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AN ANATOMY OF U.S. PERSONAL BANKRUPTCY
UNDER CHAPTER 13**

Hülya Eraslan
Rice University

Gizem Koşar
Johns Hopkins University

Wenli Li
Federal Reserve Bank of Philadelphia

Pierre-Daniel Sarte
Federal Reserve Bank of Richmond

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An Anatomy of U.S. Personal Bankruptcy under Chapter 13[*]

Hülya Eraslan[†]
Department of Economics
Rice University

Gizem Koşar[‡]
Department of Economics
Johns Hopkins University

Wenli Li[§]
Federal Reserve Bank of Philadelphia

Pierre-Daniel Sarte[¶]
Federal Reserve Bank of Richmond

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ABSTRACT

We build a structural model of Chapter 13 bankruptcy that captures salient features of personal bankruptcy under Chapter 13. We estimate our model using a novel data set we construct from bankruptcy court dockets recorded in Delaware between 2001 and 2002. Our estimation results highlight the importance of debtor's choice of repayment plan length on Chapter 13 outcomes under the restrictions imposed by the bankruptcy law. We use the estimated model to conduct policy experiments to evaluate the impact of more stringent provisions of Chapter 13 that impose additional restrictions on the length of repayment plans. We find that these provisions would not materially affect creditor recovery rates and would not necessarily make discharge more likely for debtors with income above the state median income.

In short, the bankruptcy system operates behind a veil of darkness created by the lack of reliable data about its operations. The lack of information about "what is going on" in the bankruptcy system leads to a distrust of its results – a belief by some that creditors, debtors, and professionals within the system are all somehow taking advantage of one another and the public at large, and that the system suffers from widespread fraud, abuse, and inefficiency.

1997 National Bankruptcy Commission

1   Introduction

On April 20, 2005, the Bankruptcy Abuse Prevention and Consumer Protection Act (BAPCPA) was signed into law and ended a comprehensive legislative effort that began under the Clinton administration. The most significant (and controversial) change introduced by the new personal bankruptcy law was to impose a "means test" on debtors contemplating a bankruptcy filing. The aim was to ensure that debtors with sufficient income would file under Chapter 13 and complete a repayment plan out of future income. The key presumption underlying this provision was that a large number of households did not repay as much as their income allowed. In particular, it was thought that Chapter 13 would perform better, both as a collection device for creditors and as a means to provide debtors with a financial fresh start, if stricter rules were imposed on repayment plans.[1]

The objective of our paper is to take a first step at evaluating the impact of these stricter rules. Specifically, we aim to assess the effect of section 1325, paragraph 4, which was added to the U.S. Bankruptcy Code under BAPCPA and imposes additional restrictions on the length of repayment plans for debtors with income above the state median. In order to do so, we build and estimate a structural model of Chapter 13 bankruptcy using a novel data set we construct. For a side contribution, we provide empirical evidence regarding the outcomes under Chapter 13 and its performance both as a collection device for creditors and as a means to provide debtors with a financial fresh start.

Our model captures the salient features of personal bankruptcy under Chapter 13. In our model, a debtor first makes decisions regarding whether or not to file under Chapter 13 and, if so, what repayment plan to propose. Since the law requires that all of a debtor's excess income be applied to his repayment plan, the debtor's choice of repayment plan boils down to its length. In choosing what plan to propose, the debtor recognizes that its duration has a bearing on the confirmation outcome that is determined by the recommendations of a bankruptcy trustee appointed to oversee the bankruptcy process. Under the bankruptcy law, in deciding whether to confirm a plan or not, the trustee must form an opinion as to the fairness and feasibility of the plan. The fairness condition is satisfied as long as the debtor contributes all excess income into the plan payments. The feasibility condition requires that the debtor's excess income is sufficient to pay the unsecured creditors over a three- to five-year period an amount no less than they can recover under liquidation of the debtor's assets. To capture the idea that the trustee has some leeway in the interpretation of the bankruptcy law, in our model, whether the trustee views a given plan as fair and feasible or not is random from the perspective of the debtor. Specifically, whether the trustee views a plan as fair and feasible depends on the debtor's characteristics and the plan length.

Even if a plan is initially confirmed, it may nonetheless become unfair or infeasible due to fluctuations in the debtor's financial condition. We model this possibility by introducing shocks to income or expenses of the debtor at a random date. Following the shocks, the trustee reevaluates

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[1]See, for example, https://www.tinyurl.com/bapcpa2005.

the feasibility of the plan under the new debtor characteristics. If the case is not dismissed, the debtor decides whether to continue or voluntarily default on his plan.

Overall, our model highlights a basic trade-off debtors face in proposing long repayment plans versus short ones. Long repayment plans are costly in that they impose restraints on debtors for longer periods, but these plans may also be more likely to be confirmed by the court and, ultimately, to result in a financial fresh start. In addition, our model highlights the importance of shocks to excess income during the bankruptcy process. In particular, even though a plan may be fair and feasible at the time a debtor files for Chapter 13 bankruptcy, it may cease to be so later on before the repayment plan is complete.

We estimate our model using newly collected data contained in court files on all Chapter 13 personal bankruptcies recorded by the United States Bankruptcy Court for the District of Delaware between August 2001 and August 2002. From the court documents, we extract information concerning the filers' financial and demographic information at the time of filing and the final outcome of their cases. Specifically, we collect data on the outcomes predicted by our model: the choice of plan length, whether the plan is confirmed or not, whether the case is successfully completed or not, and the recovery rate of the creditors. In addition to these endogenous outcomes, in our model the decision to file for Chapter 13 in the first place is also endogenous. Although all the debtors in our sample have chosen to file for Chapter 13, we identify the parameters associated with this decision through the variation in the decision to continue or voluntarily default on the plan following the shocks to financial conditions.

We estimate our model using the maximum likelihood approach. Our estimates confirm that the debtor's choice of plan length indeed affects the trustee's opinions on the fairness and feasibility of the plan. In particular, after controlling for exogenous debtor characteristics, we find that longer plans are more likely to be confirmed in the first place and less likely to be dismissed after the original plan becomes infeasible. However, whether a debtor's income is above the state median level does not play a significant role in the confirmation of the plan.[2] As such, the means test established under BAPCPA appears inconsequential. In addition, we find that changes in debtors' conditions during bankruptcy play a significant role in governing Chapter 13 outcomes, including the ability of debtors to obtain a financial fresh start. In particular, negative shocks to excess income, especially when experienced early in the program, raise the probability of dismissal significantly.

We next conduct policy experiments to assess the effect of section 1325, paragraph 4, that was added to the U.S. Bankruptcy Code under BAPCPA. This policy imposes additional restrictions on the length of payment plans for debtors with income above the state median. Our results predict that this new policy would not materially affect creditor recovery rates and would not necessarily make discharge more likely for debtors with income above the state median. This finding is robust to alternative policy experiments that require bankruptcy plans to meet stricter standards in other ways, such as proposing a higher recovery rate. In fact, in these alternative experiments, some Chapter 13 filers no longer choose to file, with the result that recovery rates and discharge rates even decline. It appears, therefore, that a stricter bankruptcy code can make it more difficult for debtors to obtain a fresh start but without necessarily helping to raise creditor recovery rates.

The remainder of this paper is organized as follows. Section 2 the discusses related literature. Section 3 presents institutional details associated with U.S. personal bankruptcy law as well as a summary of creditors' options outside bankruptcy. Section 4 provides a description of the data. Section 5 presents a structural model of Chapter 13 bankruptcy. Section 6 presents econometric

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[2]Whether income is above the state median appears immaterial for the confirmation of the plan; however, income plays an important role through the determination of excess income (income minus necessary expenses) and therefore the required plan payments.

specification. Section 7 presents our estimation results. Section 8 assesses the effects of policy experiments directly related to BAPCPA as well as hypothetical ones. Section 9 offers some concluding remarks.

2   Related Literature

Our paper contributes to a growing literature on households' bankruptcy decisions. With some exceptions, this literature has largely focused on households' bankruptcy decisions under Chapter 7. In early work, Domowitz and Sartain (1999) combine a sample of households who filed for bankruptcy in the early 1980s with data from the Survey of Consumer Finances for 1983. They find that households with more credit card debt are more likely to file for bankruptcy. Gross and Souleles (2002) study individuals' credit card account data and conclude that a decrease in stigma associated with bankruptcy is partly responsible for the increase in bankruptcy filing rates between 1995 and 1997. Using data from the Panel Study of Income Dynamics, Fay, Hurst, and White (2002) test the role of financial benefits in households' bankruptcy decisions and find support for underlying strategic considerations. In particular, households are more likely to file when their financial benefit from filing is higher.[3]

More recently, given the debates that surrounded the proposal and eventual passage of BAPCPA, attention has shifted toward consumer bankruptcy under Chapter 13. Similarly to our methods, Warren (2003) and Norberg and Velkey (2007) construct data on Chapter 13 bankruptcy filers using U.S. bankruptcy court files. However, their focus is entirely descriptive. By contrast, we estimate a structural model and conduct policy experiments to evaluate stricter rules imposed under BAPCPA.[4]

Our paper also informs a literature in macroeconomics that has provided tractable models relating documented empirical facts on consumer bankruptcy to aggregate considerations. A number of studies have used calibration and simulation exercises to explain observed aggregate U.S. consumer bankruptcy filing rates and have evaluated the effects of information, financial innovation, and changes in bankruptcy laws on these rates and other economic aggregates. Examples include Athreya (2002), Athreya, Tam, and Young(2012a), Chatterjee, Corbae, Nakajima, and Rios-Rull (2007), Drozd and Nosal (2008), Li and Sarte (2006), Livshits, MacGee, and Tertilt (2007, 2011), and Sanchez (2010). These papers abstract from the details of the personal bankruptcy laws, and do not distinguish between Chapter 7 and Chapter 13 personal bankruptcies.

3   Legal Background

This section first briefly reviews creditors' legal remedies outside bankruptcy. It then addresses the main features of U.S. personal bankruptcy law focusing in detail on Chapter 13 court procedures.

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[3]Sullivan, Warren, and Westbrook (1989, 2000) and Warren (2005) provide vivid narratives of debtors and creditors who end up in bankruptcy court. Conclusions underscore that bankruptcy is often caused by crises in debtors' lives, including divorce, job loss, and medical problems. There is also a separate empirical literature that examines the effects of personal bankruptcy law on the supply and demand for credit (Gropp, Scholz, and White (1997) and Lin and White (2001)), on the ability of households to insure against labor income risk (Athreya, Tam, and Young (2012b)), on consumption behavior (Filer and Fisher (2005) and Grant (2003)), on labor supply (Han and Li (2007)), and on mobility (Elul and Subramanian (2002)).

[4]See Eckstein and Wolpin (1989), Rust (1994), Aguirregabiria and Mira (2010), and Keane, Todd, and Wolpin (2011) for surveys of structural dynamic choice models.

3.1 Creditors' Legal Remedies Outside of Bankruptcy

When a debtor defaults on his debt obligations without explicitly filing for bankruptcy, secured creditors, such as mortgage lenders or car loan lenders, seize property to recover what they are owed. Unsecured creditors, such as credit card issuers, often start with making calls and writing letters soliciting payments. They then typically sell their debts to collecting agencies. Unsecured creditors also have the option to sue the debtor and obtain a court judgment against him. They collect on the judgment by having the court order that the debtor's employer take a portion of his paycheck and remit that money to the sheriff, who then forwards the payment appropriately. This process is known as "wage garnishment." Unsecured creditors can also potentially seize a debtor's bank account and/or foreclose on his home. State laws typically restrict the amount and type of assets that can be seized to different degrees. Therefore, the process of seizing an account or foreclosing on a property can be costly and, in practice, unsecured creditors rarely do so.

3.2 Main Features of U.S. Personal Bankruptcy Law Prior to BAPCPA

U.S. personal bankruptcy law features two distinct procedures: Chapter 7 and Chapter 13. Prior to BAPCPA, debtors had the right to choose between the two chapters.[5] Chapter 7 is often referred to as "liquidation."Under Chapter 7, the debtor surrenders all assets above an exemption level that varies across states. In exchange, he obtains the discharge of most of his unsecured debt such as credit card debt, medical bills, personal loans, utility bills, etc.[6] A debtor cannot file again for Chapter 7 during the six years that follow the last filing. In contrast, Chapter 13 is formally known as "adjustment of debts of consumers with regular income."Under Chapter 13, a portion of a debtor's future earnings are used to meet part of his debt obligations. The repayment plan can last for a period of up to five years. While the debtor's assets are unaffected under Chapter 13, at the end of the payment plan, any remaining debt is discharged. A debtor is prevented from filing again under Chapter 13 for a period of 180 days following his last filing.

3.3 Bankruptcy Procedure under Chapter 13

A Chapter 13 case begins when a debtor files a petition with the bankruptcy court. This petition gives a description of, among other information, the debtor's assets, debts, income, and expenditures. In the petition, the debtor also proposes a repayment plan that devotes all of his *excess income* to the payment of unmet claims. Bankruptcy law defines excess income as any income net of necessary living expenses including housing expenses, which is in the form of mortgage payments for most of the debtors. In order to be confirmed by the court, the proposed plan must provide to repay the debt over a three- to five-year period. It must also be filed in good faith.[7] In particular, the debtor must propose to pay at least as much as the value of the assets creditors would have otherwise received under Chapter 7. Finally, the plan must cure any default on secured debt at the time of filing before providing for payments to unsecured creditors. Because the law requires debtors

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[5]Given the time span covered by our data set and the objectives of this paper, the basic features of personal bankruptcy law we provide below predate the passage of the 2005 Bankruptcy Reform Act.

[6]Discharge prevents the creditors who are owed the discharged debts from taking any action against the debtor, including any communication with the debtor regarding unpaid debts.

[7]Trustees typically ask Chapter 13 filers to start submitting periodic payments according to the plan as soon as the plan is filed. Payments are distributed to creditors only if the plan is confirmed and are otherwise refunded. This practice, together with other court rules, discourages debtors from staying in Chapter 13 bankruptcy without a confirmed plan for too long.

to devote all of their disposable income to the payment plan, the key element of the repayment plan is the proposed plan length.

Upon the filing of a petition, a trustee is appointed by the bankruptcy court. The trustee is responsible for evaluating and recommending whether or not to confirm a proposed plan. He also works as a disbursing agent during the implementation of the plan, collecting payments from debtors and distributing them to creditors. Within a month of the petition filing, the trustee schedules a section 341 meeting. At this meeting, creditors are given an opportunity to ask any questions regarding the debtor's financial situation that may affect the plan. Ultimately, the trustee recommends to the court that a proposed plan either be confirmed, along with the implied repayment schedule, or be dismissed.

If the plan is dismissed, the case ends. Creditors can resume legal remedies outside bankruptcy, as described above, to pursue the repayment of their loans. If a repayment plan is confirmed, the debtor starts making payments as specified in that plan.[8] Once plan payments are completed, any remaining debt is discharged. It is possible for a plan that is initially confirmed to be subsequently altered. In particular, the debtor is free to prepay his debts in the event that his assets appreciate or he receives additional income from an unexpected source, such as an inheritance. The debtor can also potentially convert the case to a Chapter 7 filing, even after confirmation of the Chapter 13 plan, or voluntarily default on the confirmed plan and have the case dismissed. When a debtor benefits from a substantial increase in income after confirmation of a repayment plan, the law requires the debtor to increase his payments by the amount of additional income received (unless expenses for basic maintenance have also changed). Ultimately, the final plan that is carried out can look very different from the proposed and confirmed plan.

4   The Data

4.1   Data Collection

The data collected in this paper are obtained using an electronic public access service to case and docket information from Federal Bankruptcy courts and the U.S. Party/Case Index. This service is known as Public Access to Court Electronic Records (PACER) and offers bankruptcy court information including i) a listing of all parties and participants including judges, attorneys, and trustees, ii) a chronology of the dates of case events entered in the case record, iii) a claims registry, and iv) the types of documents filed for specific cases and imaged copies of these documents.

The docket sheet together with the court files it contains allow us to extract information concerning important dates that mark the Chapter 13 bankruptcy procedure, including the filing date, the confirmation date, and the dismissal or discharge date, as well as filers' financial and income information at the time of filing and the final outcome of the case. The court files include debtor petitions, attorney disclosure forms, statements of financial affairs, Chapter 13 plans, and the trustee report. The debtor petitions contain different schedules, labeled A through J, that set forth the financial situation of the debtor, including real property that is owned, other personal assets in the form of furniture, cash, or insurance, liabilities such as secured debt and unsecured priority debt (taxes), and maintenance expenses for food, clothes, and transportation, among other basic expenses.

The court files are mostly PDF images from which information cannot be directly extracted using software. We manually collected all of our data by downloading these images and coding them into a database. The data were entered twice and the corresponding entries were cross-checked. The

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[8]In Delaware, the trustee receives 6% of total payments made under a confirmed plan.

data were also checked against different sources where the same information was reported. For instance, the summary of schedules provides headline numbers on filers' assets, debts, income, and expenditures, while petition schedules A through J provide the same information in greater detail.

There were $1,085$ Chapter 13 bankruptcy cases filed in Delaware over our sample period (August 2001 to August 2002). Of the $1,085$ cases, we deleted from our sample 134 cases that have incomplete information resulting from either court recording or filing errors, and that were therefore trivially dismissed. In addition, 130 cases were omitted from the data due to inconsistent information filed by the debtors. Our final sample contains 821 cases, of which 364 (or 44%) resulted in a discharge upon successful completion of the repayment plans while 457 cases were dismissed under Chapter 13. Of the dismissed cases, 52 were later converted to Chapter 7 filings. Table 1 summarizes this information.

4.2 Data Description

4.2.1 Selected Characteristics of Chapter 13 Debtors

Most of the variables we use in our analysis are directly available from the court files. Others are constructed on the basis of these original variables. For comparison, demographics, employment status, and income information are obtained for the State of Delaware from the 2000 Census and the Mortgage Bankers Association. We also report data on expenditures from the northeast region of the 2001 Consumer Expenditure Survey. Balance sheet information at the national level is obtained from the 2001 Survey of Consumer Finances.

The debtors in our sample are somewhat less likely to be unemployed than the average Delaware resident, with approximately 4% of the filers being unemployed compared to 5% in Delaware. This is not surprising since Chapter 13 bankruptcy is designed for curing the debts of individuals with regular income. What is more surprising is that about 5% of the filers are self-employed. Average monthly household income for the debtors in our sample is $2,938$, which falls short of Delaware's average adjusted gross income by about 30%. Filers for whom we have income data for both the current and previous year experience a nearly 20% average decline in income prior to filing.

The court files also provide information regarding debtors' monthly expenses that define basic maintenance under Chapter 13. Debtors in our sample spend on average $1,164 on housing expenses (mortgage or rent). While housing expenses are shielded by law, a provision prohibits debtors from boosting these expenses prior to filing. In our sample, housing expenses, including expenses for home maintenance, account on average for 40% of total monthly expenses.[9] Debtors in Chapter 13 spend about $442 a month on average for food and clothing, which is considerably less than the $600 monthly average reported for the northeast region of the Consumer Expenditure Survey. Food and clothing represent 19% of debtors' monthly expenses in our sample. The remaining categories that define maintenance expenses include alimony payments,[10] insurance premia, medical expenditures, transportation expenses, and discretionary expenses. Discretionary expenses include recreation and entertainment. These expenses are arguably the least related to basic necessities and the most subject to interpretation by the trustee. In our sample, however, discretionary expenses account for approximately 2.5% of total monthly expenses on average.

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[9]About 87% of the debtors in our sample own their homes, which exceeds the 70% state homeownership rate. That said, over one-fifth of homeowners who file for bankruptcy have pending foreclosure lawsuits, much higher than the state average foreclosure rate of 0.35%.

[10]Compared to their peers, Chapter 13 filers in our sample are less likely to be married, with 46% of the sample being recorded as married versus 54% for the state of Delaware. Approximately 6% of the filers listed alimony as part of either their monthly income or monthly expenses, thus suggesting a recent divorce.

We refer to a debtor as a *repeat filer* if he has filed for either Chapter 7 or Chapter 13 bankruptcy at least once prior to the current filing, since 1980. In our sample, about 24% of the debtors are repeat filers and thus have already been exposed to the experience of bankruptcy.

As expected, the most striking aspect of Chapter 13 filers relates to their level of indebtedness. Specifically, their median total debt, including mortgages, car loans, and credit card debt, is about $121,852, around six times the national median, while their median total assets are $104,000, less than half of the corresponding national median. Their median unsecured debt is $14,737, compared to a national median of zero. Median arrears[11] amount to $12,517. Together, total debt in default (henceforth, total debt) for the median filer - arrears as well as unsecured debt - amounts to approximately to the debtor's annual gross income. Specifically, the debtor with the median income earns $31,284 and the debtor with the median total debt in default owes $30,834 in past-due debt. By contrast, the debtor with the median total debt, including mortgages, car loans, and credit card debt, owes about $121,852. The large difference is due to the fact that some of the debt is not in default.

Table 2 provides summary statistics for the debtor characteristics we use in our analysis. As can be seen from this table, monthly rent or mortgage payments average a little under $850 a month, which amounts to about 31% of monthly income. For about 8.5% of filers, medical debt constitutes over 10% of their total debt in default.[12] About a quarter of filers have above-state-median-income at the time of filing. Moreover, on average, the debtors in our sample have been in their current job for about five months. A little over 1% of the filers did not hire an attorney. Those who did hired experienced attorneys in the sense that their attorneys handled, on average, 94 cases in our sample. Finally, the majority of the filers proposed long repayment plans (over four years), with the proposed recovery rates over 65%.

To sum up, Chapter 13 filers in our sample tend to earn noticeably less than average and are very heavily indebted. These observations are broadly consistent with previous findings in the literature (see, for example, Domowitz and Sartain (1999), Nelson (1999), and Fay, Hurst, and White (2002)).

4.2.2 Outcomes under Chapter 13

Two of the key outcomes of the personal bankruptcy process are creditors' *recovery rate* and debtors' ability to obtain a *discharge*. These outcomes depend crucially on the *length of plans* that are chosen by debtors and whether these plans are *confirmed*[13] by the trustee. Hence, this paper focuses on these four quantifiable aspects of Chapter 13.

Figures 1 and 2 illustrate noteworthy aspects of proposed Chapter 13 plans in our sample. First, proposed plan lengths in Figure 1 are nearly bimodal, with the majority of filers proposing either three-year or five-year plans. In what follows, we will refer to plans shorter than four years as three-year plans and the plans longer than four years as five-year plans. The fact that a large fraction (84%) of the debtors propose five-year plans is not surprising given that it often takes at least three years for filers to repay arrears in full.

Second, there exists considerable variation in proposed creditor recovery rates. As shown in Figure 2a, the majority of filers propose to repay at least half of their total debt. The mean and

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[11]Arrears are missed payments that are past due on a (secured) loan. This is particularly relevant for mortgage debt in the case of consumer bankruptcy. For secured debt, the part of the debt that is in default is only the arrears.

[12]We calculate medical debts by flagging keywords such as "health," "medical,"or "Labcorp,"that are listed for either the debt type or the associated creditor.

[13]Cases that are not confirmed are either converted to Chapter 7 or dismissed. Given the small number of Chapter 7 conversions in our sample, we do not formally distinguish between dismissal and chapter conversion in our analysis, even though a case that is converted to Chapter 7 may eventually be discharged under that chapter.

median proposed recovery rates are close to 66 cents and 60 cents on the dollar, respectively. Around 20% of filers propose to pay their creditors back in full.

Third, as illustrated in Figure 2b, these recovery rates are strikingly lower than those implied by the proposed plans. An important reason for the discrepancy is that many debtors in bankruptcy end up not carrying out their plans in full, either because they are dismissed by the trustee at a later stage or because they voluntarily exit Chapter 13 before completing their plans. Accordingly, the distribution of actual recovery rates looks very different, depending on whether debtors completed Chapter 13 and were successfully discharged or not. This is shown in Figure 3a. Furthermore, Figure 3b illustrates that the proposed plan length also matters somewhat for the distribution of recovery rates. Interestingly, although their average recovery rates are similar, debtors that propose five-year plans are associated with a lower median recovery rate than those that propose three-year plans. Specifically, the actual median recovery rates are 15% for the debtors with five-year plans versus 19% for the debtors with three-year plans. One possible reason is that debtors who seek to smooth their payments over longer periods could be the ones in greater financial distress.

The average recovery rate for the creditors is 29%, with a median recovery rate of 14%. The mean and median recovery rates conditional on the debtor being discharged are 59% and 55%, respectively.[14] This recovery rate is the weighted average of the recovery rates of the unsecured and secured creditors. The mean recovery rate on unsecured debt is 17% while the median is 0%. Conditional on discharge, the mean and median recovery rates on unsecured debt are 38% and 25%, respectively. By contrast, the mean recovery rate on secured debt is 49% while the median is 39%. By law, the recovery rate on secured debt conditional on discharge must be 100%. The unconditional recovery rate on secured claims is, however, lower than 100% for two reasons. First, when the debtor does not obtain a discharge in Chapter 13, he does not necessarily pay his secured creditors in full. Second, for secured debt other than mortgages (for example, car loans), it is possible that the value of the claim is reduced during the bankruptcy proceedings through cram-down. Although we do not have the data on cram-down, we do not expect the recovery rates we report to be too different from the actual recovery rates since most of the secured debt is mortgage debt, which cannot be crammed down.

The descriptive statistics for the variables we just discussed as well as the remaining outcomes are summarized in Table 3. As can be seen, close to 20% of the cases in our sample are dismissed without ever obtaining the confirmation of a plan, and only 55% of the confirmed plans are carried out to completion. In summary, creditor recovery rates are considerably lower than those that are first proposed. In addition, more than half of the debtors fail to obtain the financial fresh start potentially afforded by the bankruptcy law. A natural question is this: what debtor characteristics, or other aspects of Chapter 13, are associated with these outcomes? To answer this question, the next section builds a structural model of Chapter 13 bankruptcy.

5   The Model

In this section, we model the behavior of debtors while they are in Chapter 13 bankruptcy, taking as given trustees' decision rules. We do not explicitly model the creditors' problem since they don't actively participate in the bankruptcy process.

Our analysis begins with a debtor's decision to file for bankruptcy under Chapter 13. We let $F \in \{0, 1\}$ denote the debtor's decision to file for Chapter 13 bankruptcy, where $F = 1$ if and only if the debtor files for Chapter 13. In order to be able to discharge his debts, the debtor must propose

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[14]Chapter 13 recovery rates are necessarily zero for cases that are dismissed without confirmation.

a repayment plan, have it confirmed by the court, and carry it out in full. The payoff of the debtor depends on the payments P he makes in Chapter 13 and whether or not he obtains a discharge. We let $D \in \{0, 1\}$ denote the discharge outcome, where $D = 1$ if and only if a discharge in Chapter 13 is obtained. The payoff from discharge is normalized to zero, and the payoff from exiting Chapter 13 without a discharge is given by $\overline{V}(Z)$, where Z denotes the predetermined debtor characteristics at the time of filing for bankruptcy.[15] We assume that the payoff of the debtor is additively separable over payments and the discharge outcome and that it is given by

$$u(P, D) = -P + (1 - D)\overline{V}(Z).$$

Since the law requires all of the debtor's excess income to be applied to the repayment plan, he has little say over per-period plan payments, and these are treated as exogenous. As discussed in the previous section, discretionary expenses account for a negligible fraction of the monthly expenses. As such, we assume the monthly payment amount is exogenously given by the excess income, denoted by X, and the debtor's choice regarding the plan consists solely of its length. We assume the debtor can propose either a three-year (short-term) plan or a five-year (long-term) plans and we denote the plan length by L.[16]

Once a plan is proposed, a trustee must decide whether or not to confirm the proposed plan. We assume that the trustee is nonstrategic and that his decision rule is exogenous, which the debtor takes as given. In addition, we assume that the decision rule is stochastic. This captures the idea that the interpretation of the bankruptcy law is not entirely unambiguous, and the trustee has some leeway in the interpretation of its provisions. How the trustee interprets the ambiguous provisions is unobservable to the debtor. We let $C \in \{0, 1\}$ denote the confirmation outcome, where $C = 1$ if and only if the plan is confirmed. At the time the trustee makes the decision to confirm the case or not, he observes the plan length L and the debtor characteristics Z, and his confirmation decision rule is characterized by the probability $\Pr(C|L)$.[17]

If the plan is confirmed, then the debtor starts making payments according to the plan. In particular, he is expected to pay his excess income X in each period $t \in \{1, \ldots, L\}$. However, his excess income may change during bankruptcy due to unexpected shocks.[18] Specifically, we assume the existence of an additive shock $\eta \in \mathbb{R}$ to excess income. In addition, we assume the timing of this shock is random and given by $\tau \in [0, L]$.

We assume that once the shocks to excess income are realized, the trustee reevaluates the plan in light of the changes to the excess income and thus to the per-period payment amount and therefore to the total payments. Specifically, the total plan payments are now given by $X\tau + (L - \tau)(X + \eta)$. As before, we take the trustee's decision rule as exogenous and stochastic. We let $S \in \{0, 1\}$ denote the trustee's reevaluation outcome, where $S = 1$ if and only if the trustee dismisses the case. At the time the trustee makes the decision to dismiss the case or not, he observes the shock η to excess income and its timing τ in addition to the plan length L and the debtor characteristics Z. We let

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[15]Since payments (if any) made outside Chapter 13 are not available, the payoff from options that do not involve Chapter 13 must be estimated.

[16]While this assumption is made for simplicity, it is consistent with the observed distribution of proposed plan lengths being highly bimodal around these two values (recall Figure 1).

[17]In our estimation, we allow this probability to depend on the debtor characteristics Z as well. We suppress this dependency in our notation.

[18]For example, once a plan is confirmed, a debtor may switch employment, gain additional income in the form of inheritance, or obtain access to refinancing on secured debt. These changes can in principle be observed by the trustee, but they are not documented and therefore are unavailable to us.

$\Pr(S|L, \eta, \tau)$ denote the probability that characterizes the dismissal decision rule by the trustee.[19]

Even if a plan is not dismissed by the trustee at τ, the debtor may decide to voluntarily exit Chapter 13 bankruptcy without a discharge. We let $E \in \{0, 1\}$ denote the debtor's decision to exit Chapter 13, where $E = 1$ if and only if the debtor voluntarily exits Chapter 13 following the realization of the shock to his excess income.[20]

Figure 4 summarizes the timing of events. First, the debtor chooses F. If $F = 1$, then the debtor chooses L. Given L, the confirmation outcome C is realized. If $C = 1$, the shocks η and τ are realized followed by the realization of the dismissal outcome S. If $S = 0$, then the debtor chooses E. The decisions F, L, and E together with the realizations of random variables C, S, η, and τ determine whether the debtor obtains a discharge D, as well as the payments P made in Chapter 13 bankruptcy. We explain this next.

5.1 Discharge and Payment Outcomes under Chapter 13

If $F = 0$, then the debtor obtains no discharge, and the payments in Chapter 13 are zero, i.e., $D = 0$ and $P = 0$. If $F = 1$, then there are four cases:

(i) If $C = 0$, then the plan is not confirmed, the case is terminated without a discharge, and the creditors do not collect anything in Chapter 13. Consequently $D = 0$ and $P = 0$ in this case.

(ii) If $C = 1$ and $S = 1$, then the case is dismissed after the shocks to debtor's excess income are realized, and again the debtor fails to obtain a discharge $D = 0$. In this case, the payments in Chapter 13 consist of the payments made up to the realization of the shock to excess income at time τ, that is, $P = X\tau$.

(iii) If $C = 1$, $S = 0$, and $E = 1$, then the case is not dismissed at time τ but the debtor decides to exit the bankruptcy voluntarily. In this case, too, we have $D = 0$ and $P = X\tau$.

(iv) If $C = 1$, $S = 0$, and $E = 0$, then the debtor decides to remain in bankruptcy and his payments are modified to $X + \eta$. Because he already paid X per year until time τ, and he pays $X + \eta$ per year from τ to L, and because he does not need to pay more than what he owes, the total payment in this case is $P = \min\{X\tau + (X + \eta)(L - \tau), B\}$, where B is the total debt at the time of filing for bankruptcy.[21] In this case, the debtor obtains a discharge, and so $D = 1$.

Note that, the variables F, L and E are determined as the solution to the debtor's dynamic optimization problem. We next discuss how these variables are determined.

5.2 The Debtor's Problem

In this section, we characterize the debtor's optimal choices $\widehat{F}$, $\widehat{L}$, and $\widehat{E}$ using backward induction. First, consider the debtor's choice of $\widehat{E}$ at time τ after his excess income becomes $X + \eta$. If the debtor decides to exit bankruptcy, his utility is given by

$$-X\tau + \overline{V}(Z'),$$

where Z' reflects the debtor's new characteristics at time τ, after taking into account the reduction in his debt due to the payments he has already made, and his new excess income, taking into account

---

[19]As before, in our estimation, we allow this probability to depend on the debtor characteristics Z as well.

[20]Note that this decision resembles the decision to file for Chapter 13 bankruptcy in the first place. Since in our data set we observe only people who chose to file for Chapter 13 bankruptcy, the debtor's decision to exit Chapter 13 or plays an important role in our identification.

[21]As mentioned earlier, the trustee collects a 6% fee from the total payments. To account for this, we adjust the total debt amount.

the shock η it received. If the debtor decides to remain in bankruptcy, his utility is given by

$$-\min\{X\tau + (X + \eta)(L - \tau), B\}.$$

As such, $\widehat{E} = 0$ if and only if $-\min\{X\tau + (X + \eta)(L - \tau), B\} \geq -X\tau + \overline{V}(Z').$[22]

Next consider the debtor's choice of plan length. This choice has two consequences. First, it affects the probability that the plan will be confirmed. Second, it affects the payoff conditional on the plan being confirmed. Let $V(L)$ denote this conditional payoff.[23] Formally, we have

$$
\begin{aligned}
V(L) = \mathbb{E}_{\eta,\tau}[&\Pr(S = 1|L, \eta, \tau)[-X\tau + \overline{V}(Z')] \\
&+ Pr(S = 0|L, \eta, \tau)[\max\{-\min\{X\tau + (X + \eta)(L - \tau), B\}, -X\tau + \overline{V}(Z')\}]].
\end{aligned}
\tag{1}
$$

The debtor's choice of plan length must maximize his expected utility, i.e.,

$$\widehat{L} \in \underset{L \in \{3,5\}}{\text{argmax}} \ \Pr(C = 1|L)V(L) + (1 - \Pr(C = 1|L))\overline{V}(Z). \tag{2}$$

Finally, the debtor's choice of filing must be optimal. Assuming that the debtor files for Chapter 13 when indifferent, we have $\widehat{F} = 1$ if and only if

$$\Pr(C = 1|\widehat{L})V(\widehat{L}) + (1 - \Pr(C = 1|\widehat{L}))\overline{V}(Z) \geq \overline{V}(Z)$$

or, equivalently, if and only if $V(\widehat{L}) \geq \overline{V}(Z)$.

We now turn to our empirical specification.

6   Econometric Specification

6.1   Likelihood Function

The solution of the optimization problem just discussed serves as the input into estimating the parameters of the model given data on choices made by the debtors and the confirmation and discharge outcomes. As mentioned earlier, for each individual in the data, we observe the choice of plan length $\widehat{L}$, discharge outcome D, confirmation outcome C, and the recovery rate of their creditors, which is equivalent to observing the payments P. The contribution to the likelihood function of each debtor in our sample is therefore equal to the probability of observing $(\widehat{L}, C, P, D)$ conditional on the vector of (exogenous) debtor characteristics Z, and the model's parameters $\boldsymbol{\beta}$.[24] Given the optimization decisions faced by debtors under Chapter 13, the likelihood of each debtor can be written as

$$\Pr(\widehat{L}, C, P, D|Z, \boldsymbol{\beta}) = \Pr(\widehat{L}|Z, \boldsymbol{\beta}) \Pr(C|\widehat{L}; Z, \boldsymbol{\beta}) \Pr(P, D|C, \widehat{L}; Z, \boldsymbol{\beta}). \tag{3}$$

The sample likelihood is the product of the probabilities in (3) over all the debtors in the data set. The remainder of this section addresses each of the components on the right-hand side of (3), suppressing the conditioning on Z and β.

---

[22]We assume that the debtor remains in bankruptcy when indifferent. Under the assumptions we make on the distribution of η in the next section, this is a zero probability event.

[23]Of course, this payoff depends on the debtor characteristics Z as well, which we suppress.

[24]The expected payoff from filing under Chapter 13 is also endogenous in the model. As explained later in this section, the vector of endogenous events therefore implicitly takes into account the fact that all debtors in our sample have chosen to file under that chapter.

Although the choice of plan length is deterministic for the debtor, it is probabilistic from our view since we do not have the same information the debtor has. A debtor's health or educational status, for instance, may affect the probability of a plan being confirmed, which in turn affects the choice of plan length. To reconcile any potential discrepancy between the model's predictions and observed plan length choices, we allow for the fact that the debtor evaluates the probability $\Pr(C = 1|L)$ of confirmation of the proposed plan L using information that is unavailable to us. We let ε_L denote a multiplicative error term that lets us differentiate between the debtors' probability assessment of initial plan confirmation and the analogous evaluation made by us. Hence, the true conditional probability of confirmation is given by

$$\Pr(C = 1|L, \varepsilon_L) = Q(C = 1|L)\varepsilon_L, \tag{4}$$

where $Q(C = 1|L)$ reflects our assessment of initial plan confirmation and is parameterized below. We assume that ε_L is distributed with a cumulative distribution function $G(\varepsilon_L|L)$ with support $\mathcal{E}_L$. (The fact that the probability of confirmation lies in $[0, 1]$ imposes restrictions on $\mathcal{E}_L$. We discuss these restrictions explicitly in the next section.) Although the debtor's estimate of the confirmation probability of his proposed plan uses more information than is available to us, there is no *a priori* reason why our estimate of $\Pr(C = 1|L)$ should be biased. Therefore, we require that $\mathbb{E}(\varepsilon_L) = 1$ $\forall L$, which immediately implies that

$$\Pr(C = 1|L) = \mathbb{E}[\Pr(C = 1|L, \varepsilon_L)] = Q(C = 1|L). \tag{5}$$

From (2) and (5), it follows that

$$
\begin{aligned}
Q(C = 1|\widehat{L})\varepsilon_{\widehat{L}}V(\widehat{L}) + (1 - Q(C = 1|\widehat{L}))\varepsilon_{\widehat{L}}\overline{V}(Z) \\
\geq \ Q(C = 1|L)\varepsilon_L V(L) \ + \ (1 - Q(C = 1|L)\varepsilon_L)\overline{V}(Z)
\end{aligned} \tag{6}
$$

for all $L \neq \widehat{L}$. Since this is trivially satisfied when $L = \widehat{L}$. There are three cases to consider:

(i) If $V(\widehat{L}) < \overline{V}(Z)$, then $\Pr(\widehat{L}) = 0$. This is because the expected payoff $V(\widehat{L})$ from filing under Chapter 13 is endogenous in the model, and for the debtor to be observed in the data set, we must have $V(\widehat{L}) \geq \overline{V}(Z)$.

(ii) If $V(L) < \overline{V}(Z)$ and $V(\widehat{L}) \geq \overline{V}(Z)$, the left-hand side of (6) is at least as large as $\overline{V}(Z)$ and the right-hand side of (6) is less than $\overline{V}(Z)$. Thus (6) is always satisfied regardless of $\varepsilon_{\widehat{L}}$ and ε_L, implying $\Pr(\widehat{L}) = 1$.

(iii) If $V(L) \geq \overline{V}(Z)$, then (6) implies that

$$
\begin{aligned}
\Pr(\widehat{L}|\varepsilon_{\widehat{L}}) &= \Pr\left(\varepsilon_L \leq \left.\frac{Q(C = 1|\widehat{L})\varepsilon_{\widehat{L}}(V(\widehat{L}) - \overline{V}(Z))}{Q(C = 1|L)(V(L) - \overline{V}(Z))}\right| \varepsilon_{\widehat{L}}\right), \\
&= G\left(\left.\frac{Q(C = 1|\widehat{L})\varepsilon_{\widehat{L}}(V(\widehat{L}) - \overline{V}(Z))}{Q(C = 1|L)(V(L) - \overline{V}(Z))}\right| L\right),
\end{aligned} \tag{7}
$$

and therefore

$$\Pr(\widehat{L}) = \int_{\mathcal{E}_{\widehat{L}}} G\left(\left.\frac{Q(C = 1|\widehat{L})\varepsilon_{\widehat{L}}(V(\widehat{L}) - \overline{V}(Z))}{Q(C = 1|L)(V(L) - \overline{V}(Z))}\right| L\right) dG(\varepsilon_{\widehat{L}}|\widehat{L}). \tag{8}$$

This completes the derivation of $\Pr(C|\widehat{L})$ and $\Pr(\widehat{L})$, the first two terms on the right-hand side

of (3). We now turn to the derivation of the last term, i.e., the derivation of $\Pr(P, D|C, \widehat{L})$, making use of the discussion in Section 5.1.

First, consider the case when $C = 0$. In this case, we have

$$\Pr(P, D|C = 0, \widehat{L}) = \begin{cases} 1 & \text{if } P = 0 \text{ and } D = 0, \\ 0 & \text{otherwise.} \end{cases} \tag{9}$$

Next, consider the case $C = 1$. Note that, in this case, the payment P and the discharge outcome D depend on the realization of the random variables η and τ. Since we do not observe the realization of these variables, we integrate them out:

$$\Pr(P, D|C = 1, \widehat{L}) = \mathbb{E}_{\eta,\tau}\{\Pr(P, D|C = 1, \widehat{L}, \eta, \tau)\}. \tag{10}$$

When $C = 1$ and $D = 0$, there are two possibilities. Either $S = 1$, which happens with probability $\Pr(S = 1|\widehat{L}, \eta, \tau)$, or $S = 0$ and $E = 1$, which happens with probability $\Pr(S = 0|\widehat{L}, \eta, \tau)$ when

$$- \min\{X\tau + (X + \eta)(\widehat{L} - \tau), B\} < -X\tau + \overline{V}(Z'). \tag{11}$$

Although we do not observe S and E per se, in both of these cases, we must have $P = X\tau$ and $D = 0$. Since we know the excess income X, observing the total payment P allows us to infer the realized value of τ. Substituting it in (11), we obtain

$$\Pr(P, D = 0|C = 1, \widehat{L}) = f_\tau\left(\frac{P}{X}\right)\frac{B}{X}\mathbb{E}_\eta\left\{\Pr(S = 1|\widehat{L}, \eta, \frac{P}{X})\right.$$
$$\left. + \Pr(S = 0|\widehat{L}, \eta, \frac{P}{X})1\left(-\min\{P + (X + \eta)(\widehat{L} - \frac{P}{X}), B\} < -P + \overline{V}(Z')\right)\right\}. \tag{12}$$

where f_τ denotes the density function of τ and $1(.)$ is an indicator function that takes the value 1 when the statement in parentheses is true.[25]

Finally, when $C = 1$ and $D = 1$, we must have $S = 0$ and $E = 0$, which happens with probability $\Pr(S = 0|\widehat{L}, \eta, \tau)$ when

$$- \min\{X\tau + (X + \eta)(\widehat{L} - \tau), B\} \geq -X\tau + \overline{V}(Z'). \tag{13}$$

In this case, we observe full debt repayment if and only if $X\tau + (X + \eta)(\widehat{L} - \tau) \geq B$ or, alternatively, $\eta \geq \frac{B - X\widehat{L}}{(\widehat{L} - \tau)}$. Therefore,

$$\Pr(P = B, D = 1|C = 1, \widehat{L}) = \mathbb{E}_{\eta,\tau}\left\{\Pr(S = 0|\widehat{L}, \eta, \tau)\right.$$
$$\left. 1\left(-\min\{X\tau + (X + \eta)(\widehat{L} - \tau), B\} \geq -X\tau + \overline{V}(Z')\right)\middle|\eta \geq \frac{B - X\widehat{L}}{(\widehat{L} - \tau)}\right\}. \tag{14}$$

By contrast, when we observe less than full payment, i.e., for $P < B$, we must have $P = X\tau + (X + \eta)(\widehat{L} - \tau)$ and consequently $\eta = \frac{P - X\widehat{L}}{\widehat{L} - \tau}$. Therefore, for $P < B$, we have

---

[25] Note that, as discussed earlier, Z' depends on η and τ.

$$\Pr(P, D = 1 | C = 1, \widehat{L}) = \mathbb{E}_\tau \left\{ f_\eta \left(\frac{P - X\widehat{L}}{(\widehat{L} - \tau)} \right) \frac{1}{(\widehat{L} - \tau)} \right. $$
$$\left. \left[1 - \Pr(S = 0 | \widehat{L}, \frac{P - X\widehat{L}}{(\widehat{L} - \tau)}, \tau) \right] 1 \left(P \geq -X\tau + \overline{V}(Z') \right) \right\}. \tag{15}$$

6.2   Parametrization

In order to maximize the likelihood function (3), several objects must first be parameterized, taking into account the restrictions implied by both our model and the econometric specification. These objects relate to the conditional probability of initial plan confirmation, $Q(C|L, Z)$, the probability of dismissal after the shocks η and τ are realized, $\Pr(S = 1|L, \eta, \tau, Z)$, the payoff associated with options outside Chapter 13, $\overline{V}(Z)$, the density functions that govern the shocks η and τ, $f_\eta(\eta|L, Z)$ and $f_\tau(\tau|L, Z)$, respectively, and the distribution of ε_L, $G(\varepsilon_L|L, Z)$.

We assume $Q(C|L, Z)$ is specified as a logistic function:

$$Q(C = 1 | L; Z) = \frac{e^{q(L,Z)}}{1 + e^{q(L,Z)}}, \tag{16}$$

where

$$
\begin{aligned}
q(L, Z) = {} & \beta_0^c + \beta_1^c L + \beta_2^c ratio\_asset\_debt + \beta_3^c ratio\_arrears\_debt + \beta_4^c ratio\_rent\_mortgage\_inc \\
& + \beta_5^c medical\_debt + \beta_6^c job\_tenure + \beta_7^c inc\_above\_med + \beta_8^c repeat\_filer \\
& + \beta_9^c attorney\_exp + \beta_{10}^c p\_recovery\_rate,
\end{aligned}
$$

and the β_i^C's are parameters to be estimated.[26]

We next discuss the parametrization of $G(\varepsilon_L|L, Z)$. We assume $G(\varepsilon_L|L, Z)$ is specified by a power distribution, i.e.,

$$G(\varepsilon_L|L, Z) = [\varepsilon_L Q(C = 1|L, Z)]^{\varphi(L,Z)}. \tag{17}$$

for $\varepsilon_L \in \mathcal{E}_L$. To ensure that the conditional probability $P(C = 1|L, Z)$ of plan confirmation lies in $[0, 1]$, the support of ε_L must be bounded. In addition, recall that we assume $E(\varepsilon_L) = 1 \ \forall L$. Thus, we require that $\mathcal{E}_L = [0, \frac{1}{Q(C=1|L,Z)}]$ and $\varphi(L, Z) = \frac{Q(C=1|L,Z)}{[1-Q(C=1|L,Z)]}$. These restrictions, therefore, tie down both the shape and the support of $G(\varepsilon_L|L, Z)$.

We assume $\Pr(S = 1|L, \eta, \tau, Z)$ is also specified as a logistic function,

$$\Pr(S = 1|L, \eta, \tau, Z) = \frac{e^{d(L,Z,\eta,\tau)}}{1 + e^{d(L,Z,\eta,\tau)}}, \tag{18}$$

---

[26] All the observed variables are defined in Table 4.

where

$$
\begin{aligned}
d(L, Z, \eta, \tau) \;=\; & \beta_0^d + \beta_1^d L + \beta_2^d ratio\_asset\_debt + \beta_3^d ratio\_arrears\_debt + \beta_4^d ratio\_rent\_mortgage\_inc \\
+ \; & \beta_5^d medical\_debt + \beta_6^d job\_tenure + \beta_7^d inc\_above\_med + \beta_8^d repeat\_filer \\
+ \; & \beta_9^d attorney\_exp + \beta_{10}^d discharge\_recovery\_rate \\
+ \; & \beta_{11}^d dismiss\_recovery\_rate + \beta_{12}^d \eta + \beta_{13}^d \tau.
\end{aligned}
$$

We estimate the payoff associated with options that do not involve Chapter 13 as

$$
\overline{V}(Z) = \beta_1^D arrears + \beta_2^D unsecured\_debt + \beta_3^D assets. \tag{19}
$$

This specification allows for the possibility that debtors' payoff outside Chapter 13 decreases with both the amount of debt they carry and the amount of assets that would have otherwise been protected under Chapter 13.

We assume that τ has a power distribution with density

$$
f_\tau(\tau | L, Z) = \frac{\beta_L^\tau \tau^{\beta_L^\tau - 1}}{L^\beta} \text{ for } \tau \in [0, L]. \tag{20}
$$

Finally, we assume η is normally distributed with density

$$
f_\eta(\eta | L, Z) = \frac{1}{\sqrt{2\pi \left(\beta_{1,L}^\eta\right)^2}} \exp\left(-\frac{(\eta - \beta_{0,L}^\eta)^2}{2(\beta_{1,L}^\eta)^2}\right). \tag{21}
$$

The family of distribution functions we choose has enough flexibility to capture any potential effects of a debtor's plan length choice and characteristics on the likelihood that his case will be confirmed and discharged, as well as the determination of his implied recovery rate.

7   Results

Tables 5, 6, and 7 present the maximum likelihood estimates of the model's parameters. Specifically, Table 5 presents the maximum likelihood estimates of the parameters of the confirmation probability $Q(C = 1 | L, Z)$ given by (16), Table 6 presents the estimates of the parameters of the dismissal probability $\Pr(S = 1 | L, \eta, \tau, Z)$ given by equation (18), and Table 7 presents the estimates of the parameters of the outside payoff $\overline{V}(Z)$ given by (19), the distribution of the shock η given by (21), and the distribution of its timing τ given by (20).

These estimates allow us to directly answer two questions of interest. First, what debtor characteristics significantly influence the likelihood that a Chapter 13 bankruptcy plan will be confirmed by the bankruptcy court? In a related vein, do these characteristics still matter at a later bankruptcy stage as the debtor's circumstances have changed and the trustee reevaluates the plan? With the answers to these questions, we can indirectly infer how particular debtor attributes affect creditor recovery rates.

Table 5 indicates that, all else equal, long-term plans are more likely to be initially approved by the trustee than are short-term plans. Longer plans typically imply higher proposed recovery rates in our sample. Even after controlling for the proposed recovery rate, the probability of a proposed plan being confirmed is higher when the proposed plan length is longer. In addition, as can be seen from Table 6, longer plans make it less likely that the plan will be dismissed later on in the

16

bankruptcy.

Recall that a Chapter 13 plan must propose to pay all arrears in order for a plan to be confirmed and must be able to pay them all in order to be discharged. As a result, having considerable arrears in relation to total debt in default decreases the confirmation probability and increases the dismissal probability.

Having a high housing expense relative to monthly income decreases the confirmation probability and increases the dismissal probability. This is consistent with our conversations with the Chapter 13 Trustee for the District of Delaware, who emphasized the importance of fairness and feasibility as the most important criteria for confirming plans and allowing them to continue. Recall that the bankruptcy law requires the debtors to pay all of their excess income to the Chapter 13 plan, and excess income is calculated after taking out all expenses, including the housing expense. A high housing expense relative to monthly income may be viewed as a luxurious consumption at the expense of creditors and thus not fair. In addition, a high housing expense makes the debtor more vulnerable to negative shocks to excess income, making it more difficult for him to pay the arrears in full and therefore less likely to pass the feasibility test.

A longer job tenure suggests some degree of stability in the debtor's financial situation. As a result, the plan is more likely to be feasible when the debtor has a longer job tenure. Consistent with this, longer job tenure increases the probability that the trustee will confirm the plan and decreases the dismissal probability.

The fact that a debtor is a repeat filer decreases the probability that his plan will be confirmed. There are two main reasons for why a debtor might be a repeat filer. First, a debtor whose case is not initially confirmed has little chance of seeing his financial situation improve without outside help and, by law, he must wait at least 180 days before attempting a new filing. A repeat filer, therefore, could simply be someone who is unable to extricate himself from a dire financial situation on his own. Second, a repeat filer might be someone who abuses the bankruptcy system by periodically filing for bankruptcy and discharging his debt. One would think that a debtor who is in the first category is more likely to file for bankruptcy as soon as that option becomes available to him, whereas a debtor in the second category is more likely to strategically acquire debt first and delay bankruptcy filing. In our data set, 88% of repeat filers had their previous filings around 180 days prior to the current bankruptcy filing and hence fall in the first category. For the rest of the filers, we are unable to identify the reasons for their repeat filing behavior. It is possible that the same nonstrategic cause (for example, health problems) is the reason for multiple bankruptcy filings. Although we do not observe the cause for the repeat filing, the trustee has access to much more information. Regardless of the cause, being a repeat filer reduces the likelihood of confirmation. One possibility is that debtors in the first category are unlikely to propose feasible plans, whereas debtors in the second category are unlikely to propose fair plans.

Having an experienced attorney helps to have a plan confirmed, but it also increases the probability of dismissal after the debtor's financial situation changes. Recall that we measure attorney experience by the number of cases in the sample associated with the attorney representing the debtor. One would expect that more experienced attorneys have higher demand for their services and better bargaining power regarding their fee structure. In the U.S. Bankruptcy Court for the District of Delaware, the fee charged by an attorney for a Chapter 13 case must be approved by the bankruptcy court. The structure of the fee, however, is not defined by the law. In particular, the attorneys can ask to be paid prior to or after filing the case and can stipulate whether the fee is to be paid directly by the debtor or by the Chapter 13 trustee. The court then approves a fee it finds to be reasonable. If more experienced attorneys charge fees that are mostly front-loaded, then they may prefer to devote less of their time to cases that are already confirmed and have less time to

finish, since less fees can then be collected. As such, it is not surprising that having an experienced attorney is helpful initially but may backfire later on in the case.

Notably, Table 6 also indicates that the trustee puts significant weight on information regarding changes in the debtor's conditions after initial confirmation of his plan. The likelihood of dismissal falls with τ, since the longer a debtor has stuck by his initial plan before facing a change in circumstances, the more he has already contributed to this plan. Similarly, the likelihood of dismissal falls with η, since increases in excess disposable income raise creditors' recovery rate.

The parameters governing the distributions of η and τ are reported in Table 7 and are all statistically significant at the 1% level. We estimate that, on average, debtors who file for short-term plans are less likely to experience a negative shock to their excess incomes during bankruptcy, although the variation in experiences for those debtors is considerable. Specifically, the excess income of debtors with short-term plans reduces by $464 while the excess income of debtors with long-term plans reduces by $704, on average. While these amounts are small, they do not imply that the actual recovery rate will be close to the proposed recovery rate. The standard deviation of η conditional on a short-term plan is $3,217, while the standard deviation conditional on a long-term plan is $3,395; as a result, there is considerable variation in shocks to excess income. Many debtors for whom there is a substantial negative shock to excess income see their plans dismissed by the trustee in the second stage. Thus, for those debtors, the recovery rate is in fact close to zero.

Finally, Table 7 indicates that the payoff obtained outside Chapter 13 decreases with the updated level of arrears and assets held at the time of exit, while it does not depend on the level of unsecured debt at the time of exit. This is because once a filer is no longer eligible under Chapter 13, his assets are no longer protected and thus secured creditors can seize property to recover what they are owed. Secured creditors are more likely to aggressively seek a filer's assets when the assets are more valuable and the secured debt (i.e., arrears) is higher. By contrast, unsecured creditors have little power outside the bankruptcy system.

7.1 Effects of Debtor Characteristics on the Distribution of Recovery Rates

The second question of interest in this section relates to the effects of specific debtor characteristics on Chapter 13 outcomes and, in particular, on the distribution of creditor recovery rates.[27] For example, given that we have identified being a repeat filer as a significant variable in the trustee's confirmation and dismissal decisions, what are the implications for the distribution of recovery rates? In answering this question, the lens provided by the particular model at hand is crucial since the distribution of the recovery rates depends not only on the exogenous characteristics of debtors, but also on the endogenous decisions they make. The model allows us to create a data set of artificial debtors that resembles the raw data in all dimensions but one, say, being a repeat filer, by bootstrapping from observed debtor characteristics (outside of being a repeat filer). Having created these artificial debtors, we can then explore, using the estimated model, how the distribution of recovery rates changes depending on whether, in addition, these debtors are assumed to be repeat filers.[28]

Figure 5, panel a, illustrates how the distribution of creditor recovery rates changes depending on one's experience with bankruptcy. We can see that repeat filers are generally associated with lower recovery rates, with 50% of debtors repaying between 0% to 20% of their debt. In contrast,

---

[27]In our model and in our empirical specification, we focused on the payment P. We present our results below in terms of the recovery rates to make them comparable across debtors with different levels of debt.

[28]See Diermeier, Eraslan, and Merlo (2003) for alternative applications of this procedure in a political economy context and in a Chapter 11 bankruptcy environment, respectively.

only 41% of debtors are associated with the lowest recovery rates among first-time filers. More generally, creditors recover 38% of what they are owed on average from first-time filers, but only 31% from repeat filers. Similarly, Figure 5, panel b, depicts changes in the distribution of recovery rates depending on the amount of arrears debtors hold as a fraction of their total debt in default. Debtors for whom arrears constitute 25% of their debt (arrears being equal to 25% of debt corresponds to the 25th percentile in the raw data) are associated with a 35% average recovery rate, and 44% of those debtors repay between 0% and 20% of their debt. In contrast, when debtors hold arrears equal to 69% of their debt (arrears being equal to 69% of debt corresponds to the 75th percentile in the raw data), the average recovery rate falls to 25%, while the measure of debtors repaying less than 20% increases by 16 percentage points.[29] Finally, Figure 5, panel c, illustrates the extent to which the distribution of recovery rates changes conditional on debtors having a given ratio of excess (annual) income to debt. This measure essentially determines what debtors can potentially repay depending on the plan length they choose. Debtors in the lowest 25th percentile, those with excess income representing 8% of their debt, repay 23% of what they owe on average. Debtors in the highest 25th percentile, those whose excess income represents 19% of their debt, are associated with a significantly higher 42% average recovery rate.[30]

Figure 6 provides lower and upper bounds in terms of what creditors can expect to recover in Chapter 13 by considering extreme debtor types based on the experiments carried out in Figure 5. The distribution of recovery rates related to "bad types" conditions on being a repeat filer, having high arrears, and having low excess income relative to debt. This "worst case" scenario generates an average recovery rate of only 15%, with a substantial 74% of debtors repaying less than 20% of their debt and only 3% repaying more than 80%. At the other extreme, the distribution of recovery rates for "good types" is conditional on being a first-time filer, having low arrears, and having high excess income relative to debt. This distribution is associated with a much higher 51% average recovery rate, with only 31% of the debtors repaying between 0% and 20% of their debt and 34% of debtors repaying at least 80%.

7.2 Importance of Shocks in Bankruptcy

We saw in Table 6 that the shock η and its timing τ play a significant role in the trustee's reevaluation of previously confirmed cases. To quantify their importance, we provide in Table 8 a comparison of Chapter 13 outcomes between our benchmark model and the model estimated without latent variables η and τ. In the absence of shocks after a plan confirmation, we find that debtors are less willing to commit to long-term plans. Debtors with unfavorable characteristics tend to file for longer plans to increase their chances of confirmation and decrease the probability of dismissal. However, with the elimination of the dismissal process later in the plan, fewer debtors feel the need to file for long plans. The confirmation rate stays unchanged even if the ratio of debtors who file for longer plans declines. The reason is that the composition of debtor characteristics conditional on plan length is different compared to the benchmark model. Without shocks, the negative effect on confirmation rates coming from the fact that fewer debtors file for long plans counteracts the

---

[29]More specifically, we first calculate the 25th percentile and the 75th percentile of the distribution for the ratio of arrears to debt in default. We then bootstrap a data set of artificial debtors from the raw data such that all characteristics of debtors resemble the raw data while the values for the ratio of arrears to debt is set to the 25th percentile of the distribution in the raw data. Next, we repeat this procedure and construct another data set of artificial debtors, where the values for the ratio of arrears to debt are set to the 75th percentile of the distribution in the raw data.

[30]The method for constructing the data with artificial debtors is similar to that used in creating Figure 5, panels a and b.

positive effect resulting from the more favorable characteristics of short-plan filers. Furthermore, without being affected by changing circumstances while in bankruptcy, all debtors with confirmed plans are eventually discharged. We find that 81% of debtors in our sample are discharged absent shocks as opposed to only 46% in the benchmark model. Furthermore, absent any income shocks, debtors are able to repay on average 48% of their debt as opposed to 29% in the benchmark model. This finding arises, because without shocks, all plans are carried out to completion. Therefore, aside from debtor characteristics that are observable at the time of filing, changes in debtors' conditions after the start of a bankruptcy procedure play a key role in governing Chapter 13 outcomes.

7.3   Goodness of Fit

In order to gauge the fit of our model, we present figures that compare its predictions for the distributions of endogenous variables with the analogous empirical distributions in the data. Each figure focuses on a key aspect of Chapter 13 bankruptcy: the distribution of plan length chosen by debtors, the confirmation rate, the discharge rate, and the distribution of recovery rates. We assess how well our model fits the data using Pearson's χ^2 test,

$$N \sum_{j=1}^{K} \frac{\left[f(j) - \widehat{f}(j)\right]}{f(j)} \sim \chi^2_{K-1},$$

where $f(.)$ denotes the empirical density function, or histogram, of a given endogenous variable and $\widehat{f}(.)$ is the corresponding maximum likelihood estimate of the density function of that variable. N is the number of observations, and K is the number of bins used in the histogram.

Figure 7, panel a, shows a comparison of the distribution of plan length chosen by debtors generated by the model (left columns) with the corresponding distribution in the data (right columns). As indicated in the figure, the χ^2 goodness-of-fit test does not reject the model at conventional significance levels. Panels b and c of Figure 7 illustrate similar comparisons with respect to the confirmation rate and the discharge rate. In both cases, the model is capable of reproducing the empirical distributions quite well, and the χ^2 goodness-of-fit tests cannot reject the model at conventional significance levels. Finally, we can see from Figure 7, panel d, that the shape of the distribution of recovery rates produced by the model closely matches that of the corresponding empirical distribution. The model slightly under-predicts the fraction of debtors associated with relatively higher recovery rates, which implies a slightly lower average recovery rate than observed in the data. As in the other cases, however, the χ^2 goodness-of-fit test does not reject the model at standard significance levels.

8   Policy Analysis

Recent changes in the bankruptcy law embodied in BAPCPA were primarily intended to raise creditor recovery rates for subsets of debtors perceived to be benefiting from too lenient a bankruptcy code. One such change now prohibits all debtors with income above the state median from filing for short-term plans. Specifically, the law states that "the applicable commitment period shall be (...) not less than five years, if the current monthly income of the debtor and the debtor's spouse combined, when multiplied by 12, is not less than (...) the median family income of the applicable state."[31] Using the structural model we estimated, we now explore the quantitative effects of such

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[31]See 11 U.S.C § 1325(b)(4)(A)(ii).

a change on Chapter 13 outcomes.

8.1   Requiring Five-Year Plans for Above-Median-Income Debtors

Table 9 summarizes the effects of requiring debtors with above-state-median-income to file for five-year plans. Note that, following the policy change, debtors who had initially filed for three-term plans, but who no longer have that option, may well decide not to file Chapter 13 altogether, rather than filing for Chapter 13 and proposing a five-year plan. Put another way, and recalling equation (1), debtors for whom $V(L) \geq \overline{V}(Z)$ when $L = 3$ in the benchmark model may well have $V(L) < \overline{V}(Z)$ when $L = 5$ if forced to make the higher payments implied by a five-year plan. We find that this effect is somewhat muted in this policy experiment, as only 1% of above-median-income debtors choose to exit Chapter 13 following the policy change.

Interestingly, for the set of debtors targeted by the policy change, the main finding is a minimal increase in creditor recovery rates without considerably changing the discharge and confirmation rates. In other words, requiring the above-median-income debtors to file for five-year plans makes neither a financial fresh start more likely for that subset of debtors nor the creditors materially better off. At first look, it is puzzling that the confirmation rates and the discharge rates go down when these debtors are required to file five-year plans in light of our estimation results, which indicate that five-year plans are more likely to be confirmed and less likely to be dismissed. However, two additional effects need to be taken into consideration. First, the debtors who opt out of Chapter 13 as a result of this policy are likely to be the ones who are in better financial condition and therefore, more likely to have confirmed plans prior to the implementation of the new policy. Once these debtors drop out of Chapter 13, confirmation rates go down. Second, the debtors who file for five-year plans are more likely to receive negative shocks to their excess income, making dismissal more likely, and therefore discharge less likely.

We should also note that, although the policy change lowers the Chapter 13 filing rate by 1% for above-median-income debtors, the outcomes in the overall sample are not materially affected. This follows from the fact that debtors whose income exceeds the state median represent only 23% of the filers in our sample.

An important consideration under this policy provision is that, while more debtors are being pushed into five-year plans, the analysis assumes that their other characteristics remain unchanged. This simplifying assumption reflects a limitation of our data. As a direction for future research, it would be ideal to sample the general population and, given this sample, consider both bankruptcy and chapter choices explicitly.[32]

8.2   Imposing a Minimum Proposed Recovery Threshold

Because the BAPCPA policy change targeted at above-median-income debtors proved ineffective in raising their recovery rates, we explore an alternative policy experiment that instead requires these debtors to propose at least a 30% recovery rate in order to have their plan confirmed by the court. In other words, we impose that all debtors with above-state-median-income propose at least the observed mean recovery rate in our sample.

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[32] For now, this more challenging exercise remains beyond the scope of this paper. While some existing data sets such as the Survey of Consumer Finances, the Panel Study of Income Dynamics, and the National Longitudinal Survey of Young Men provide us with financial and income statements pertaining to the general U.S. population, the challenge lies in the collection of data on bankruptcy filers, and more precisely Chapter 7 and Chapter 13 filers separately, within that general population, as well as the resolution of their respective bankruptcy cases. For this reason, the different policy experiments in this paper are conditional on the observed distribution of the debtor characteristics.

Table 10 suggests that, when confronted with this alternative policy change, a considerable fraction of debtors (13%) now find it optimal not to file under Chapter 13 in the first place. Accordingly, substantially fewer debtors ultimately obtain a financial fresh start under Chapter 13; the discharge rate falls, from 0.48 to 0.41, for this group of affected filers.

The average creditor recovery rate under this policy experiment falls slightly, from 0.31 to 0.29, for the affected debtors. The latter result can be understood in the following way. First, above-state-median-income debtors who were already proposing to repay at least 30 cents on the dollar see their fate (confirmation, discharge, and repayment rates) essentially unchanged by the new policy. Hence, any effect of the policy change on bankruptcy outcomes must come from debtors who were initially proposing less than a 30% recovery rate. Second, the latter debtors are precisely those associated with low Chapter 13 recovery rates in the benchmark model; they tend to have high levels of arrears and high levels of debt more generally (and therefore low ratios of excess income to debt). Consequently, the fact that they are now opting out of Chapter 13 and are assigned zero (rather than small but positive) recovery rates, has very little effect on overall repayment rates. Stated differently, the analysis suggests that debtors associated with low proposed recovery rates simply opt out of Chapter 13 if required to propose a higher recovery rate. However, since these debtors repay very little in the benchmark model, recovery rates for the overall targeted population are left virtually unchanged. In the end, the model suggests that the hypothetical minimum recovery rate policy studied here makes it more difficult for debtors to obtain a financial fresh start without necessarily increasing creditor recovery rates.

8.3   Implications for Overall Recovery Rates

Thus far, our policy experiments have tracked bankruptcy outcomes, and in particular creditor recovery rates, within Chapter 13 bankruptcy only. In computing recovery rates, therefore, we did not particularly focus on debtors who wound up outside Chapter 13 for one reason or another. For some policy experiments, this is not necessarily a problem since the fraction of debtors who opt out of Chapter 13 following a given policy change is small, as in the case of BAPCPA. In other cases, however, as in the experiment that imposes a minimum proposed recovery threshold to obtain confirmation of a case, the fraction of debtors who chose not to file for Chapter 13 is sizable. In addition, recall that some debtors are also dismissed out of Chapter 13 at a later bankruptcy stage. In such cases, debtors may be able to file under Chapter 7 or simply default on their loans. Since our focus in this paper is on Chapter 13, we model the payoff outside Chapter 13 as an indirect utility.

A question remains as to how overall recovery rates are affected by the recovery rates outside Chapter 13. To be able to answer this question, we would need to model what happens outside Chapter 13. Unfortunately, we do not have the data to be able to estimate such a richer model, and to the best of our knowledge, such micro data is not available. At a more aggregated level, Flynn, Bermant, and Hazard (2002) document that during the year ended June 30, 2002, in approximately 96% of Chapter 7 filings, the case closed without any funds being collected by the trustee and distributed to creditors. In general, studies report a 0% average return to creditors from Chapter 7 filers. Indeed, this is what motivated BAPCPA to push debtors into Chapter 13 in the first place.

Taking into account the possibility that the debtors in our data set can be in better financial shape than those debtors considered in the above statistics, Table 11 presents overall recovery rate calculations based on the assumption that debtors outside Chapter 13 repay either 10% or 20% of their debts. The table considers the experiment where above-state-median-income debtors must propose at least a 30% recovery rate in order to have their case confirmed by the court. Recall that

in contrast to the BAPCPA experiment we considered, this policy experiment was associated with a sizable fraction of debtors no longer choosing to file under Chapter 13. The benchmark model in Table 11 refers to the situation without the policy change, but is nevertheless relevant since, even in that case, some debtors are either dismissed by the trustee or voluntarily exit Chapter 13 after initial confirmation. As expected, overall recovery rates increase, both in the benchmark model and in the policy experiment, when debtors outside Chapter 13 repay positive amounts on their debts. This increase, however, remains somewhat contained, even at the extreme where debtors outside Chapter 13 repay 20 cents on the dollar. More importantly, as in Table 10, the policy change is unable to yield a substantive increase, and may even yield a decrease, relative to the higher recovery rates generated in the benchmark model. As before, this result is driven by the fact that debtors who opt out of Chapter 13 were repaying very little in the benchmark model.

9   Conclusion

From court dockets recorded in the state of Delaware between 2001 and 2002, we built and estimated a structural model of Chapter 13 bankruptcy. We find that several factors significantly affect the distribution of creditor recovery rates: whether debtors are first-time filers, their arrears at the time of filing, and their income in excess of that required for basic maintenance. The analysis further underscores the importance of changes in debtors' conditions while in bankruptcy in governing Chapter 13 outcomes, including debtors' ability to obtain a financial fresh start. Our model predicts that the more stringent provisions of Chapter 13 in BAPCPA, in particular those that force subsets of debtors to file for long-term plans, would not materially affect creditor recovery rates and would not make discharge materially more likely for that subset of debtors. The results are also true in the context of alternative policy experiments that required bankruptcy plans to meet stricter standards in order to be confirmed by the court.

The analysis has an important caveat. Because of data limitations, we do not model simultaneously households' bankruptcy and chapter choice decisions. At this point, the payoff that debtors achieve outside of Chapter 13 is captured by way of an estimated indirect utility. However, this modeling strategy precludes a more detailed study of policy reforms that directly target chapter choice decisions. We leave this work to future research.

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Table 1

DATA SUMMARY	
Total Filings	821
Terminated	821
Discharged	364
Dismissed	457
Converted to Chapter 7	52

Table 2

DESCRIPTIVE STATISTICS	Mean	Standard Deviation	Median	Min	Max
Assets ($)	117,739	98,797	104,000	295	1,239,220
Assets/debt	4.42	4.79	3.28	0.02	55.46
Arrears ($)	15,492	12,517	11,000	30.43	132,012
Arrears/debt	0.48	0.29	0.46	0.001	1
Unsecured debt ($)	25,767	42,289	14,737	0	642,642
Excess income ($)	4,550	3,425.7	3,708	600	34,932
Medical debt (if exceeds 10% of total debt)*	0.08	0.28	0	0	1
Job tenure (years)	4.91	7.61	1	0	40
Income above median*	0.23	0.42	0	0	1
Repeat filer*	0.24	0.42	0	0	1
Attorney experience* (number of cases)	94.05	51.67	108	0	165
Monthly rent or mortgage payments ($)	845.75	431.25	760	2.5	4,299
Monthly rent or mortgage payment/monthly income	0.31	0.13	0.29	0.0009	1.06

Note: * indicates dummy variables; zero attorney experience indicates that the filer did not hire an attorney.

Table 3

DESCRIPTIVE STATISTICS	
Fraction of Three-Year Plans*	0.16
Confirmation Rate	0.81
Discharge Rate	0.44
Recovery Rate for Total Debt	
Mean	0.29
Standard Deviation	0.34
Median	0.14
Proposed Recovery Rate for Total Debt	
Mean	0.66
Standard Deviation	0.4
Median	0.6

*Three-year plans are defined as plans less than or equal to 48 Months

Table 4

VARIABLE DEFINITIONS	
Variable	Definition
L	The debtor's choice of plan length: 3 or 5 years.
$ratio\_asset\_debt$	Total assets as a fraction of debt in default at the time of filing.
$ratio\_arrears\_debt$	Arrears accumulated on secured debt as a fraction of debt in default at the time of filing.
$ratio\_rent\_mortgage\_inc$	Monthly rent or mortgage payments as a fraction of monthly income.
$medical\_debt$	Whether medical debts exceed 10% of total debt in default.
job_tenure	The debtor's tenure in years in his current job. (If the debtor is unemployed, this variable is equal to zero.)
inc_above_med	Whether the debtor's most recent annual income at the time of filing is above the state median.
$repeat\_filer$	Whether the debtor has previously filed for bankruptcy.
$attorney\_exp$	Attorney experience in handling bankruptcy cases, measured as the in-sample frequency.
$eligible\_7$	Whether the debtor is eligible for Chapter 7 bankruptcy.
$p\_recovery\_rate$	The proposed recovery rate defined as total proposed payments over total debt in default.
$discharge\_recovery\_rate$	The recovery rate obtained upon discharge. It is calculated as total payments over total debt in default, conditional on the trustee not dismissing the debtor after the realization of shocks to excess income.
$dismiss\_recovery\_rate$	The recovery rate obtained upon dismissal. It is calculated as the ratio of total payments made by the debtor under the plan, prior to the realization of the shocks to excess income, to total debt in default.
η	Excess income shock.
τ	Timing of the excess income shock.

Table 5

MAXIMUM LIKELIHOOD ESTIMATES

Confirmation Probability, $Q(C|L, Z)$

Parameter	Estimate	Definition
β_0^c	0.079	constant.
	(0.391)	
β_1^c	0.471***	plan length.
	(0.071)	
β_2^c	-0.015	assets as a fraction of debt in default at the time of filing.
	(0.013)	
β_3^c	-1.696***	arrears accumulated on secured debt.
	(0.276)	
β_4^c	-1.042**	rent or mortgage payments as a fraction of monthly income.
	(0.492)	
β_5^c	0.011	whether medical debt exceeds 10% of total debt in default.
	(0.277)	
β_6^c	0.028***	job tenure.
	(0.01)	
β_7^c	0.237	whether the debtor's annual income is above the state median.
	(0.181)	
β_8^c	-0.388**	whether the debtor has previously filed for bankruptcy.
	(0.165)	
β_9^c	0.005***	attorney experience in handling bankruptcy cases.
	(0.001)	
β_{10}^c	0.083	proposed recovery rate.
	(0.140)	

* indicates statistical significance at the 10% level; ** indicates statistical significance at the 5% level; and *** indicates statistical significance at the 1% level.

Table 6

	MAXIMUM LIKELIHOOD ESTIMATES	
	Dismissal Probability, $\Pr(S = 1 | L, \eta, \tau, Z)$	
Parameter	Estimate	Definition
β_0^d	-2.366***	constant.
	(0.303)	
β_1^d	-0.291***	plan length.
	(0.044)	
β_2^d	0.065***	assets as a fraction of debt in default at the time of filing.
	(0.020)	
β_3^d	3.916***	arrears accumulated on secured debt.
	(0.447)	
β_4^d	4.046***	rent or mortgage payments as a fraction of monthly income.
	(0.830)	
β_5^d	-6.326***	whether medical debt exceeds 10% of total debt in default.
	(1.845)	
β_6^d	-0.019***	job tenure.
	(0.007)	
β_7^d	-0.814***	whether the debtor's annual income is above the state median.
	(0.263)	
β_8^d	1.458***	whether the debtor has previously filed for bankruptcy.
	(0.287)	
β_9^d	0.006***	attorney experience in handling bankruptcy cases.
	(0.002)	
β_{10}^d	0.006	recovery rates to be obtained upon discharge.
	(0.007)	
β_{11}^d	-0.856**	recovery rates to be obtained upon dismissal.
	(0.376)	
β_{12}^d	-0.980***	dollar amount of the shock to excess income.
	(0.337)	
β_{13}^d	-1.078***	timing of the shock to excess income.
	(0.090)	

* indicates statistical significance at the 10% level; ** indicates statistical significance at the 5% level; and *** indicates statistical significance at the 1% level.

Table 7

MAXIMUM LIKELIHOOD ESTIMATES

Parameter	Estimate	Definition
Utility from Dismissal		
β_1^D	-5.875**	arrears accumulated on secured debt.
	(2.463)	
β_2^D	-4.470***	assets.
	(1.662)	
β_3^D	-0.669	unsecured debt.
	(0.427)	
$f_\tau(\tau\|L)$		
β_3^τ	0.546***	parameter of the distribution of τ when proposed pay length is 3.
	(0.027)	
β_5^τ	0.315***	parameter of the distribution of τ when proposed pay length is 5.
	(0.014)	
$f_\eta(\eta\|L)$		
$\beta_{0,3}^\eta$	-464.039***	mean of the distribution of η when proposed pay length is 3.
	(31.036)	
$\beta_{1,3}^\eta$	3217.090***	standard deviation of the distribution of η when proposed pay length is 3.
	(81.360)	
$\beta_{0,5}^\eta$	-703.762***	mean of the distribution of η when proposed pay length is 5.
	(20.572)	
$\beta_{1,5}^\eta$	3395.419***	standard deviation of the distribution of η when proposed pay length is 5.
	(47.959)	

* indicates statistical significance at the 10% level; ** indicates statistical significance at the 5% level; and *** indicates statistical significance at the 1% level.

Table 8

EFFECTS OF CHANGES IN DEBTORS' CONDITIONS

	Model	Model Without η and τ
Whole Sample		
Plan Length		
Fraction Proposing $L = 3$	0.22	0.32
Fraction Proposing $L = 5$	0.78	0.68
Confirmation Rate	0.81	0.81
Discharge Rate	0.42	0.81
Mean Recovery Rate	0.29	0.48

Table 9

IMPLEMENTING BAPCPA-REQUIRED 5-YEAR PLANS		
	Benchmark Model	Experiment
Above-Median-Income Debtors		
Fractions No Longer Filing	0	0.01
Plan Length		
Fraction Proposing $L = 3$	0.24	0.00
Fraction Proposing $L = 5$	0.76	1.00
Confirmation Rate	0.85	0.84
Discharge Rate	0.48	0.47
Mean Recovery Rate	0.31	0.33
Whole Sample		
Confirmation Rate	0.82	0.82
Discharge Rate	0.42	0.41
Mean Recovery Rate	0.28	0.29

Table 10

IMPOSING A 30% RECOVERY RATE THRESHOLD		
	Benchmark Model	Experiment
Above-Median-Income Debtors		
Fraction No Longer Filing	0	0.13
Plan Length		
Fraction Proposing $L = 3$	0.24	0.14
Fraction Proposing $L = 5$	0.76	0.73
Confirmation Rate	0.85	0.73
Discharge Rate	0.48	0.41
Mean Recovery Rate	0.31	0.29
Whole Sample		
Confirmation Rate	0.82	0.80
Discharge Rate	0.42	0.40
Mean Recovery Rate	0.28	0.27

Table 11

	Outside Recovery Rate: *0.10*		Outside Recovery Rate: *0.20*	
IMPOSING A 30% RECOVERY RATE THRESHOLD	Benchmark Model	Experiment	Benchmark Model	Experiment
Above-Median-Income Debtors				
Fraction No Longer Filing	0	0.13	0	0.13
Initial Dismissal Rate	0.15	0.14	0.15	0.14
Dismissed after Confirmation	0.37	0.32	0.37	0.32
Mean Recovery Rate				
Under Chapter 13	0.31	0.29	0.31	0.29
Overall	0.35	0.35	0.40	0.40
Whole Sample				
Mean Recovery Rate	0.34	0.33	0.39	0.39
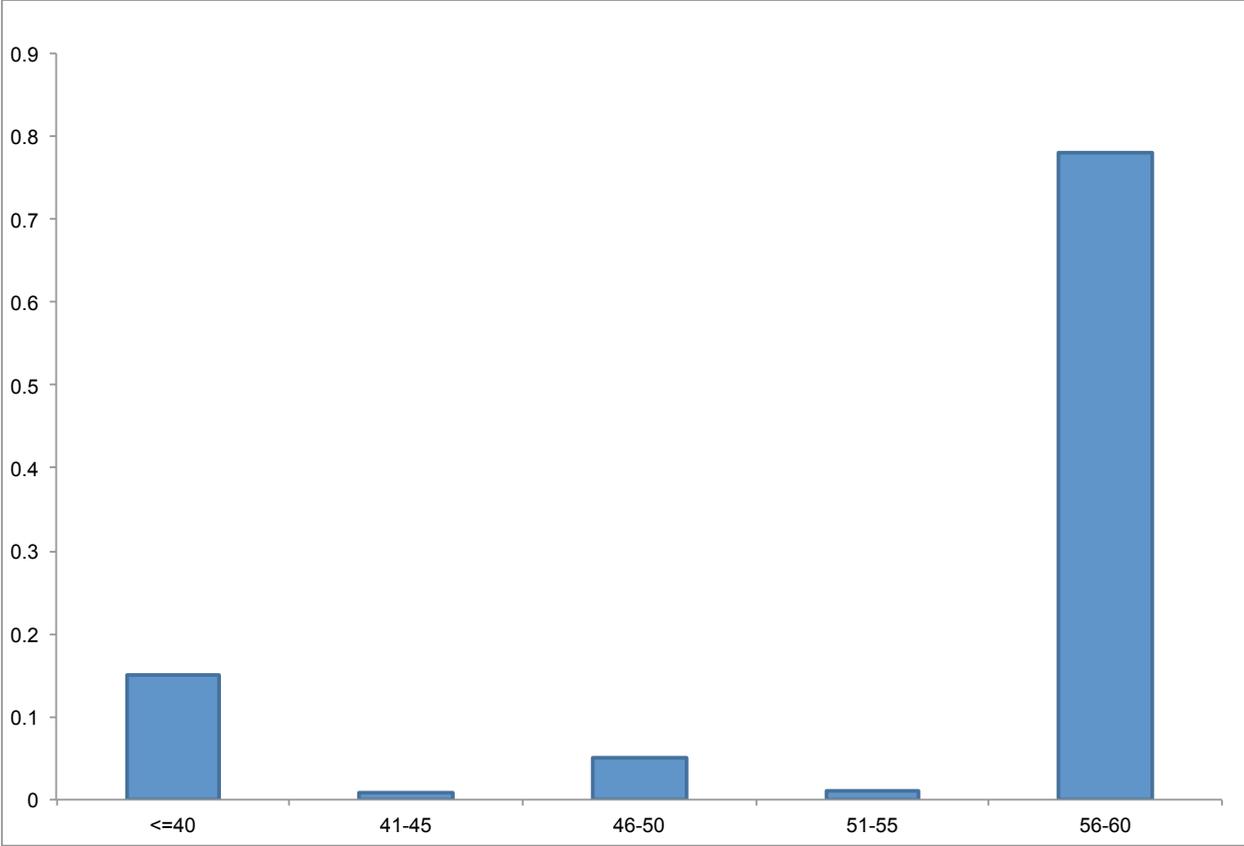
Figure 1: Distribution of Plan Length in Months
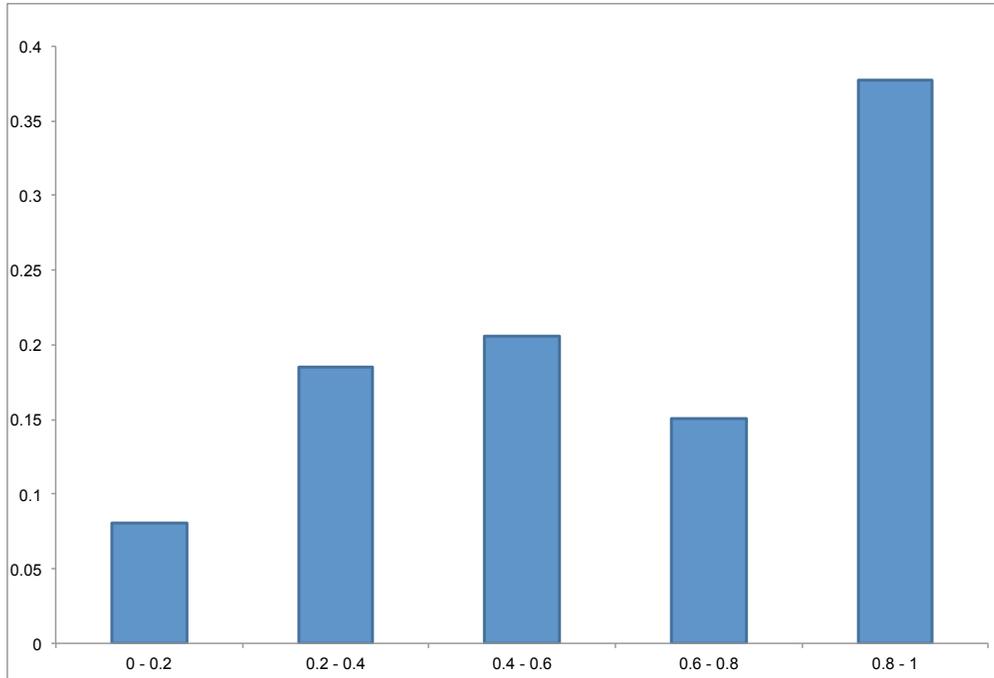
(a) Proposed
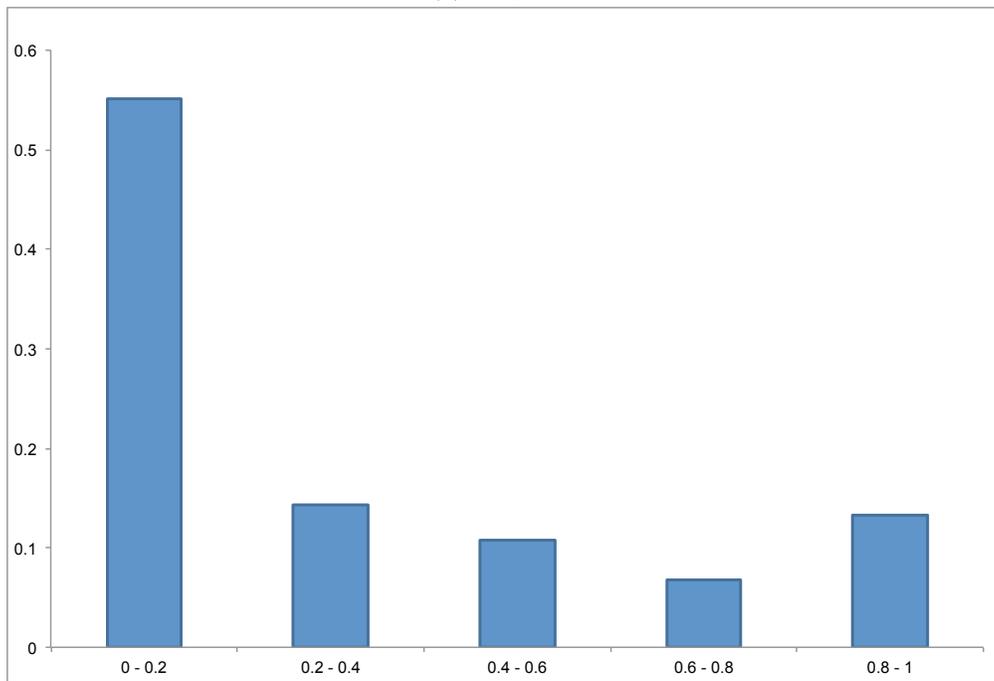
(b) Actual

Figure 2: Distributions of Proposed and Actual Credit Recovery Rates
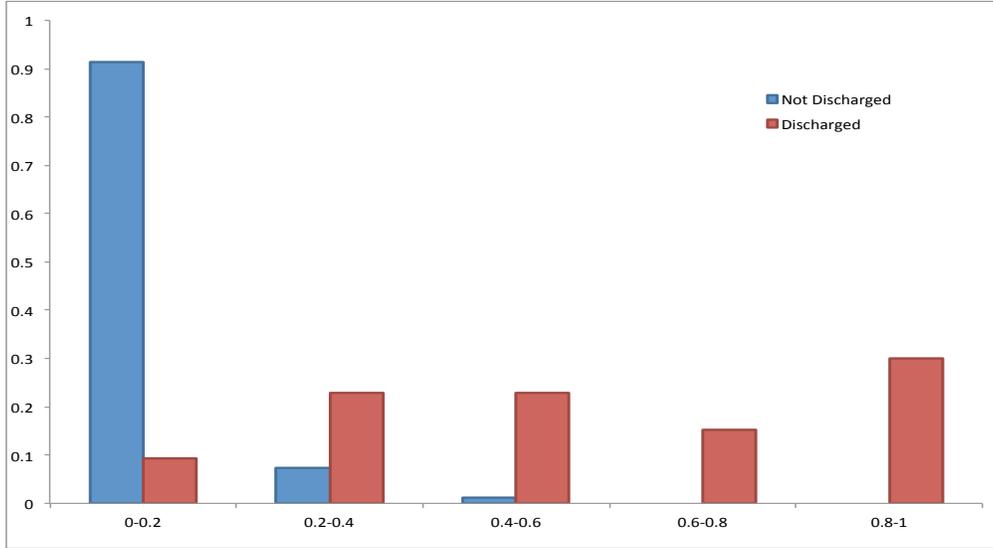
(a) Recovery Rate Conditional on Discharge
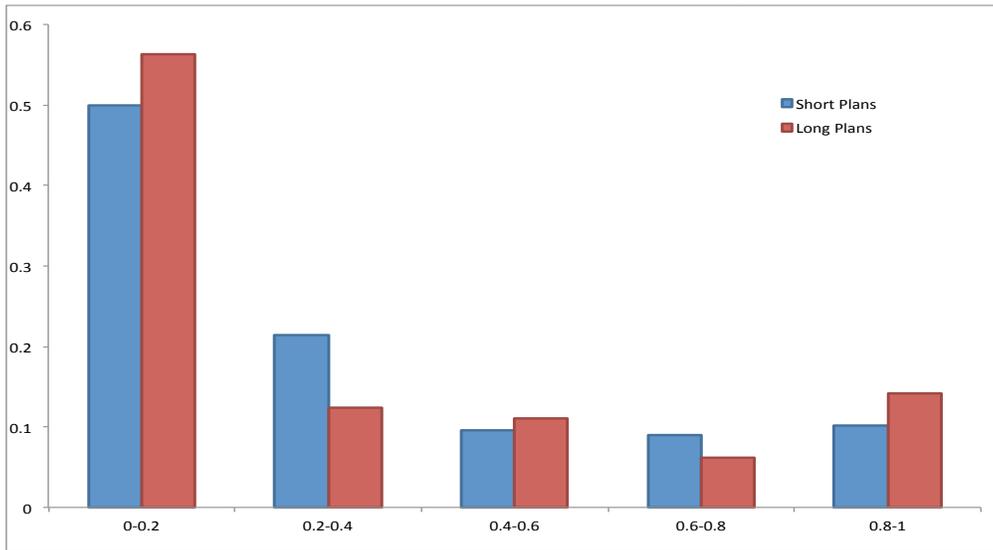
(b) Recovery Rate Conditional on Plan Length
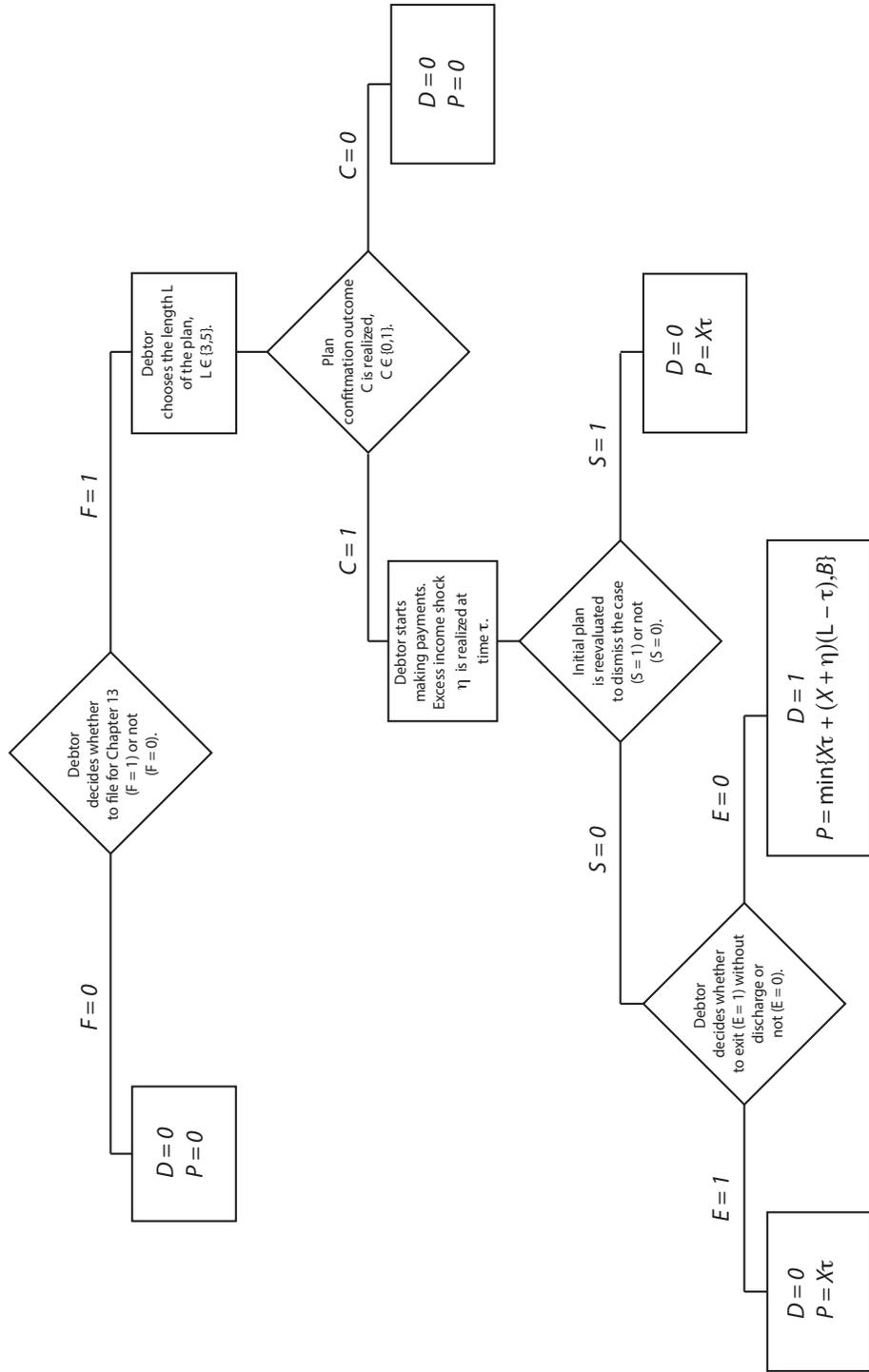
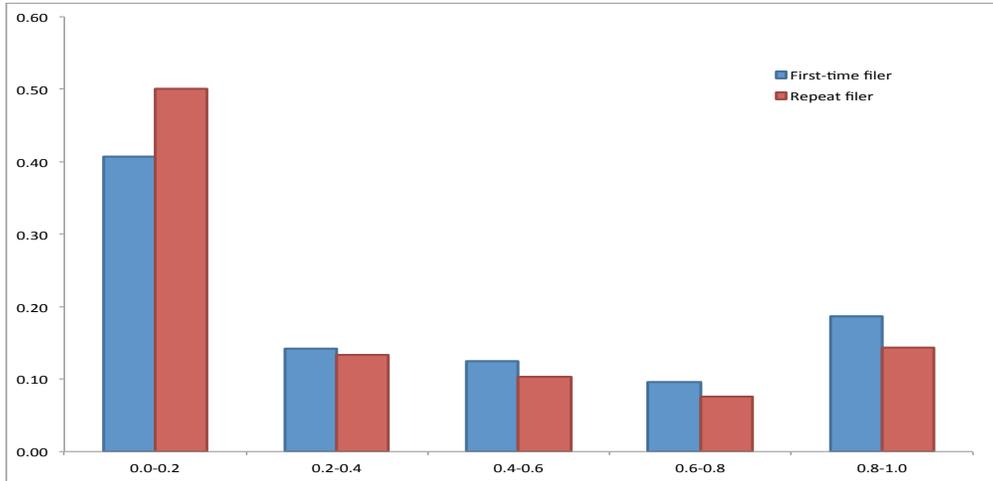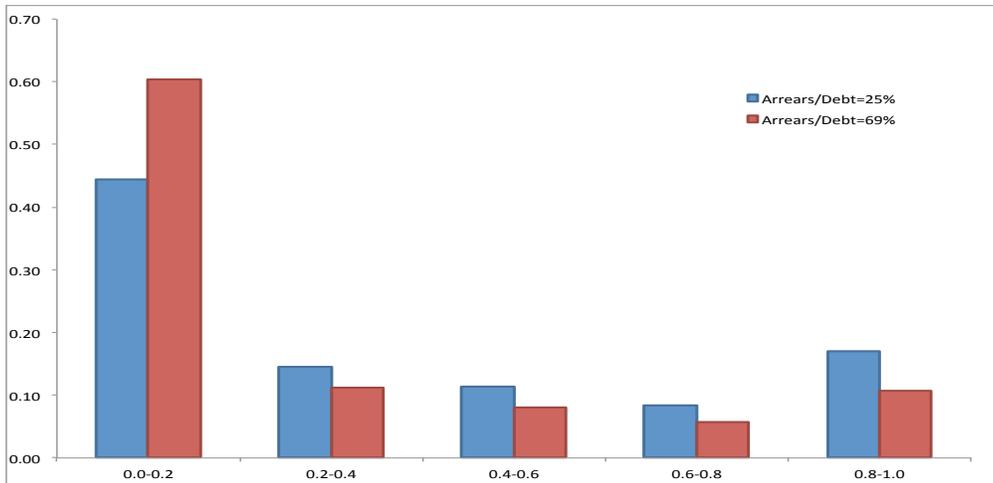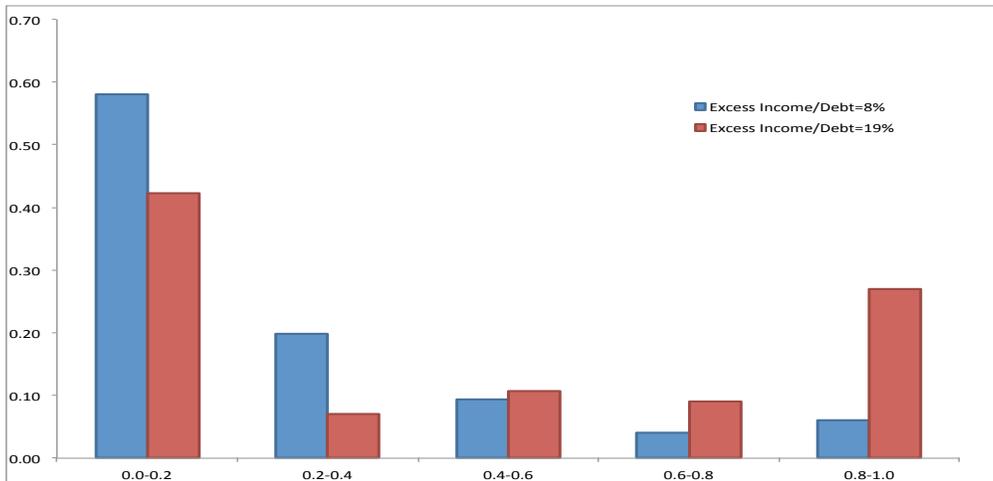Figure 3: Conditional Distributions of Recovery Rates

Figure 4: Timing of Events

(a) Recovery Rate Conditional on Bankruptcy Experience

(b) Recovery Rate Conditional on Arrears Burden

(c) Recovery Rate Conditional on Ability to Pay

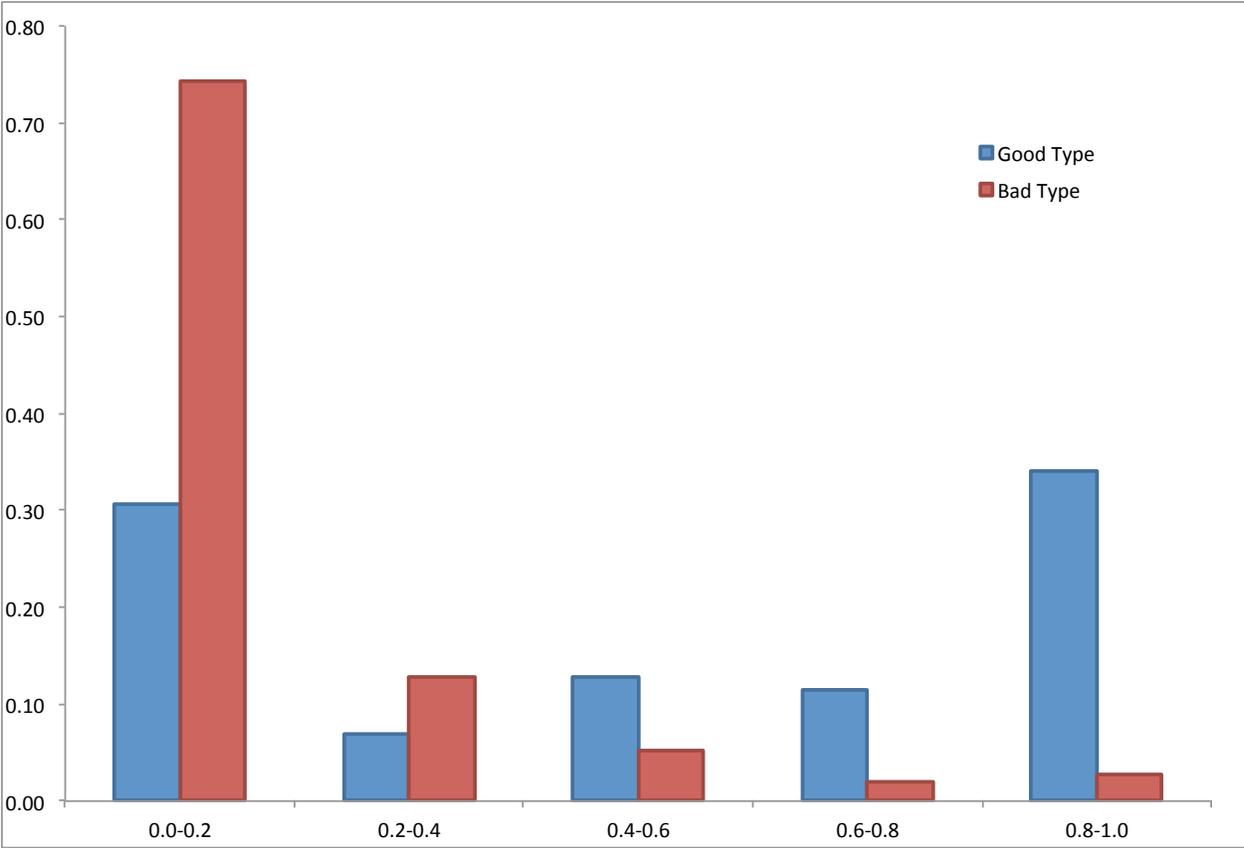Figure 5: Model-Generated Conditional Distributions of Recovery Rates

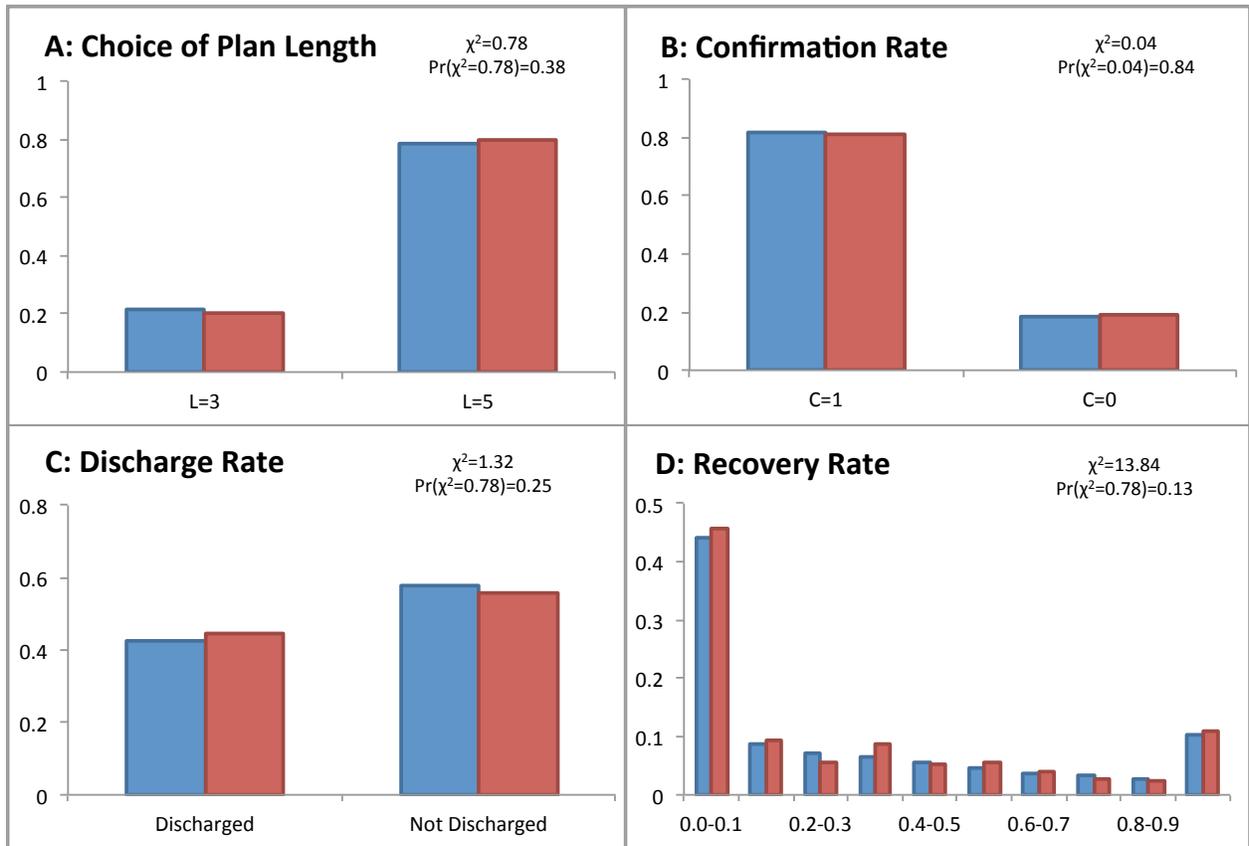Figure 6: Distributions of Recovery Rates for Extreme Debtor Types

A: Choice of Plan Length $\chi^2=0.78$
$Pr(\chi^2=0.78)=0.38$

1
0.8
0.6
0.4
0.2
0

L=3   L=5

B: Confirmation Rate $\chi^2=0.04$
$Pr(\chi^2=0.04)=0.84$

1
0.8
0.6
0.4
0.2
0

C=1   C=0

C: Discharge Rate $\chi^2=1.32$
$Pr(\chi^2=0.78)=0.25$

0.8
0.6
0.4
0.2
0

Discharged   Not Discharged

D: Recovery Rate $\chi^2=13.84$
$Pr(\chi^2=0.78)=0.13$

0.5
0.4
0.3
0.2
0.1
0

0.0-0.1   0.2-0.3   0.4-0.5   0.6-0.7   0.8-0.9

Figure 7: Model Fit (left columns: model; right columns: data