon u_2|Q_{11} = 1, Q_c = 1) \\
&= \rho_1\sigma_\epsilon E(u_1|u_1 \geq -\gamma_1' X_{sub}) + \rho_2\sigma_\epsilon E(u_2|u_2 \geq -\gamma_2' X_{sub})(\because u_1 \perp u_2) \\
&= \rho_1\sigma_\epsilon \frac{\phi(\gamma_1' X_{sub})}{\Phi(\gamma_1' X_{sub})} + \rho_2\sigma_\epsilon \frac{\phi(\gamma_2' X_{sub})}{\Phi(\gamma_2' X_{sub})}.
\end{aligned}$$

Similarly,

$$E(s\epsilon|Q_{11} = 0) = \rho_1\sigma_\epsilon \frac{-\phi(\gamma_1' X_{sub})}{1 - \Phi(\gamma_1' X_{sub})}.$$

■

From Lemma 1, we have to control for $\frac{\phi(\gamma_1' X_{sub})}{\Phi(\gamma_1' X_{sub})}$ and $\frac{\phi(\gamma_2' X_{sub})}{\Phi(\gamma_2' X_{sub})}$ for converted Chapter 11 firms and for $\frac{-\phi(\gamma_1' X_{sub})}{1-\Phi(\gamma_1' X_{sub})}$ for pure Chapter 7 firms when estimating equation (2) to get unbiased estimators of δ_1 and δ_2.

One can implement the methodology by the following procedure:

(1) Estimate γ_1 and γ_2 using probit analysis for the full sample and for the subsample of Chapter 11 filing firms, respectively.

(2) From the estimates of γ_1 and γ_2, one can compute $\frac{\phi(\gamma_1' X_{sub})}{\Phi(\gamma_1' X_{sub})}$, $\frac{\phi(\gamma_2' X_{sub})}{\Phi(\gamma_2' X_{sub})}$, and $\frac{-\phi(\gamma_1' X_{sub})}{1-\Phi(\gamma_1' X_{sub})}$.

(3) The estimated values of the correction terms are used as additional regressors in equation (2) for the converted Chapter 11 and the pure Chapter 7 firms.

4.1.2 Results

Table 2 reports the first-stage probit regressions for the chapter choice and conversion decisions. First, firms with a higher share of secured debt, lower leverage ratio, and higher assets or liabilities are more likely to choose Chapter 11 over Chapter 7. Second, a firm with fewer creditors, a lower share of secured debt, and lower assets or liabilities is more likely to convert to Chapter 7 conditional on initially choosing Chapter 11. The leverage ratio is not a significant predictor of the case conversion decision.

	Chapter 11		Conversion	
Number of Creditors / 100	-0.00	-0.00	-0.01***	-0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
Secured Liabilities / Total Liabilities	0.65***	1.03***	-0.35***	-0.37***
	(0.03)	(0.02)	(0.04)	(0.04)
Total Liabilities / Total Assets > 1 [Y/N]	-0.21***	-0.92***	-0.03	0.00
	(0.02)	(0.02)	(0.03)	(0.03)
log(Total Assets)	0.33***		-0.02**	
	(0.00)		(0.01)	
log(Total Liabilities)		0.37***		-0.02*
		(0.01)		(0.01)
Constant	-4.69***	-5.27***	0.12	0.11
	(0.06)	(0.08)	(0.11)	(0.14)
R squared	0.3652	0.3140	0.0128	0.0126
Observations	39,326	39,326	10,203	10,203

Table 2: Probit Regressions for Chapter Choice and Conversion

Notes. * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. Standard errors in parentheses.

Table 3 reports the main regression results for monthly bankruptcy costs scaled by firm size. It shows OLS and selection-corrected results when the size variable is total assets or total liabilities. Three things are notable. First, Chapter 11 reorganization is more costly than Chapter 7 liquidation after we correct for selection bias. The signs of the OLS results are similar to those from Table 1, where monthly bankruptcy costs over total assets were higher for Chapter 7 firms while the monthly bankruptcy costs over total liabilities were higher for Chapter 11 firms. However, the coefficients on Chapter 11 are significantly positive for both measures of size after we correct for selection bias. One might wonder why the coefficient in OLS regressions is underestimated. This is not easy to explain, as we do not have a good theory of how the bankruptcy costs and chapter choice and conversion decisions are influenced by unobserved variables. What we can learn from the regressions at best is as follows. According to Lemma 1, the signs of the coefficients of the Mills ratios represent the correlation between u and ϵ. As the estimated coefficients of the Mills ratios are negative, we infer that the unobserved factors determining bankruptcy costs and the chapter choice and conversion decisions are negatively correlated. In other words, $\delta_1 + \delta_2$ should be underestimated in the OLS regressions, which is what we observe.

The result that bankruptcy costs are higher for Chapter 11 is worthy of further comment, as it contrasts with Bris et al. (2006). They find that " $\cdots$ Chapter 11 cases consume more fees proportionally, not because Chapter 11 is intrinsically the more expensive procedure, but rather only because self-selecting Chapter 11 firms intrinsically require more expenses." This finding has important implications for parametrizing bankruptcy costs in a structural model. If we believe the results from Bris et al. (2006), there would be no reason to differentiate bankruptcy cost parameters for Chapter 7 and 11. However, the results in this paper argue that we should differentiate them.

Second, the coefficient for the interaction between choosing Chapter 11 and total assets is significantly negative after correcting for selection bias, while the estimated impact of the interaction between Chapter 11 and total liabilities is insignificant. This implies that Chapter 11 is disproportionately costly for businesses with low assets, but there is no evidence that businesses with low debts pay a relatively higher cost for Chapter 11. This suggests that the special treatment for low debt firms in the SBRA may have a weak empirical justification. One might wonder if the insignificance of debt stems from the fact that the measured bankruptcy costs in Chapter 11 in this sample represent only the "unpaid" costs in Chapter 11 prior to conversion. This might be true if the share of costs under Chapter 11 that was unpaid at the time of conversion is particularly large or small for businesses with high debt.

Lastly, the coefficients for the Mills ratios are significant, suggesting that OLS results are significantly affected by selection bias. The selection problem only comes from the choice of bankruptcy chapter when we study bankruptcy costs relative to total assets. However, the selection problem arises both in the chapter choice and conversion decisions in the regression for bankruptcy costs relative to liabilities.

4.2 Composition of Bankruptcy Chapters after the SBRA

The objective of the SBRA is to decrease inefficient liquidation among small firms by prompting them to file Chapter 11 reorganization. It is expected to have less Chapter 7 cases and more Chapter 11 cases among small businesses after the SBRA. Thus, it is natural to explore how composition of bankruptcy chapters change after the SBRA.

It is important to note that, right after the effective date of the SBRA (Feb. 19, 2020), massive COVID-19 shocks and associated policy responses hit the economy. These

	Assets		Liabilities	
	OLS	Selection	OLS	Selection
Chapter 11 [Y/N]	-3.02	48.88***	0.31*	1.05***
	(2.56)	(2.55)	(0.16)	(0.22)
log(Total Assets)	-1.48***	-3.06***		
	(0.05)	(0.09)		
Chapter 11 $\times$ log(Total Assets)	0.40**	-1.36***		
	(0.18)	(0.26)		
log(Total Liabilities)			-0.07***	-0.09***
			(0.00)	(0.01)
Chapter 11 $\times$ log(Total Liabilities)			-0.01	0.01
			(0.01)	(0.01)
Forced Petition [Y/N]	3.09***	2.18**	0.06*	0.06*
	(0.81)	(0.86)	(0.03)	(0.03)
Number of Creditors / 100	0.05***	0.02***	0.00***	0.00***
	(0.01)	(0.01)	(0.00)	(0.00)
Secured Liabilities / Total Liabilities	1.56***	-4.58***	-0.03***	-0.08***
	(0.15)	(0.23)	(0.01)	(0.02)
Total Liabilities / Total Assets $>$ 1 [Y/N]	-1.04***	1.70***	-0.20***	-0.15***
	(0.10)	(0.10)	(0.01)	(0.02)
Mills Ratio (Chapter)		-15.91***		-0.13***
		(0.56)		(0.04)
Mills Ratio (Conversion)		-2.54		-0.75***
		(2.10)		(0.15)
Constant	18.88***	29.31***	1.28***	1.44***
	(0.60)	(0.77)	(0.04)	(0.06)
Adjusted R squared	0.3788	0.5202	0.2410	0.2468
Observations	6,713	6,713	6,713	6,713

Table 3: Determinants of Monthly Bankruptcy Costs / Firm Size

Notes. * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. Standard errors in parentheses.

shocks make researchers hard to study the impact of the SBRA on the economy. To account for the pure impact of the SBRA, we need bankruptcy data after the economy returns to its normal status. Thus, I want to emphasize that the results in this section should be regarded as preliminary and suggestive.

4.2.1 Framework

Main empirical objective is to document the effect of the SBRA on bankruptcy filings. By following Wang et al. (2021), I estimate weekly changes in chapter 11 shares where bankruptcy filings in 2019 are regarded as the counterfactual. Therefore, my sample period is from January 1, 2019 to December 31, 2020. I conduct the analysis solely based on FJC data as it contains the universe of bankrupt firms including sole proprietorship businesses. The specification is as follows:

$$y_t = \alpha + \sum_{\tau=\text{2020w1}}^{2020w52} \beta_\tau \mathbb{1}\{t = \tau\} + \gamma_{wom} + \gamma_{month} + \epsilon_t, \tag{3}$$

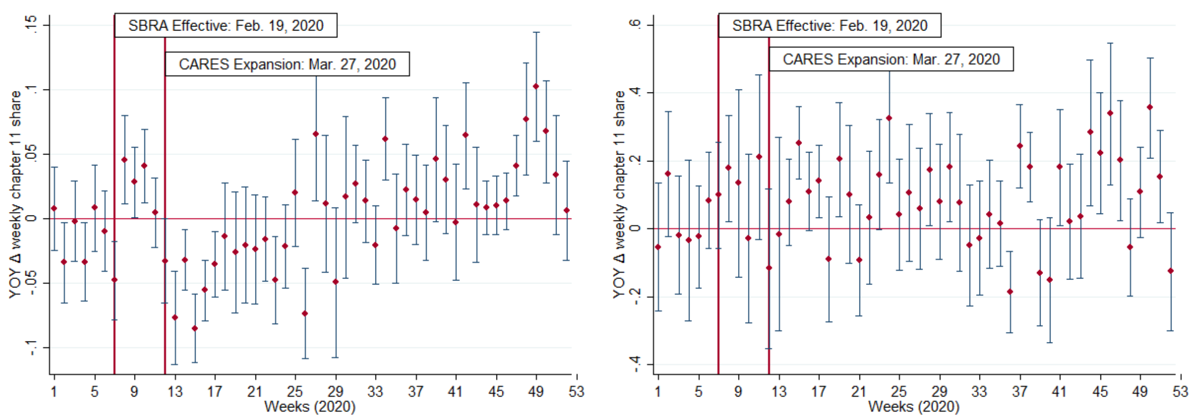
where γ_{wom} and γ_{month} are week-of-the-month and month-of-the-year fixed effects, respectively. These fixed effects control for seasonal variations. The dependent variable y_t is the share of firms that file Chapter 11 among all bankrupt firms. I split the sample by the level of liabilities. I define small businesses as firms that have less than 10 million dollars.[17] I am interested in $\hat{\beta}_\tau$, which estimate differences in Chapter 11 share in 2020 related to 2019 after controlling for the seasonal variations.

4.2.2 Results

I plot these results in Figure 3. First, the estimates before the SBRA effective date are insignificant, so there are no systematic pre-trends in both small and large businesses' chapter 11 shares. Thus, 2019 chapter 11 share would be a reasonable counterfactual for those in 2020. Second, for small businesses, Chapter 11 share had increased right after the SBRA effective date, but there was a clear decline between March and May. Although the estimates are noisy, Chapter 11 share among small businesses increased after May. Third, for large businesses, it is hard to observe any significant trends after the SBRA and CARES Act effective dates.

[17] Ideally, the small businesses should be defined according to the SBRA thresholds, i.e., \$2,725,625 or \$7,500,000 after the CARES Act. However, there are many missing values in a continuous variable that reports liabilities (*totlblts*). Instead, I use a categorical variable that reports liabilities (*orgelblts*), and \$10 million is the closest value to the SBRA thresholds.

The increases in chapter 11 share for small businesses and the insignificant change in chapter 11 share for large businesses for a period after the SBRA effective date and before mid-March might indicate that the SBRA leads more Chapter 11 filing and less Chapter 7 filing only for the small businesses.[18] However, the period is less than 1 month, so it would be hard to conclude that we clearly see the intended effect of the SBRA. After mid-March, the analysis would be much more incomplete as the U.S. economy have been experiencing unprecedented changes that affect business bankruptcy margins. As discussed in Wang et al. (2021), physical constraints by court shutdowns, liquidity constraints, government subsidies, and uncertainty could affect bankruptcy filings during this pandemic period. Thus, it is hard to disentangle the pure effect of the SBRA on bankruptcy filings. Bankruptcy filing data generated in a normal course of the economy would be needed to say something more clearly about the impact of the SBRA.



(a) Small Businesses **(b)** Large Businesses

Figure 3: YoY Change in Chapter 11 Shares (2019 - 2020) - Small and Large Businesses

Notes. The sample consists of the universe of business bankruptcy filing reported by the FJC. The red points represent estimates of the β_τ coefficients in equation (3). The blue capped spikes provide the 95-percent confidence interval for each point estimate. The dependent variable in each panel is the share of Chapter 11 filing firms among all bankrupt firms for small (Panel (a)) and large businesses (Panel (b)). Small businesses are those with less than \$10 million in liabilities at filing. All business filings are consolidated to remove subsidiary filings. February 19, 2020 is the date when the SBRA started to be effective. March 27, 2020 is the date when the eligibility for the SBRA was expanded from \$2,725,625 to \$7,500,000 due to the CARES Act.

5 Model

I study the effects of the SBRA in the model of Corbae and D'Erasmo (2020), so I will closely follow their notation. This is a discrete time, general equilibrium

[18] Note that the national emergency was declared on March 13, 2020.

model with four types of agents: heterogeneous firms, representative households, competitive lenders, and the government. Firms are heterogeneous in terms of productivity. They produce a homogeneous good with capital and labor. They finance their capital investment and dividends using both defaultable debt and equity. There is a standard representative household whose income comes from wages, dividends, and bankruptcy costs paid by firms. Competitive lenders set the price of debt considering default probabilities and payoffs. The government has a passive role to balance tax revenue and transfers.

The model has several differences from Corbae and D'Erasmo (2020). First, I design bankruptcy costs to depend on the endogenous choice of debt instead of exogenous productivity to model the SBRA experiment correctly. Second, I assume bankruptcy costs are transfers from bankrupt firms to households, so there are no direct deadweight losses from bankruptcy costs. This assumption allows me to analyze the impact of the SBRA on household consumption only through the *indirect* general equilibrium effects of the change in bankruptcy costs, excluding the *direct* reduction of deadweight losses in the economy. Lastly, I add taste shocks to value function to improve the convergence properties of the model, following Dvorkin et al. (2021).

5.1 Firms

Firms produce a homogeneous good using a standard decreasing returns to scale production technology:

$$y_{it} = z_{it}(k_{it}^{\alpha} n_{it}^{1-\alpha})^{\nu}, \tag{4}$$

where $\alpha, \nu \in (0,1)$. The decreasing returns to scale technology allows us to generate a firm size distribution in equilibrium by having a concave profit function. $z_{it} \in \{z^1, \cdots, z^n\}$ is an idiosyncratic productivity shock, i.i.d. across firms, which follows a first-order Markov process with transition probability $G(z_{jt+1}|z_{jt})$. k_{jt} and n_{jt} are capital and labor input, respectively. Firms pay a fixed cost c_f to produce. Firms pay standard capital adjustment costs $\Psi(i_{it}, k_{it}) = \frac{\psi}{2}(\frac{i_{it}^g}{k_{it}})^2 k_{it}$, where $i_{it}^g = k_{jt+t} - (1-\delta)k_{jt}$ is gross investment.

Production inputs, investment, and dividends are financed using defaultable debt and equity issuance. To ensure that firms issue both debt and equity at an optimum, I assume that (1) there is a tax deduction for interest expense; (2) the price of debt is discounted to reflect the probability of default; and (3) equity issuance is costly. Taxable income is $\Gamma_{it} = \pi_{it} - \delta k_{it} - (\frac{1}{q_{it}} - 1)\frac{b_{it+1}}{1+r}$, where operating income is given by $\pi_{it} = y_{it} - w_t n_{it} - c_f$, w_t is the real wage, b_{it+1} is one-period non-contingent debt issued at t and repaid at $t+1$, and r is the interest rate for a risk-free bond. The corporate tax rate is τ_c, so tax revenue is $T^c_{it} = \tau_c \Gamma_{it} \mathbb{1}_{\{\Gamma_{it} \geq 0\}}$. The price of debt q_{it} is determined from the competitive lender's problem later. External equity is issued at cost $\lambda(e_{it})$ for equity issuance $e_{it} < 0$, which will be described in detail later.

New firms can enter by paying a one-time sunk cost κ. Entrants choose their initial capital level and their mix of debt and equity financing prior to learning their initial productivity. The initial productivity of entrants is drawn from the stationary distribution of the Markov process $G(z_{jt+1}|z_{jt})$, which I denote as $\bar{G}(z)$. I denote the mass of entrants as M. I assume $k_{jt} \in \mathcal{K}$ and $b_{jt} \in \mathcal{B}$, where $\mathcal{K}$ and $\mathcal{B}$ are finite capital and debt grids. For notational convenience, the k-th component of the set $\mathcal{K} \times \mathcal{B}$ is denoted by (k_k, b_k). By abusing notation, I denote the dimensions $|\mathcal{K}|$ and $|\mathcal{B}|$ as $\mathcal{K}$ and $\mathcal{B}$, respectively and I define $\mathcal{N} = \mathcal{K} \times \mathcal{B}$ as the dimension of the endogenous state space.

Incumbent firms have four operation options given idiosyncratic states (z_{it}, k_{it}, b_{it}): (i) normal operation (N), (ii) exit without bankruptcy (X), (iii) Chapter 7 liquidation (7), and (iv) Chapter 11 reorganization (11). In normal operation and Chapter 11 reorganization, firms choose (k_{it+1}, b_{it+1}) to maximize their value function, while firms that exit or liquidate have no such (k_{it+1}, b_{it+1}) choice. From now on, I denote $x_t = x$ and $x_{t+1} = x'$ for a recursive representation.

Incumbent firms receive a vector

$$\epsilon = (\epsilon(N,1), \cdots, \epsilon(N,\mathcal{N}), \epsilon(X), \epsilon(7), \epsilon(11,1), \cdots, \epsilon(11,\mathcal{N}))$$

of action specific, additively separable taste shocks each period. These taste shocks follow a generalized extreme value distribution whose distribution function is given by

$$F(\epsilon) = exp(-[\sum_{j=1}^{\mathcal{N}} exp(-\frac{\epsilon(N,j)-\mu}{\sigma})] - exp(-\frac{\epsilon(X,j)-\mu}{\sigma}) \\ - exp(-\frac{\epsilon(7,j)-\mu}{\sigma}) - [\sum_{j=1}^{\mathcal{N}} exp(-\frac{\epsilon(11,j)-\mu}{\sigma})])$$

where $\sigma > 0$ is a parameter governing the variance of the shocks. I set $\mu = -\sigma\gamma_E$ to make the shocks mean zero, where $\gamma_E = 0.56767...$ is Euler's constant.

Similarly, entrants receive a vector

$$\epsilon_E = (\epsilon(E,1), \cdots, \epsilon(E,\mathcal{N}))$$

that has the same extreme value distribution as that of incumbent firms, where ϵ_E and ϵ are independent. Note that ϵ and ϵ_E is independent across incumbent firms and entrants, respectively.

The *ex-post* value of a firm $V(z,k,b;\epsilon)$ is defined by:

$$V(z,k,b;\epsilon) = \max(V_N(z,k,b;\epsilon), V_X(z,k,b;\epsilon), V_7(z,k,b;\epsilon), V_{11}(z,k,b;\epsilon)) \tag{5}$$

where V_N, V_X, V_7, and V_{11} are the ex-post value functions of choosing normal operation, exit without bankruptcy, Chapter 7 liquidation, and Chapter 11 reorganization, respectively. By ex-post, I mean after the realization of the taste shocks ϵ.

The *ex-ante* value of a firm with state (z,k,b) is defined by

$$W(z,k,b) = \int V(z,k,b;\epsilon)dF(\epsilon). \tag{6}$$

5.1.1 Normal Operation (N)

If the firm chooses normal operation, then $V_N(z,k,b;\epsilon)$ is defined as follows:

$$V_N(z,k,b;\epsilon) = \max_{n,(k_j,b_j)\in\mathcal{K}\times\mathcal{B}} \{v_N^j(z,k,b) + \epsilon(N,j)\} \tag{7}$$

s.t.

$$\begin{aligned} v_N^j(z,k,b) &= d_j + \frac{1}{1+r}E_{z'|z}W(z',k_j,b_j) \\ e_j &= \pi - T_j^c - i_j^g - b + q(z,k_j,b_j)b_j - \Psi(k_j,k) \\ d_j &= \begin{cases} e_j & e_j \geq 0 \\ e_j - \lambda(e_j) & e_j < 0. \end{cases} \end{aligned}$$

As corporate tax payments and gross investment depend on the choice of (k_j, b_j), they are subscripted by j. Note that firms discount future expected values by $\frac{1}{1+r}$, as the consumer's stochastic discount factor equals $\frac{1}{1+r}$ in a stationary equilibrium.

5.1.2 Exit without Bankruptcy (X)

If the firm exits without bankruptcy, it sells all of its capital at price s_x and repays all of its existing debt.

$$V_X(z,k,b;\epsilon) = v_X(z,k,b) + \epsilon(X) \tag{8}$$
$$v_X(z,k,b) = \begin{cases} s_x k - b, & s_x k - b \geq 0 \\ s_x k - b - \lambda(s_x k - b), & s_x k - b < 0 \end{cases}$$

5.1.3 Chapter 7 Liquidation (7)

If the firm chooses to liquidate in Chapter 7, it sells all of its capital at price s_7 and repays its debt until it can enjoy the benefit of limited liability. The bankruptcy cost in Chapter 7 is denoted by $c_7(b)$. Note that the bankruptcy costs are paid before debt when $s_7 k - b - c_7(b) < 0$.

$$V_7(z,k,b;\epsilon) = v_7(z,k,b) + \epsilon(7) \tag{9}$$
$$v_7(z,k,b) = \max(s_7 k - b - c_7(b), 0)$$

5.1.4 Chapter 11 Reorganization (11)

If the firm chooses to reorganize in Chapter 11, some of its debt will be written off at the rate $(1 - \phi(z,k,b))$. The recovery rate $\phi(z,k,b)$ will be endogenously determined by Nash bargaining between firms and lenders. The firm pays bankruptcy costs $c_{11}(b)$. In addition, there are further debt financing costs λ_{11}^b and equity issuance costs λ_{11} that are different from those in normal operation. Capital is sold at a discount s_x.[19] Lastly, I assume firms in Chapter 11 are not allowed to distribute dividends.[20] These features reflect the higher financing costs and frictions observed for firms in Chapter 11

[19] I assume that capital is sold at price s_x. In principle, the sale price under Chapter 11 does not have to be the same as the sale price in exit. However, I want to impose a penalty for capital sales in Chapter 11 reorganization, as firms need to have a court's approval to sell their capital, which can be costly. At the same time, I do not want to increase the number of parameters.

[20] Instead of assuming $e_j \leq 0$, I express the constraint for dividends as $e_j + \phi(z,k,b)b + c_{11}(b) \leq 0$. $e_j + \phi(z,k,b)b + c_{11}(b) \leq 0$ implies $e_j \leq 0$, so dividend distribution is still limited. There are two reasons why I impose the stronger constraint. First, by including ϕ in the constraint, the Nash bargaining game (14) has a closed form solution, so there is a huge computational benefit. Second, by including $c_{11}(b)$, I simplify the impact of a change in $c_{11}(b)$ on the value of Chapter 11 reorganization. If I exclude $c_{11}(b)$, a decrease in $c_{11}(b)$ makes the dividend constraint tighter by mechanically increasing e_j (note that $c_{11}(b)$ has a negative sign in the definition of e_j), so it can decrease the value of Chapter 11. I do not want to have this property in this model.

in reality.

$$V_{11}(z,k,b;\epsilon) = \max_{n,(k_j,b_j)\in\mathcal{K}\times\mathcal{B}} \{v_{11}^j(z,k,b) + \epsilon(11,j)\} \tag{10}$$

s.t.

$$v_{11}^j(z,k,b) = d_j + \frac{1}{1+r} E_{z'|z} W(z',k_j,b_j)$$

$$e_j = \pi - T_j^c - i_j^g \mathbb{1}_{\{i_j^g \geq 0\}} - s_x i_j^g \mathbb{1}_{\{i_j^g < 0\}} - \phi(z,k,b)b + \lambda_b^{11} q(z,k_j,b_j)b_j - \Psi(k_j,k) - c_{11}(b)$$

$$e_j + \phi(z,k,b)b + c_{11}(b) \leq 0$$

$$d_j = e_j - \lambda_{11}(e_j).$$

As mentioned above, $\phi(z,k,b)$ is determined by Nash bargaining between firms in Chapter 11 and lenders. For a given recovery rate ϕ, the ex-post value of a bargaining agreement for the firm in Chapter 11 is:

$$V_R(z,k,b;\phi,\epsilon) = \max_{n,(k_j,b_j)\in\mathcal{K}\times\mathcal{B}} \{d_j + \frac{1}{1+r} E_{z'|z} W(z',k_j,b_j) + \epsilon(11,j)\} \tag{11}$$

s.t.

$$e_j = \pi - T_j^c - i_j^g \mathbb{1}_{\{i_j^g \geq 0\}} - s_x i_j^g \mathbb{1}_{\{i_j^g < 0\}} - \phi b + \lambda_b^{11} q(z,k_j,b_j)b_j - \Psi(k_j,k) - c_{11}(b)$$

$$e_j + \phi b + c_{11}(b) \leq 0$$

$$d_j = e_j - \lambda_{11}(e_j).$$

I assume that the threat points in the Nash bargaining procedure are the payoffs in Chapter 7, as bankruptcy law imposes a minimum payoff to lenders in Chapter 11 reorganization as the payoff they would get if the case converted to Chapter 7 ("Best Interest Test"). Therefore, the (ex-ante) surplus for the firm in Chapter 11 is:

$$W_R(z,k,b;\phi) = E_\epsilon V_R(z,k,b;\phi,\epsilon) - \max(s_7 k - b - c_7(b), 0). \tag{12}$$

Similarly, the surplus for the lender is:

$$W_L(z,k,b;\phi) = \phi b - \min(b, \max(s_7 k - c_7(b), 0)). \tag{13}$$

Given these definitions, the recovery rate $\phi(z,k,b)$ is determined by the Nash bargaining procedure as follows:

$$\phi(z,k,b) =_{\phi\in[0,1]} W_R(z,k,b;\phi)^{\theta} W_L(z,k,b;\phi)^{1-\theta}, \qquad (14)$$
$$s.t.\ \ W_R(z,k,b;\phi), W_L(z,k,b;\phi) \geq 0,$$

where θ is the bargaining power of the debtor firm. Note that taste shocks do not affect the recovery rate.

5.1.5 Entrants

Entrants choose capital and debt after paying an entry cost κ, but prior to learning their initial productivity. Entrants know taste shocks when choosing k and b.

$$V_E(\epsilon_E) = \max_{(k_j,b_j)\in\mathcal{K}\times\mathcal{B}} \{v_E^j + \epsilon(E,j)\} \qquad (15)$$
$$v_E^j = d_{j,E} + \frac{1}{1+r} E_{z'} W(z', k_j, b_j)$$
$$d_{j,E} = -k_j + q_E(k_j,b_j)b_j - \kappa - \lambda(-k_j + q_E(k_j,b_j)b_j - \kappa).$$

Note that $\lambda(-k_j + q_E(k_j,b_j)b_j - \kappa)$ is the equity issuance cost of entrants. I assume that entrants do not know taste shocks when they make entry decision, so free entry of firms should imply $E_\epsilon V_E = 0$.

5.2 Competitive Lenders

Risk-neutral competitive lenders borrow funds from households using risk-free bonds and lend to firms. The lenders set the price of defaultable debt $q(z,k',b')$ by considering expected payoffs, which depend on the probability of bankruptcy and returns for each case. The lender's expected profit from lending to a firm that wants to borrow b' with productivity z and future capital k' (collateral) is

$$\begin{aligned}\Pi^L(z,k',b') = -q(z,k',b')b' + \frac{1}{1+r} E_{z'|z}[&P_N(z',k',b')b' + P_X(z',k',b')b' \\ &+ P_7(z',k',b')\min(b', \max(s_7 k' - c_7(b'), 0)) \\ &+ P_{11}(z',k',b')\phi(z',k',b')b'],\end{aligned} \qquad (16)$$

where P_N, P_X, P_7, and P_{11} are the ex-ante choice probabilities of normal operation, exit, Chapter 7 liquidation, and Chapter 11 reorganization, which will be described in detail in Section 5.7. As the lenders are competitive, the expected profit $\Pi^L(z,k',b')$ is zero in equilibrium. As a result, the equilibrium debt price schedule is derived as follows:

$$q(z,k',b') = \frac{1}{1+r}E_{z'|z}[P_N(z',k',b') + P_X(z',k',b') + P_7(z',k',b')\frac{\min(b', \max(s_7k' - c_7(b'), 0))}{b'} + P_{11}(z',k',b')\phi(z',k',b')]. \tag{17}$$

5.3 Households

A representative household solves the following standard problem:

$$V_H(B, \{S_i\}) = \max U(C) + \beta E V_H(B', \{S_i'\}) \tag{18}$$

$$s.t.$$

$$C + \int p_i S_i' di + q^B B' = w + \int (p_i + d_i) S_i di + B + \int (c_{11,i} + \lambda_{11}(c_{11,i}) + c_{7,i}) di + T^h,$$

where p_i is the price of stocks of firm i, S_i is the shares of stock of firm i held by the household, q^B is the price of the risk-free bond, B is the amount of risk-free bonds held by households, $c_{11,i}$ and $c_{7,i}$ are the bankruptcy costs paid by firm i, and T^h is the lump-sum transfer from the government. Unlike Corbae and D'Erasmo (2020), I assume that the bankruptcy costs and the part of equity issuance costs due to Chapter 11 bankruptcy paid by firms are transferred to the households. This assumption allows me to focus on the indirect effects of the SBRA without having direct changes in deadweight losses due to lower bankruptcy costs. Note that the household inelastically supplies one unit of labor to firms.

5.4 Government

The government collects corporate income tax from firms and makes lump-sum transfers to the household,

$$T^h = \int T_i^c di. \tag{19}$$

5.5 Law of Motion for Cross-Sectional Distribution

The law of motion for the cross-sectional distribution of firms is as follows:

$$\Gamma(z', k', b') = \sum_{z,k,b} [P_N(z, k, b)\sigma_N(z, k, b, k', b') + P_{11}(z, k, b)\sigma_{11}(z, k, b, k', b')]G(z'|z)\Gamma(z, k, b) + M\sigma_E(k', b')\bar{G}(z'), \tag{20}$$

where $\sigma_N(z, k, b, k', b')$ and $\sigma_{11}(z, k, b, k', b')$ are the ex-ante choice probabilities of choosing (k', b') in normal operation and Chapter 11 reorganization, respectively, for firms in state (z, k, b), which will be described in detail in Section 5.7. Similarly, $\sigma_E(k', b')$ is the ex-ante choice probability of (k', b') for entrants.

5.6 Definition of Equilibrium

A stationary recursive equilibrium is a list $\{W^*, w^*, r^*, q^{B*}, q^*, \phi^*, \{p_j^*\}, \Gamma^*, M^*, C^*, B'^*, S'^*\}$ that satisfies:

1. Given w^*, r^*, q^*, and ϕ^*, the value function W^* is the solution for the firm's problem in (7),(8),(9), and (10).

2. Given W^*, w^*, r^*, and q^*, the recovery rate ϕ^* solves the Nash bargaining problem (11), (12), (13), and (14).

3. Given the decision rules implied by W^*, q^* solves the zero-profit condition of the lenders (16).

4. Free entry of firms implies $E_\epsilon V_E^* = 0$ in (15).

5. Γ^* and M^* in (20) are consistent with decision rules implied by W^* and the exogenous stochastic process $G(\cdot|\cdot)$.

6. Given $\{p_j^*\}$, $q^{B,*}$, w^*, and $T^{h,*}$, the household solves (18).

7. Labor, bond, and stock markets clear at w^*, q^{B*}, and $\{p_j^*\}$,

$$\text{labor:} \sum_{z,k,b} n^*(z, k, b)[P_N^*(z, k, b) + P_{11}^*(z, k, b)]\Gamma^*(z, k, b) = 1$$

$$\text{bond:} \sum_{z,k,b}[(P_N^*(z,k,b)+P_X^*(z,k,b))b+P_7^*(z,k,b)min(b,max(s_7k-c_7(b),0))$$
$$+P_{11}^*(z,k,b)\phi^*(z,k,b)b]\Gamma^*(z,k,b)=B$$
$$\text{stock}: S^{',*}=1.$$

8. The government budget balance (19) is satisfied.

5.7 Ex-Ante Value Functions and Choice Probabilities

Assuming that the taste shocks ϵ and ϵ_E follow generalized extreme value distributions gives us closed-form solutions for the ex-ante value function W and choice probabilities P_N, P_X, P_7, P_{11}, σ_N, σ_{11}, and σ_E (see, for instance, Rust (1987)). The reason why I employ these taste shocks is described in Section 6.2.

The ex-ante value functions W and $E_\epsilon V_E$ are as follows:

$$W(z,k,b)=\sigma log(\sum_j[exp(\frac{v_N^j(z,k,b)}{\sigma})]+exp(\frac{v_X(z,k,b)}{\sigma})+exp(\frac{v_7(z,k,b)}{\sigma})+\sum_j[exp(\frac{v_{11}^j(z,k,b)}{\sigma})]),$$
$$E_\epsilon V_E=\sigma log(\sum_j[exp(\frac{v_E^j}{\sigma})]).$$

The operation choice probabilities P_N, P_X, P_7, and P_{11} are as follows:

$$P_N(z,k,b)=\frac{\sum_j[exp(\frac{v_N^j(z,k,b)}{\sigma})]}{\sum_j[exp(\frac{v_N^j(z,k,b)}{\sigma})]+exp(\frac{v_X(z,k,b)}{\sigma})+exp(\frac{v_7(z,k,b)}{\sigma})+\sum_j[exp(\frac{v_{11}^j(z,k,b)}{\sigma})]},$$
$$P_X(z,k,b)=\frac{exp(\frac{v_X(z,k,b)}{\sigma})}{\sum_j[exp(\frac{v_N^j(z,k,b)}{\sigma})]+exp(\frac{v_X(z,k,b)}{\sigma})+exp(\frac{v_7(z,k,b)}{\sigma})+\sum_j[exp(\frac{v_{11}^j(z,k,b)}{\sigma})]},$$
$$P_7(z,k,b)=\frac{exp(\frac{v_7(z,k,b)}{\sigma})}{\sum_j[exp(\frac{v_N^j(z,k,b)}{\sigma})]+exp(\frac{v_X(z,k,b)}{\sigma})+exp(\frac{v_7(z,k,b)}{\sigma})+\sum_j[exp(\frac{v_{11}^j(z,k,b)}{\sigma})]},$$
$$P_{11}(z,k,b)=\frac{\sum_j[exp(\frac{v_{11}^j(z,k,b)}{\sigma})]}{\sum_j[exp(\frac{v_N^j(z,k,b)}{\sigma})]+exp(\frac{v_X(z,k,b)}{\sigma})+exp(\frac{v_7(z,k,b)}{\sigma})+\sum_j[exp(\frac{v_{11}^j(z,k,b)}{\sigma})]}.$$

The capital and debt choice probabilities σ_N, σ_{11}, and σ_E are as follows:

$$\sigma_N(z,k,b,k_j,b_j) = \frac{exp(\frac{v_N^j(z,k,b)}{\sigma})}{\sum_j [exp(\frac{v_N^j(z,k,b)}{\sigma})]},$$
$$\sigma_{11}(z,k,b,k_j,b_j) = \frac{exp(\frac{v_{11}^j(z,k,b)}{\sigma})}{\sum_j [exp(\frac{v_{11}^j(z,k,b)}{\sigma})]},$$
$$\sigma_E(k_j,b_j) = \frac{exp(\frac{v_E^j}{\sigma})}{\sum_j [exp(\frac{v_E^j}{\sigma})]}.$$

5.8 Resource Constraint

Combining the household budget constraint with the labor, bond, and stock market clearing conditions leads to the following resource constraint.

$$\text{Consumption } \; C = Y - CF - I - \Psi - \Lambda - E + X, \tag{21}$$

where

$$\begin{aligned}
\text{Output } \; Y &= \sum_{z,k,b} y(z,k,b)[P_N(z,k,b) + P_{11}(z,k,b)]\Gamma(z,k,b), \\
\text{Fixed costs } \; CF &= \sum_{z,k,b} c_f [P_N(z,k,b) + P_{11}(z,k,b)]\Gamma(z,k,b), \\
\text{Investment } \; I &= \sum_{z,k,b} \{P_N(z,k,b) \sum_{k',b'} [\sigma_N(z,k,b,k',b') i_N^g(z,k,b,k',b')] \\
&+ P_{11}(z,k,b) \sum_{k',b'} [\sigma_{11}(z,k,b,k',b') i_{11}^g(z,k,b,k',b')]\}\Gamma(z,k,b), \\
\text{Capital adjustment costs } \; \Psi &= \sum_{z,k,b} \{P_N(z,k,b) \sum_{k',b'} [\sigma_N(z,k,b,k',b') \psi_N(z,k,b,k',b')] \\
&+ P_{11}(z,k,b) \sum_{k',b'} [\sigma_{11}(z,k,b,k',b') \psi_{11}(z,k,b,k',b')]\}\Gamma(z,k,b), \\
\text{External financing costs } \; \Lambda &= \sum_{z,k,b} \{P_N(z,k,b) \sum_{k',b'} [\sigma_N(z,k,b,k',b') \lambda_N(z,k,b,k',b')] \\
&+ P_{11}(z,k,b) \sum_{k',b'} [\sigma_{11}(z,k,b,k',b') \lambda_{11}(z,k,b,k',b')] \\
&+ P_X(z,k,b)\lambda_x(z,k,b)\}\Gamma(z,k,b) + M \sum_{k',b'} \sigma_E(k',b')\lambda_E(k',b'),
\end{aligned}$$

$$\text{Entrants} \quad E = M \sum_{k',b'} \sigma_E(k',b')(k'+\kappa),$$

$$\text{Value of resold capital} \quad X = \sum_{z,k,b} (P_X(z,k,b)s_x k + P_7(z,k,b)s_7 k)\Gamma(z,k,b).$$

6 Quantitative Analysis

6.1 Mapping the Model to Data

I assume that firm productivity follows an AR(1) process: $log(z') = \rho_z log(z) + \eta$ with $\eta \sim N(0, \sigma_\eta^2)$. I use Tauchen's method to discretize this process into a 7-state Markov chain with support $\{z_1, \cdots, z_7\}$.

I assume that the bankruptcy costs are functions of debt and that the cost structures are different for small and large businesses.

$$c_7(b) = \begin{cases} \max(0, c_{7,0S} + c_{7,1S}b + c_{7,2S}b^2), & b \leq \hat{b} \\ \max(0, c_{7,0L} + c_{7,1L}b + c_{7,2L}b^2), & b > \hat{b} \end{cases} \tag{22}$$

$$c_{11}(b) = \begin{cases} \max(0, c_{11,0S} + c_{11,1S}b + c_{11,2S}b^2), & b \leq \hat{b} \\ \max(0, c_{11,0L} + c_{11,1L}b + c_{11,2L}b^2), & b > \hat{b} \end{cases} \tag{23}$$

where $\hat{b}$ is the threshold for the SBRA.

In this model, there are 24 parameters. I divide the parameters into three groups. The first group is a set of parameters that are fixed by standard values in the literature. The second group is the set of bankruptcy costs parameters in (22) and (23), which I estimate directly from data. Parameters in the last group are calibrated within the model by targeting informative data moments.

Table 4 shows the externally calibrated parameters. Most of them are standard, but some are worth discussion. First, I set the value of the returns to scale parameter ν as 0.85. This parameter is set to 0.75 and 0.95 in Bloom et al. (2018) and Bartelsman et al. (2013), respectively, so I choose the average of them. Second, I take the parameter values for the idiosyncratic productivity process from Khan and Thomas (2013). Ideally, these parameters should be internally calibrated by targeting informative moments such as dispersion in investment rates, or directly estimated using the method in Cooper and Haltiwanger (2006). The latter method would be preferred in terms of computation as the first method changes a productivity grid for different ρ_z and σ_η. As I do not have good enough micro data to implement the latter method, I want to keep it as the next to-do list. Lastly, the variance of the taste shocks σ is taken from Dvorkin et al. (2021) who develop a computational method that adds taste shocks following an extreme value distribution to smooth decision rules. This value is consistent in scale ($\sim 10^{-3}$) with Chatterjee et al. (2020), who also include these taste shocks in their model. In a later draft, I will calibrate σ by myself.

Parameter	Explanation	Value	Source
r	Risk-free Rate	0.020	T-bill rate
τ_c	Corporate Tax Rate	0.300	Hennessy and Whited (2005)
δ	Depreciation Rate	0.100	Bartelsman et al. (2013)
α	Capital Share	0.330	Standard
ν	Returns to Scale	0.850	Bartelsman et al. (2013), Bloom et al. (2018)
ρ_z	Autocorrelation z	0.659	Khan and Thomas (2013)
σ_η	Std. Dev. Shock	0.118	Khan and Thomas (2013)
s_7	Ch. 7 Capital Price	0.380	Bris et al. (2006)
σ	Taste Shock Variance	0.001	Dvorkin et al. (2021)

Table 4: Externally Calibrated Parameters

Next, I directly estimate the cost parameters in (22) and (23) by using the bankruptcy cost data in Section 3. I assume the cost functions are the same for small and large businesses in the pre-SBRA economy, as there was no separate bankruptcy procedure for small businesses. To match the scale of the data to the above model, I re-scale the data by matching the maximum value of debt observed in the data to the maximum value of the model. In addition, I multiply by the average observed durations in Chapter 7 and 11 to convert monthly bankruptcy costs to total bankruptcy costs. Using this re-scaled data, I run regressions of total bankruptcy costs for each Chapter on a constant, the level of debt, and the square of debt. I note that the level of debt in the data is what is owed just prior to bankruptcy filing. As in Section 4, I deal with the selection problem by controlling for the Mills ratios generated from the first-stage probit regressions.

Table 5 presents the estimates of the bankruptcy cost functions. Correcting for selection bias decreases the estimate of the fixed cost for Chapter 7 and increases the estimate for Chapter 11. It is interesting to note that the fixed cost estimates of Chapter 7 and 11 in Corbae and D'Erasmo (2020) are 0.001 and 0.128, respectively. The fixed cost for Chapter 11 is thus 128 times higher than that for Chapter 7 in their paper. However, the selection corrected estimates in this paper are 0.0010 and 0.0157 for Chapter 7 and 11, respectively, so the fixed cost for Chapter 11 is only 16 times higher than that for

Chapter 7. The fixed cost estimates for Chapter 7 are in the same ballpark, but the Chapter 11 fixed cost estimate is much higher in Corbae and D'Erasmo (2020). I use the selection corrected estimates as the parameter values for the bankruptcy cost functions in (22) and (23).

	Ch. 7			Ch. 11		
	OLS	Selection		OLS	Selection	
b	0.0064***	$[c_{7,1S} = c_{7,1L}]$	0.0042***	0.0050***	$[c_{11,1S} = c_{11,1L}]$	0.0052***
	(22.03)		(11.60)	(4.45)		(3.95)
b^2	-0.0008***	$[c_{7,2S} = c_{7,2L}]$	-0.0005***	-0.0007***	$[c_{11,2S} = c_{11,2L}]$	-0.0007**
	(-9.80)		(-5.59)	(-2.63)		(-2.40)
Const.	0.0015***	$[c_{7,0S} = c_{7,0L}]$	0.0010***	0.0056***	$[c_{11,0S} = c_{11,0L}]$	0.0157**
	(17.06)		(9.57)	(8.46)		(2.07)
Mills Ratio (Chapter)			-0.0031***			-0.0006
			(-10.23)			(-0.41)
Mills Ratio (Conversion)						-0.0094
						(-1.54)
Observations	6,215	6,150		567	565	

Table 5: Bankruptcy Cost Estimates

Notes. t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Lastly, I internally calibrate the remaining parameters (Table 6). I now discuss the selection of data moments to identify these parameters. The fixed cost c_f can be identified by the firm exit rate. The sales price of capital at exit s_x is related to the bankruptcy rate. The share of Chapter 7 liquidation among all bankruptcies can be informative to identify the equity issuance cost in Chapter 11 reorganization λ_{11}^1, as a higher equity issuance cost in Chapter 11 makes Chapter 7 more attractive. The creditor recovery rate in Chapter 11 is related to the debtor's bargaining power θ. The equity issuance cost in normal operation, λ_1, and the debt cost in Chapter 11, λ_{11}^b, can be identified using the debt-to-assets ratio for operating firms and Chapter 11 firms. As λ_1 goes up, firms want to substitute away from equity towards debt. Similar logic applies to λ_{11}^1. The average investment rate is informative for adjustment costs ψ. The SBRA threshold $\hat{b}$ is set to match the share of businesses that have liabilities less then \$2,725,625. Lastly, the entry cost κ is set to be consistent with an equilibrium wage of one.

I next discuss how I construct each data moment from each source. I compute the firm exit rate as the average from 2010 to 2017 from the Census Business Dynamics Statistics (BDS). I use data from 2010 to 2017 to exclude the Great Recession, and because the FJC is available for the period after 2008 and before 2017. I compute the firm bankruptcy rate as the average ratio of the number of bankrupt firms in FJC in a

Parameter	Explanation	Parameter Value	Target (Source)
c_f	Production Fixed Cost	0.295	Firm Exit Rate (BDS 2010 - 2017)
s_x	Exit Capital Price	0.942	Firm Bankruptcy Rate (BDS, FJC 2010 - 2017)
λ_{11}^1	Ch.11 Equity Cost	0.987	Chapter 7 Ratio (FJC 2010 - 2017)
θ	Firm Bargaining Power	0.826	Chapter 11 Recovery Rate (Bris et al. (2006))
λ_1	Normal Equity Cost	0.197	Debt-to-Assets Ratio for Operating Firms (Caglio et al. (2021))
λ_{11}^b	Ch.11 Debt Cost	0.411	Debt-to-Assets Ratio for Chapter 11 Firms (Table 1)
ψ	Adjustment Cost	0.108	Average Investment Rate (Cooper and Haltiwanger (2006))
$\hat{b}$	Small Firm Threshold	1.200	Share of Firms having ¡ \$2,725,625 liabilities (ORBIS 2005-2012)
κ	Entry cost	0.276	Equilibrium Wage = 1 (Normalization)

Table 6: Internally Calibrated Parameters

given year to the number of firms in BDS. I want to note how I calculate the number of firms filing for bankruptcy. In the BDS, the total number of firms includes all legal form of organization, such as sole proprietorship, partnership, and corporation. Since there is no distinction between a founder and a firm for a sole proprietorship, proprietors tend to use Chapter 13, a reorganization process for individual bankruptcies that is similar to but cheaper than Chapter 11. Therefore, to be consistent with the BDS, I include firms that file under Chapter 13 in the group of Chapter 11 firms. I also use this definition of Chapter 11 firms to compute the Chapter 7 share of all bankruptcies. I take the Chapter 11 recovery rate, the median debt-to-assets ratio for operating firms, and the average investment rate from Bris et al. (2006), Caglio et al. (2021), and Cooper and Haltiwanger (2006), respectively. I take the median debt-to-assets ratio for Chapter 11 firms from Table 1. I use the book and market values of assets to compute the leverage ratio for operating firms and Chapter 11 firms, respectively. Caglio et al. (2021) compute the leverage ratio from a firm's balance sheet as reported to lenders, while assets and liabilities in Chapter 11 are self-reported, and we see many observations in which liabilities are greater than assets. Therefore, I regard the reported value of assets for Chapter 11 firms as their market value. Lastly, I compute the share of small firms that have liabilities less than \$2,725,625 in 2019 dollars using ORBIS from 2005 to 2012.

Table 7 shows the targeted data moments and their model counterparts. Overall, the calibrated parameters match the model and data moments well. However, the creditor recovery rate in Chapter 11 and leverage ratios for operating firms and Chapter 11 firms are lower in the model. Further improvement in matching these moments should be accomplished in the next draft.

Targeted Moments	Data	Model
Firm Exit Rate (%)	7.61	7.69
Firm Bankruptcy Rate (%)	0.61	0.63
Chapter 7 Ratio (%)	71.21	72.35
Chapter 11 Recovery Rate (%)	69.40	58.66
(Median) Debt-to-Assets Ratio for Operating Firms	0.64	0.38
(Median) Debt-to-Assets Ratio for Chapter 11 Firms	1.42	1.15
Average Investment Rate (%)	12.20	12.23
Share of Small Business (%)	69.00	69.73

Table 7: Data vs. Model Moments

6.2 Taste Shocks

I briefly discuss the role of taste shocks. I employ taste shocks to improve the convergence properties of the model solution methods.[21] The bottleneck for convergence is equation (17), the debt price schedule. Equation (17) can be written as an iterative form,

$$q^{k+1} = H[W^k, q^k, \phi^k], \tag{24}$$

where W^k, q^k, and ϕ^k are the ex-post value function, debt price schedule, and Chapter 11 recovery schedule in the k-th iteration. The function H is the right-hand side of equation (17).

For the solution method to have good convergence properties, an infinitesimal change in q^k should not induce a large shift in q^{k+1}, i.e., H should be continuous. However, if there are no taste shocks, the continuity of H is not guaranteed. To see this intuitively, assume that there are no taste shocks, i.e., $\sigma \to 0$. In this case, the vector of operation choice probabilities (P_N, P_X, P_7, P_{11}) is either $(1, 0, 0, 0)$, $(0, 1, 0, 0)$, $(0, 0, 1, 0)$, or $(0, 0, 0, 1)$. This means that an infinitesimal change in q^k can induce a *discrete* change in (P_N, P_X, P_7, P_{11}), so there would be a jump in q^{k+1}.

One might think that this should not be a problem as we take expectations with respect to z in the function H, so an infinitesimal change in q^k would result in an infinitesimal change in q^{k+1}. However, there are two problems with this logic. First, we might have to set a high number of grid points for z, which is computationally impractical. Adding more grid points increases the computational burden considerably. Second, even if we run this model with a high number of grid

[21] For recent papers employing such taste shocks, see Chatterjee and Eyigungor (2012), Caliendo et al. (2019), Chatterjee et al. (2020), and Dvorkin et al. (2021).

points, the continuity of H still might not be guaranteed. If the measure of firms that are indifferent between two discrete choices, e.g. $(1,0,0,0)$ and $(0,1,0,0)$, is not zero, an infinitesimal change in q^k can still create a jump in q^{k+1}. For these reasons, adding taste shocks allows us to improve the model's convergence properties by smoothing out the problem.

Although there is a computational benefit of using these taste shocks, we need to be cautious in using them. If the variance of the taste shocks goes to infinity, choice probabilities do not depend on economic fundamentals. For example, when the variance goes to infinity, $\sigma_N(z,k,b,k_j,b_j)$ goes to $\frac{1}{N}$ even when $v_N^j(z,k,b) > v_N^k(z,k,b)$, $\forall k \neq j$. Therefore, it is very important to set the variance σ sufficiently low so that taste shocks do not swamp economic fundamentals. I set σ as 0.001, similar to the variance in other papers that use taste shocks with generalized extreme value distribution. I will conduct a robustness check for different values of σ in a later draft.

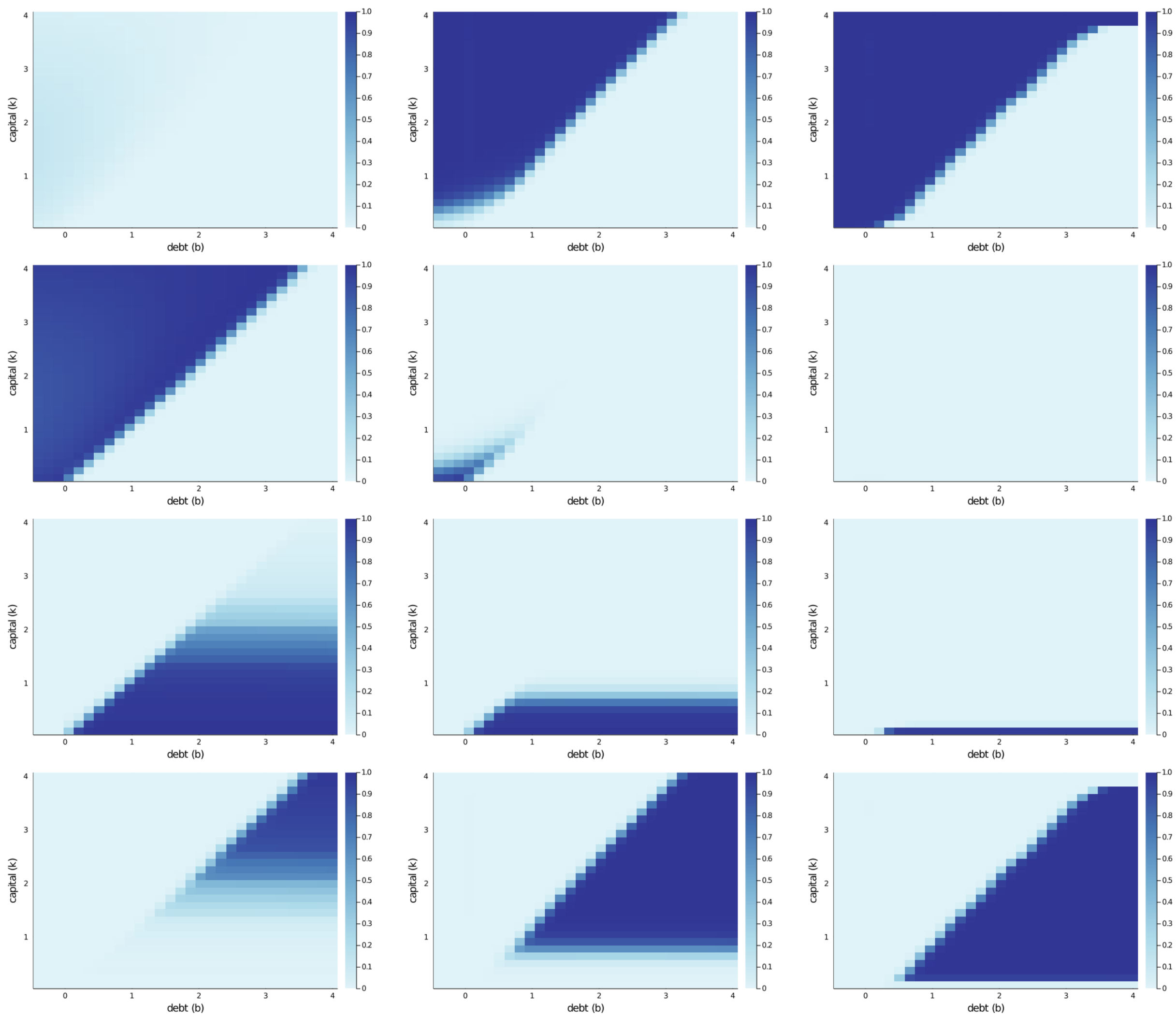
6.3 Model Properties

Figure 4 presents the bankruptcy decision rules as a function of debt and capital in the pre-SBRA economy. Panels (a), (b), and (c) represent the decision rules of low ($z = z_1$), medium ($z = z_4$), and high productivity firms ($z = z_7$), respectively. The first, second, third, and fourth rows show the probabilities of choosing normal operation ($P_N(z,k,b)$), exit without bankruptcy ($P_X(z,k,b)$), Chapter 7 liquidation ($P_7(z,k,b)$), and Chapter 11 reorganization ($P_{11}(z,k,b)$), respectively.

As shown in Figure 4, firms with high productivity tend to maintain their operations, either through normal operation or Chapter 11 reorganization, while firms with low productivity exit or liquidate. Firms with low productivity or low capital prefer to liquidate when they have a large debt. In contrast, firms with high productivity or high capital choose to reorganize when they have a large debt.

I next describe debt price schedules offered to firms conditional on how much they borrow (b'), their next period collateral (k'), and their current productivity (z). Figure 5 shows a debt price schedule for firms with median productivity ($z = z_4$). Patterns are similar for other productivity levels. For a given level of next period capital, higher firm debt reduces what lenders recover. Meanwhile, for a given level of borrowing, higher firm capital increases lenders' repayment. Thus, firms with high debt and low capital face higher real interest rates on their borrowing.

Figure 6 graphs equilibrium debt price menus offered to firms with low, medium, and high productivity for different levels of capital. For a lower level of capital



(a) $z = z_1$ **(b)** $z = z_4$ **(c)** $z = z_7$

Figure 4: Choice Probabilities

Notes. The first, second, third, and fourth rows show the probabilities of choosing normal operation ($P_N(z, k, b)$), exit without bankruptcy ($P_X(z, k, b)$), Chapter 7 liquidation ($P_7(z, k, b)$), and Chapter 11 reorganization ($P_{11}(z, k, b)$), respectively. The first, second, and third columns are the choice probabilities for $z = z_1$, $z = z_4$, and $z = z_7$, respectively.

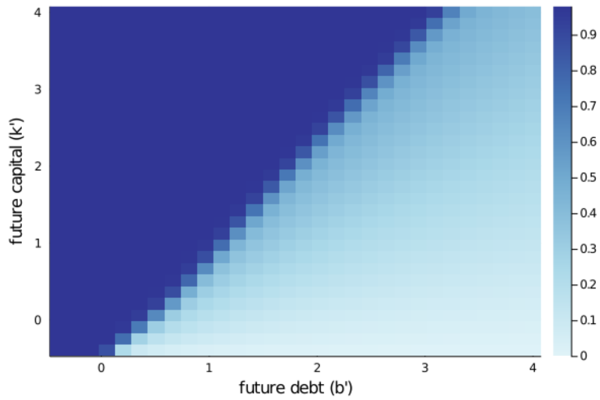


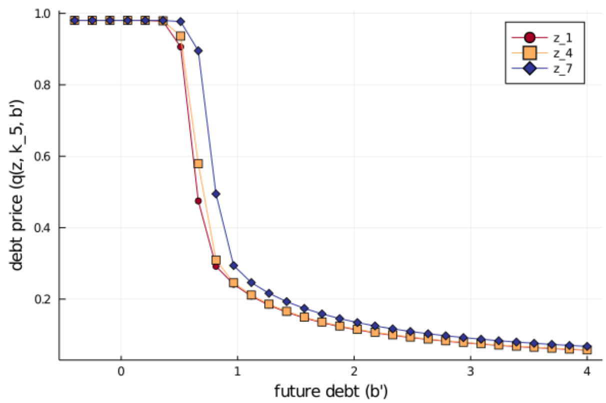
Figure 5: Debt Price Schedule ($z = z_4$)

($k = 0.64$), firms with higher productivity borrow at lower real interest rates, as higher productivity firms are less likely to go bankrupt at this level of capital. For medium ($k = 1.98$) and high ($k = 3.33$) capital, firms with the highest productivity borrow at the lowest real interest rates. However, interestingly, at these levels of future capital, medium productivity firms pay higher real interest rates than low productivity firms for a low level of borrowing while medium productivity firms pay lower interest rates for a high level of borrowing. Creditor recovery can be lower for medium productivity than low productivity, as firms with low productivity, medium to high capital, and low debt choose to exit without declaring bankruptcy, while firms with medium productivity, medium to high capital, and low debt are more likely to choose Chapter 11 reorganization, which implies lower recovery to creditors. Lastly, as in Figure 5, firms that have lower future capital and that borrow face lower (higher) debt prices (interest rates).

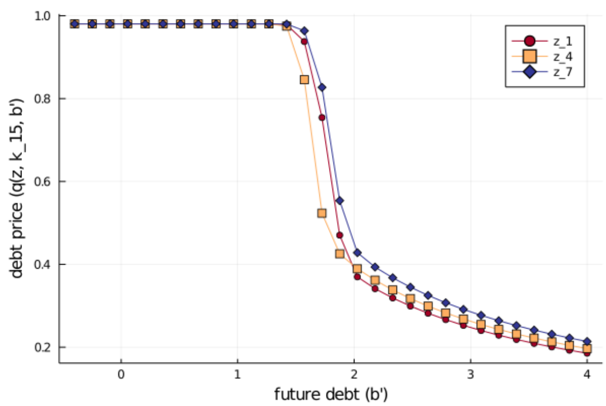
6.4 Policy Experiment

6.4.1 Policy Shock

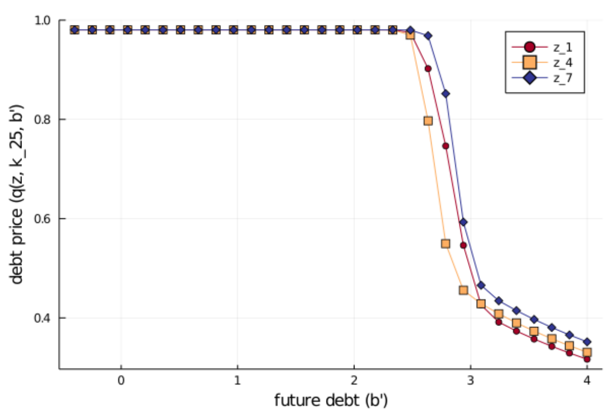
I model the SBRA as a decrease in the fixed cost of Chapter 11 only for small businesses. To be precise, I decrease $c_{11,0S}$ by 75% while $c_{11,0L}$ stays the same. Therefore, the fixed cost of Chapter 11 for small businesses under the SBRA is $0.0157/4 = 0.0039$. The 75% reduction in reorganization costs for small businesses is meant to capture the fact that (i) a debtor's maximum exclusivity period for filing a reorganization plan in Chapter 11 is 18 months for medium-to-large businesses, while the period is 300 days ($\approx$ 50% of 18 months) for small businesses and (ii) per period bankruptcy costs are



(a) $k = 0.64$



(b) $k = 1.98$



(c) $k = 3.33$

Figure 6: Debt Price Schedule

lower for small businesses under the SBRA as various requirements for Chapter 11 filers are waived (see Section 2.2).

Figure 7 presents the estimated bankruptcy cost functions from (22) and (23). The bankruptcy costs for Chapter 11 are higher than for Chapter 7 for all debt levels in the model. I model the SBRA as a 75% decrease in the fixed cost of filing for Chapter 11 only for small businesses. Chapter 11 reorganization costs under the SBRA are still larger than Chapter 7 bankruptcy costs.

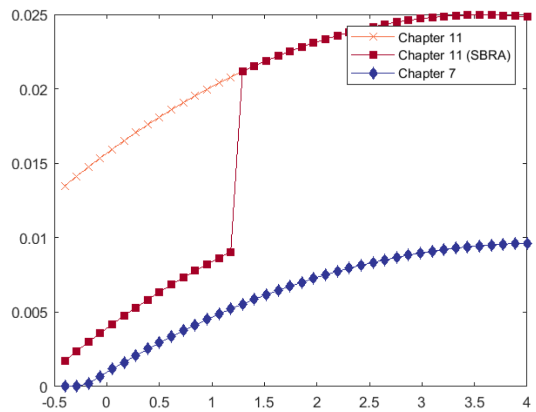


Figure 7: Estimated Bankruptcy Cost – Model

6.4.2 Results

I first describe how operation decision rules change after the SBRA. Table 8 shows the shares of each decision for the entire economy and for different productivity levels. I compute these shares by assuming a uniform distribution over (z, k, b), so these shares represent the area for each operation choice in Figure 4. This exercise thus just captures how decision rules would change after the SBRA; it does measure how shares of different choices would change in the new stationary equilibrium. Three results are notable. First, the range of Chapter 11 reorganization expands after the SBRA, as bankruptcy costs in reorganization are lower. Second, the SBRA causes some firms that choose Chapter 7 before the SBRA to choose Chapter 11 instead. At the same time, the SBRA causes some firms that operate normally or exit without declaring bankruptcy prior to the SBRA to choose Chapter 11 reorganization instead. Lastly, the overall share of firms in bankruptcy (Chapter 7 + Chapter 11) increases after the SBRA, which has an implication for debt price schedules as creditor recovery can be lower.

	z_1		z_4		z_7		All	
	pre-SBRA	post-SBRA	pre-SBRA	post-SBRA	pre-SBRA	post-SBRA	pre-SBRA	post-SBRA
N (%)	2.56	2.55 ▼	45.06	45.00 ▼	54.38	54.29 ▼	36.38	36.33 ▼
X (%)	48.68	48.67 ▼	1.77	1.76 ▼	0.00	0.00	13.46	13.46 ▼
7 (%)	32.91	32.88 ▼	13.99	13.89 ▼	2.83	2.81 ▼	15.69	15.63 ▼
11 (%)	15.86	15.89 ▲	39.18	39.35 ▲	42.79	42.89 ▲	34.47	34.59 ▲
7 + 11 (%)	48.77	48.77 ▲	53.17	53.24 ▲	45.62	45.70 ▲	50.16	50.21 ▲

Table 8: Policy Experiment: Decision Rules

Notes. ▲: increase, ▼: decrease.

I next describe how the SBRA affects the key aggregate moments that I used to calibrate the parameters (Table 9). First, after the SBRA, the firm exit rate decreases as fewer firms choose to exit or file for Chapter 7 liquidation. The firm bankruptcy rate increases, as the number of firms in Chapter 11 increases more than the decrease in Chapter 7 firms. As intended, the SBRA decreases the ratio of Chapter 7 filing among bankrupt firms. The SBRA increases the creditor recovery rate in Chapter 11, as lower Chapter 11 bankruptcy costs increase the debtor's surplus in the bargaining game (14), so the Nash bargaining solution moves in favor of creditors. The leverage ratios for operating firms and Chapter 11 firms decrease because investment increases, as will be shown later. One might wonder how the average investment rate decreases if investment increases. As the investment rate is defined by $\frac{i}{k}$, and the increase in investment shifts the distribution of firms towards high capital, the average $\frac{i}{k}$ can decrease.

	pre-SBRA	post-SBRA	% change
Firm Exit Rate (%)	7.69	7.66	-0.41
Firm Bankruptcy Rate (%)	0.63	0.64	2.68
Chapter 7 Share (%)	72.35	69.71	-3.65
Chapter 11 Recovery Rate (%)	58.66	61.46	4.77
(Median) Debt-to-Assets Ratio for Operating Firms	0.38	0.38	-0.25
(Median) Debt-to-Assets Ratio for Chapter 11 Firms	1.15	1.07	-7.40
Average Investment Rate (%)	12.23	12.22	-0.09

Table 9: Policy Experiment: Moments

Lastly, I analyze the impact of the SBRA on aggregate variables. Table 10 presents aggregate variables before the SBRA and how much the variables change after the SBRA. I want to mainly focus on consumption, output, and productivity. The SBRA increases consumption (+0.10%), so there is a welfare gain from the SBRA. However, the SBRA has small negative impacts on aggregate output (-0.01%) and productivity

	pre-SBRA	post-SBRA	% change
Aggregate Consumption, C	0.5922	0.5928	0.0957
Aggregate Output, Y	1.7559	1.7557	-0.0130
Fixed Cost, CF	0.5315	0.5310	-0.1005
Investment, I	0.3232	0.3234	0.0680
Adjustment Costs, Ψ	0.0319	0.0318	-0.1802
External Finance Costs, Λ	0.1326	0.1325	-0.0627
Entry Costs, E	0.3557	0.3549	-0.2303
Exit Value, X	0.2113	0.2108	-0.2273
TFP (= $Y/K^{\alpha\nu}$)	1.1628	1.1626	-0.0204
Output-weighted Mean Prod., $\hat{z}$	1.1288	1.1286	-0.0112
Unweighted Mean Prod., $\bar{z}$	1.0447	1.0447	-0.0068
Olley-Pakes Covariance	0.0840	0.0840	-0.0656
Mass (entrants)	0.1502	0.1494	-0.5482
Mass (total)	1.9531	1.9504	-0.1350
Wage, w	1.0000	0.9999	-0.0130
Capital, K	4.3464	4.3476	0.0265
Bankruptcy Costs, BC	0.0001	0.0001	-12.8484
Average Spread (%)	20.1701	20.1785	0.0419

Table 10: Policy Experiment: Aggregate Variables

Notes. Resource constraint, $C = Y - CF - I - \Psi - \Lambda - E + X$.

(-0.02%). The diverging impact on consumption, output and productivity are not immediately intuitive, so I explain them further below.

First, I discuss the welfare implication of the SBRA. This policy experiment is basically a comparative statics exercise. Baqaee and Farhi (2020) show that the impact of changes in parameters on welfare can be decomposed into two parts: (i) the direct change in available resources through the change in production possibilities and (ii) the improvement in allocational efficiency through resource reallocation. As I assume that bankruptcy costs are transfers from firms to the household, there is no direct change in available resources from the change in bankruptcy costs. One important lesson from Baqaee and Farhi (2020) is that to have a first-order welfare impact from resource reallocation the initial equilibrium must be inefficient. Also, it is important to identify where inefficiencies come from and how a change in parameter affects the inefficiencies in the initial equilibrium.

In the pre-SBRA economy, inefficiencies come from the fact that firms can enjoy the benefits of limited liability in Chapter 7 and charge off some of their debts in Chapter 11. To see the inefficiencies intuitively, I here define some notations and concepts. For simplicity, I assume the variance of the taste shocks $\sigma = 0$. Let $R_N(z,k,b)$ and $R_{11}(z,k,b)$ be the discounted sum of consumption (net resources) that firms with productivity z, capital k, and debt b in normal operation and Chapter 11 can deliver in the pre-SBRA economy. If we ignore $c_7(b)$ and $c_{11}(b)$ for the moment to clarify the argument, R_N and R_{11} have the following relationships with V_N and V_{11} in (7) and (10).

$$V_N(z,k,b) = R_N(z,k,b) - b \tag{25}$$

$$V_{11}(z,k,b) = R_{11}(z,k,b) - \phi b \tag{26}$$

Next I define an inefficient liquidation or reorganization in the pre-SBRA economy. An inefficient liquidation occurs when a firm chooses to liquidate to enjoy the benefits of limited liability even though its resources can contribute more to the economy under other operation choices.

Definition 2 (inefficient liquidation) *A firm with* (z,k,b) *liquidates inefficiently if* $R_N(z,k,b) > s_7k$, $R_{11}(z,k,b) > s_7k$, *or* $s_xk > s_7k$; *and* $max(s_7k - b, 0) \geq V_N(z,k,b)$, $max(s_7k - b, 0) \geq V_{11}(z,k,b)$, *and* $max(s_7k - b, 0) \geq s_xk - b$.

According to this definition of inefficient liquidation, Chapter 7 liquidation is always inefficient in my calibrated model as the calibrated s_x is greater than s_7. If a firm chooses to liquidate when $R_{11}(z,k,b) > s_7k$, the SBRA increases welfare by decreasing inefficient liquidation.

Similarly, an inefficient reorganization occurs when a firm chooses to reorganize to write off existing debts even though its resources can contribute more to the economy under other operation choices. The SBRA can increase inefficient reorganization by inducing otherwise non-distressed firms to reorganize.

Definition 3 (inefficient reorganization) *A firm with* (z,k,b) *reorganizes inefficiently if* $R_N(z,k,b) > R_{11}(z,k,b)$ *or* $s_xk > R_{11}(z,k,b)$; *and* $V_{11}(z,k,b) \geq V_N(z,k,b)$ *and* $V_{11}(z,k,b) \geq s_xk - b$.

Note that $V_{11} \geq max(s_7k - b, 0)$ cannot happen when $s_7k > R_{11}(z,k,b)$, as firms always write off more debt in Chapter 7 than Chapter 11 due to the"Best Interest Test" in Chapter 11. Therefore, if $s_7k > R_{11}(z,k,b)$, then firms always choose to liquidate.

One important lesson is that, given $R_N(z,k,b)$ and $R_{11}(z,k,b)$, the SBRA decreases inefficient liquidation while it increases inefficient reorganization. The net welfare impact from these countervailing channels is ambiguous, so a quantitative analysis is necessary.

In addition to the margins of inefficient liquidation and inefficient reorganization, the SBRA affects welfare through other channels. Since there are financial frictions (corporate income tax, equity issuance costs, limited liability, and Chapter 11) in the pre-SBRA economy, $R_N(z,k,b)$ and $R_{11}(z,k,b)$ themselves are not efficiently determined. For example, as the debt price schedule $q(z,k',b')$ depends on future capital k' and there are equity issuance costs, investment decisions under normal operation and Chapter 11 deviate from optimal investment in the frictionless world (e.g. a general equilibrium version of Hopenhayn (1992) with capital). This means that, as long as the debt price schedule $q(z,k',b')$ changes due to the lower bankruptcy costs in Chapter 11, $R_N(z,k,b)$ and $R_{11}(z,k,b)$ can be closer to or farther from their efficient values under the SBRA. This effect depends on whether a firm with a (z,k,b) over- or under-invests prior to the SBRA, and how a change in $q(z,k',b')$ affects its investment decision. In short, there are various channels by which the SBRA affects welfare, so a serious quantitative analysis is essential. Ideally, I should decompose the increase in welfare from the SBRA into these countervailing forces (inefficient liquidation, inefficient reorganization, changes in $R_N(z,k,b)$, and changes in $R_{11}(z,k,b)$), but I will leave it as a future task.

I note that entry also endogenously changes due to the change in the debt price schedule. Since the average spread increases, the value of entry decreases, so there are fewer entrants under the SBRA. However, I should emphasize that entry margin is itself efficient, in the sense that, given $R_N(z,k,b)$, $R_{11}(z,k,b)$, and $q_E(k',b')$, an infinitesimal change in the mass of entrants does not change welfare. This is because the free entry condition $E_\epsilon V_E(\epsilon) = 0$ holds and there is no debt overhang problem for entrants.

I next describe how each of the four welfare-relevant margins and the entry margin affect the resource constraint (Table 11). First, less inefficient liquidation leads to higher aggregate output and fixed costs as the number of operating firms increases. The change in aggregate investment is ambiguous, as some firms in Chapter 11 have positive investment while others have negative investment. Aggregate adjustment costs and external financing costs increase, as firms do not adjust capital or issue equity in Chapter 7 liquidation. The value of capital recovered in exit decreases as there is less Chapter 7 liquidation.

The analysis of inefficient reorganization is more complicated than for inefficient liquidation. Increased inefficient reorganization can occur under the SBRA both for firms in normal operation and firms exiting without bankruptcy. We need to distinguish these two cases. When the SBRA causes firms that otherwise exit without bankruptcy to instead choose Chapter 11 reorganization. The impact on the resource constraint is the same as the effect of lower inefficient liquidation. However, when the SBRA brings firms in normal operation into Chapter 11 reorganization, the impact on resources is theoretically ambiguous, as some firms in Chapter 11 invest more than firms in normal operation and some firms do not. Therefore, the consequences for Y, CF, I, Ψ, and Λ cannot be analytically determined, and depend on parameter values.

When there is less entry, there will be fewer operating firms. As a result, output, fixed costs, adjustment costs, and external finance costs decrease. However, the effect on investment is ambiguous as it depends on what (k', b') the entrants optimally choose. The value of capital for exiting firms would decrease, as reduced entry must imply less exit in steady state.

Lastly, the impact of changes in R_N and R_{11} on the aggregate resource constraint is ambiguous as I do not have clear analytic predictions on how R_N and R_{11} should move. As mentioned above, because $q(z, k', b')$ depends on investment and there exist equity issuance costs, it is not clear whether investment is excessive or not prior to the SBRA, from the viewpoint of an efficient equilibrium in which there are no financial frictions. For example, for a firm with high capital under normal operation, equity issuance costs should not be a concern. As higher investment decreases loan rates ($q(z, k', b')$ increases with k'), such a firm tends to over-invest prior to the SBRA. In contrast, for a low capital firm, paying equity issuance costs can be a concern, so it might under-invest pre-SBRA. As explained above, changes in R_N and R_{11} under the SBRA may be heterogeneous, so the impact of lower Chapter 11 bankruptcy costs on the aggregate resource constraint through R_N and R_{11} is theoretically ambiguous.

	C	Y	CF	I	Ψ	Λ	E	X
Less Inefficient Liquidation	▲	▲	▲	?	▲	▲	-	▼
More Inefficient Reorganization	▼	(?,▲)	(?,▲)	(?,?)	(?,▲)	(?,▲)	-	(?,▼)
Less Entry	-	▼	▼	?	▼	▼	▼	▼
Change in R_N	?	?	?	?	?	?	-	?
Change in R_{11}	?	?	?	?	?	?	-	?

Table 11: Policy Experiment: Resource Constraint

Notes. ▲: increase, ▼: decrease, -: no effect, ?: ambiguous. The first element in the 2-tuples in the "more inefficient reorganization" is for when inefficient reorganization occurs from normal operation while the second element is for when inefficient reorganization occurs from an exit without bankruptcy.

Aggregate productivity measures (TFP and output-weighted productivity) decline under the SBRA as there is less entry and exit. On average, entrants have the median productivity z_4, as $\bar{G}(\cdot)$ has the highest probability at the median. However, exiting firms have low productivity on average, and rescuing these firms through Chapter 11 reorganization shifts the productivity distribution toward low productivity firms.

7 Conclusion

This paper studies the long-run aggregate implications of a recent corporate bankruptcy reform in the U.S., known as the SBRA. Congress amended the existing bankruptcy code by introducing a streamlined debt reorganization process specifically tailored for small businesses. I develop a firm dynamics model with bankruptcy choices of insolvent firms and estimate this model using novel bankruptcy data I have uncovered. Traditionally, information about bankrupt firms has been primarily sourced from Compustat, which predominantly covers large public firms. Given that the SBRA is specifically designed to target small firms, utilizing data from large firms may not be as relevant. This paper's primary contribution lies in gathering information about the universe of bankrupt firms in the U.S. and employing this unique dataset to estimate the quantitative model. The findings of this paper indicate that the SBRA leads to an improvement in the long-run welfare of the U.S.

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