

# The Anatomy of U.S. Personal Bankruptcy under Chapter 13\*

Hülya Eraslan<sup>†</sup>

Department of Economics  
Rice University

Wenli Li<sup>§</sup>

Federal Reserve Bank of Philadelphia

Gizem Koşar<sup>‡</sup>

Department of Economics  
Johns Hopkins University

Pierre-Daniel Sarte<sup>¶</sup>

Federal Reserve Bank of Richmond

July 26, 2014

**ABSTRACT:** We compile a novel dataset from bankruptcy court dockets recorded in Delaware between 2001 and 2002. We use this data to estimate a structural model of Chapter 13 bankruptcy. This allows us to quantify how key debtor characteristics, including monthly housing expenses, whether they are experiencing bankruptcy for the first time, their past due secured debt at the time of filing, and income in excess of that required for basic maintenance, affect the distribution of creditor recovery rates. The analysis further reveals that changes in debtors' conditions during bankruptcy play a nontrivial role in governing Chapter 13 outcomes, including their ability to obtain a financial fresh start. Our model predicts that the more stringent provisions of Chapter 13 recently adopted, in particular those that force subsets of debtors to file for long-term plans, do not materially raise creditor recovery rates. This finding also arises in the context of alternative policy experiments that require bankruptcy plans to meet stricter standards in order to be confirmed by the court.

JEL Classifications: J22, K35, D14

Keywords: Personal Bankruptcy, Structural Estimation, Recovery Rate

---

\*We are grateful to Philip Bond, Bob Hunt, the editor Ken Wolpin, and two anonymous referees for helpful comments and suggestions. We also thank seminar participants at the University of Pennsylvania, the Federal Reserve Bank of Philadelphia, the FDIC, the 2007 Society of Economic Dynamics Summer Meetings, Florida International University, Southern Methodist University, the University of Oxford, and the University of Virginia. Ishani Tewari and Sarah Carroll provided excellent research assistance. We acknowledge financial support from the FDIC Center for Financial Research, the Wharton Financial Institution Center, and the Rodney White Center for Financial Research. Finally, we are indebted to Michael Joseph, the Chapter 13 Trustee for the District of Delaware, for numerous conversations and e-mail exchanges that have enhanced our understanding of bankruptcy law and its practice. The views expressed herein are those of the authors and do not necessarily reflect those of the Federal Reserve Bank of Philadelphia, the Federal Reserve Bank of Richmond, or the Federal Reserve System. Any errors are our own.

<sup>†</sup>[eraslan@rice.edu](mailto:eraslan@rice.edu).

<sup>‡</sup>[gkosar@jhu.edu](mailto:gkosar@jhu.edu).

<sup>§</sup>[wenli.li@phil.frb.org](mailto:wenli.li@phil.frb.org).

<sup>¶</sup>[pierre.sarte@rich.frb.org](mailto:pierre.sarte@rich.frb.org).

*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 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.<sup>1</sup> 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.<sup>2</sup>

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 that was added to the US Bankruptcy Code under BAPCPA, which imposes additional restrictions on the length of repayment plan for debtors with income above state median income. In order to do so, we build and estimate a structural model of Chapter 13 bankruptcy using a novel data set we construct. As 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 repayment plan choice boils down to its length. In choosing what plan to propose, the debtor recognizes that its duration has a bearing on the confirmation outcome which is determined by the recommendations of a bankruptcy trustee who is 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 the 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 the plan to “make sense”. In our model, whether the trustee views a given plan is feasible or not is random, and depends on the debtor’s characteristics and the plan length. We estimate this decision rule by the trustee which the debtors take as given.

Even if a plan is initially confirmed, it may nonetheless become infeasible due to fluctuations in debtor’s financial conditions. We model this possibility by introducing shocks to income or expenses of the debtor at a random date. Following the shocks, the trustee reevaluates the feasibility of the plan under the new debtor characteristics. If the case is not dismissed, the debtor decides whether

---

<sup>1</sup>U.S. personal bankruptcy law also allows a debtor to file under Chapter 7, in which case the debtor obtains a discharge by surrendering his assets. Under Chapter 7, however, important state asset exemptions exist, such as unlimited homestead exemptions in Florida, that severely reduce creditors’ ability to collect on loans in default. See section 2 for greater details.

<sup>2</sup>See, for example, <https://www.tinyurl.com/bapcpa2005> .

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.

We estimate our model using a newly collected data from information contained in court files related to all Chapter 13 personal bankruptcies recorded by the United States Bankruptcy Court for the District of Delaware between August 2001 and August 2002. The use of court dockets 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 demographic information at the time of filing and the final outcome of the case. Importantly, 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 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 maximum likelihood approach. Our analysis underscores the fact that bankruptcy outcomes cannot be related to plan characteristics independently of some structure, either in the form of a model or assumptions regarding instrumental variables, since Chapter 13 plans are chosen endogenously. Furthermore, even with proper instrumental variables, the empirical framework must take into account that the decision to file for Chapter 13 is itself endogenous.<sup>3</sup> To address these concerns, our paper follows a structural estimation approach that is closely related to the estimation of dynamic discrete choice structural models (surveys of this literature can be found in Eckstein and Wolpin (1989), Rust (1994), and Aguirregabiria and Mira (2010)).<sup>4</sup> Moreover, using structural methods allows us to explore the effects of the recent changes in bankruptcy law and to assess the success in raising creditor recovery rates.

Our estimates confirm that the debtor's choice of plan length indeed affects trustee's opinions on the fairness and the feasibility of the plan. In particular, after controlling for exogenous debtor characteristics, 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 debtors' income is above the state median level does not play a significant role for the confirmation of the plan.<sup>5</sup> As such, the means test established under BAPCPA appears relatively inconsequential. The analysis further reveals that changes in debtors' conditions during bankruptcy play a significant role in governing Chapter 13 outcomes, including their ability 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 US Bankruptcy Code under BAPCPA. This policy imposes additional restrictions on the length of payment plan for the debtors with income above the state median income. 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 state median income. This

---

<sup>3</sup>In other words, the framework must address the issue of sample selection bias.

<sup>4</sup>See Keane (2010) also for a detailed discussion of structural versus atheoretical approaches to econometrics.

<sup>5</sup>We take into account that income affects the calculation of proposed, dismissed, and discharged recovery rates, as well as the ratio of rent or mortgage over excess income (income minus reported necessary expenses). Thus, after controlling for these considerations, whether income is above the state median appears immaterial for the confirmation of the plan.

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 so 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 raise creditor recovery rates.

The remainder of this paper is organized as follows. Section 2 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 and its construction. In Section 5, we present a structural model of Chapter 13 bankruptcy. Section 6 presents our estimation results. Section 7 assesses the effects of policy experiments both directly related to BAPCPA as well as hypothetical. Section 8 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 decision 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, and 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 decision and find support for strategic considerations underlying bankruptcy decisions. In particular, households are more likely to file when their financial benefit from filing is higher.<sup>6</sup>

More recently, given the debates that surrounded the proposal and eventual passage of BAPCPA, attention has shifted towards consumer bankruptcy under Chapter 13. Similar to our paper, 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.

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(2008), Chatterjee, Corbae, Nakamura, 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.

---

<sup>6</sup>Books by 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 (2005)), on labor supply (Han and Li (2007)), and on mobility (Elul and Subramanian (2002)).

### 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, and focuses in detail on Chapter 13 court procedures.

#### 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, will 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. Different states, however, 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

US personal bankruptcy law features two distinct procedures: Chapter 7 and Chapter 13. 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. Thus, prior to BAPCPA, debtors had the right to choose between the two chapters.

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.<sup>7</sup> 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. The petition also details past income and lawsuit information. In the petition, the debtor also proposes a repayment plan that devotes all of his “*excess income*” – defined as any income net of necessary living expenses (including insurance and mortgage payments) – to the payment of unmet claims. In order to be confirmed by the court, the proposed plan must be carried out for at least 3 years but cannot exceed 5 years. It must also be filed in good faith. In particular,

---

<sup>7</sup>A discharge releases the debtor from personal liability for certain debts known as dischargeable debts. It prevents creditors who are owed those debts from taking any action against the debtor. The discharge also prohibits creditors from communicating with the debtor regarding unpaid debts, including by means of telephone calls, letters, or personal contact.

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 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. As an instrument of the 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 that the plan be dismissed.<sup>8</sup>

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. 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 that he receive additional income from an unexpected source, say in the form of 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 is 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 commonly 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 court files contained therein 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.

---

<sup>8</sup>In practice, the court then follows the trustee's recommendation.

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 was entered twice and the corresponding entries were cross-checked. The data was 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.

According to court documents and discussions with court legal staff, as of August 2005, the onset of this research project, 62 of the 94 U.S. bankruptcy courts required mandatory online filing. We focus on the Delaware bankruptcy court in our study because Chapter 13 plans can last as long as 5 years, and Delaware was one of the very first states to start mandatory online filing. Furthermore, we consider all Chapter 13 cases filed between August 2001 and August 2002 anticipating that the large majority of these cases will be closed as of the writing of this paper.

There were 1085 Chapter 13 bankruptcy cases filed in Delaware over our sample period. Of the 1085 cases, we deleted from our sample 134 cases that have incomplete information resulting from either court recording or filing error, 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, 52 of which were later converted to Chapter 7 filings. All of the cases have since been closed. Of the cases that were terminated under Chapter 13, 364 debtors (or 44 percent) successfully completed their repayment plans and obtained a discharge while 457 cases were dismissed under Chapter 13. 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 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 percent of the filers being unemployed compared to 5 percent in Delaware. Interestingly, about 5 percent 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 close to 30 percent. Filers for whom we have income data for both the current and previous year show a decline in income prior to filing of close to 20 percent on average. Because Chapter 13 requires that any income in excess of expenses for basic maintenance contribute to the repayment plan, debtors’ W-2 forms are reviewed annually.

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 rent or mortgage as well as utilities. 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 percent of total monthly expenses.<sup>9</sup> Debtors in Chapter 13 spend about \$442 a month on average for food and clothing, which is considerably less

---

<sup>9</sup>About 87 percent of the debtors in our sample own their homes which exceeds the 70 percent state home ownership 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 percent.

than the \$600 monthly average reported for the northeast region of the Consumer Expenditure Survey. Food and clothing represent 19 percent of debtors' monthly expenses in our sample. The remaining categories that define maintenance expenses include alimony payments, insurance premia, medical expenditures, transportation expenses, and discretionary expenses.<sup>10</sup> Discretionary expenses include recreation, entertainment, as well as magazine and newspapers, and 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 percent of total monthly expenses on average.

Throughout the paper, we refer to a debtor as a *repeat filer* if he has filed for bankruptcy at least once prior to the current filing since 1980. In our sample, about 24 percent of the debtors had previously filed for either Chapter 7 or 13, and had thus 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 6 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 on secured loans<sup>11</sup>, such as mortgages and car loans, amount to \$12,517. Together, total debt in default for the median filer – arrears as well as unsecured debt – amounts approximately to the debtor's annual gross income.<sup>12</sup> 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. We also estimate a lower bound for medical debts by flagging keywords such as "health", "medical," or "Labcorp," that are listed either as the debt type or the associated creditor. This lower bound comes to \$1,051 for the average filer and more than one third of the filers report positive medical debts.

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.<sup>13</sup>

#### 4.2.2 Outcomes under Chapter 13

Creditors' recovery rate and debtors' ability to obtain a discharge are arguably the key outcomes of the personal bankruptcy process. These outcomes, however, depend importantly on the types of plans that are chosen by debtors and whether these plans are confirmed by the trustee. Hence, this paper focuses on four quantifiable aspects of Chapter 13. These are:

**The choice of plan length:** This choice is made by the debtor and reflects a trade-off between shorter plans that impose restraints for a shorter period of time but are less likely to be

---

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

<sup>11</sup>Arrears are missed payments that are past due on a loan. This is particularly relevant for mortgage debt in the case of consumer bankruptcy. For mortgage debt, the part of the debt that is in default is only the arrears in bankruptcy. Unfortunately, the petition does not distinguish between the secured debt in default and the secured debt. Since the bankruptcy law requires that all arrears must be paid in full, we use the final reported payment on secured debt as the debt in default.

<sup>12</sup>From this point on, the term total debt refers to the amount of debt in default.

<sup>13</sup>See Domowitz and Sartain (1999), Nelson (1999), as well as Fay, Hurst, and White (2002). High asset households and households with regular income are much more likely to file under Chapter 13.



confirmed, and longer plans that are more likely to be approved but restrain the debtor over a longer period.

**The confirmation rate:** The percentage of cases that are confirmed. Cases that are not confirmed are either converted to Chapter 7, and may eventually be discharged under that chapter, 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.

**The recovery rate:** This measure captures payments received by various creditors under Chapter 13 relative to the face value of unpaid claims. Chapter 13 recovery rates are then necessarily zero for cases that are dismissed without confirmation.<sup>14</sup>

**The discharge rate:** The percentage of cases that are discharged under Chapter 13 and, therefore, that result in a financial fresh start for the corresponding debtors.

The rate of confirmation captures bankruptcy outcomes in the first stage of bankruptcy.<sup>15</sup> Discharge is an outcome that is observed in the final stage only. Cases that are discharged must necessarily first be confirmed. The recovery rate for creditors summarizes outcomes that can occur at any stage during bankruptcy (e.g. a debtor may decide to voluntarily exit Chapter 13 three quarters of the way through a plan, in which case the recovery rate is calculated as of at that date). Our analysis is based on recovery rates and discharge rates associated with cases that have already terminated.

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 5-year or 3-year plans.<sup>16</sup> The fact that a large fraction of debtors proposes long term plans is not surprising given that it often takes at least 3 years for filers to make up arrears on secured debt. 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 debt in default. The mean and median proposed recovery rates are close to 66 cents and 59 cents on the dollar respectively. Around 20 percent of filers propose to pay their creditors back in full.

As far as Chapter 13 bankruptcy outcomes are concerned, the following observations stand out in our data set. First, close to 20 percent of the filers in our sample are dismissed without ever obtaining the confirmation of a plan, despite the fact that all debtors filed for bankruptcy voluntarily. Since filing for Chapter 13 is voluntary in our sample, the proposed payment plans cannot offer unreasonable terms which makes the proceeding result surprising. Second, conditional on being terminated, less than half of the plans are carried out to completion. Third, attorney fees as well as trustee commission and expenses account for an important fraction of total disbursements.

---

<sup>14</sup>The recovery rates we document and focus on are total recovery rates for the combined unsecured debt and secured debt in default. As discussed in footnote 11 we cannot distinguish between the secured debt and the unsecured debt in default in the data and we approximate secured debt in default by the payment made to secured creditors as reported in the final report of the trustee since the law requires that the secured claims must be paid in full. Note however that 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. Since we don't have the data on cram down, our construction necessarily implies that the recovery rate on secured claims is 100%.

<sup>15</sup>Trustees typically ask Chapter 13 filers to start submitting periodical 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.

<sup>16</sup>Less than 5 percent of filers propose to use the proceeds from car or home sales, or home refinancing, to pay off some of their debts. For these debtors, the proposed plan length is, on average, 3 months shorter than for those who do not plan on using some of their assets to repay their debts.

Specifically, in Delaware, the trustee receives 6 percent of total payments made under a confirmed plan. Attorney fees represent over 6 percent of plan payments on average.

Finally, creditors ultimately collect 30 cents on every dollar they are owed on average, with a median recovery rate of 14 percent. In addition, the mean and median recovery rates conditional on the debtor being discharged are 59% and 55%, respectively<sup>17</sup>. As illustrated in Figure 2B, these recovery rates are strikingly lower than those implied by 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. This is shown in Figure 3, panel A. Furthermore, Figure 3, panel B, illustrates that the duration of the plan proposed by debtors also matters somewhat for the distribution of recovery rates. Interestingly, although their average recovery rates are similar, debtors that propose longer plans (greater than 4 years) are associated with a lower median recovery rate than those that propose shorter plans, specifically 15 percent for those proposing longer plans versus 19 percent for those proposing shorter plans. One underlying reason is that debtors who propose longer plans are often in greater financial distress and thus seek to smooth their payments over longer periods. At the time of filing, the mean ratio of debt-in-default to annual income is 1.30 for debtors who propose long-term plans but 1.15 for those who propose short-term plans. Taken together, these facts suggest that changes in debtors' conditions that are unobservable at the time of filing, and that may induce a dismissal by the trustee or a voluntary exit later in the bankruptcy process, play a significant role in determining bankruptcy outcomes. It is noteworthy that the ratio of payments to debt, or the debt recovery rate, discussed above includes payments on both secured debt in default and unsecured debt.

In summary, these Chapter 13 performance measures indicate that creditor recovery rates are considerably lower than those that are first proposed. In addition, more than half the debtors fail to obtain the financial fresh start potentially afforded by the bankruptcy law. A summary of these findings is given in Table 2, and a natural question is: 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

This section models debtors' behavior during their Chapter 13 bankruptcy procedure taking as given trustees' decision rules. We do not explicitly model the creditors' problem since they do not actively participate in the bankruptcy process.

Our analysis begins with a debtor's decision to file for bankruptcy under Chapter 13. In order to be able to discharge his debts, the debtor must propose a repayment plan, have it confirmed by the court, and carry it out in full. In the event that the debtor does not obtain a discharge, his case is either converted to a Chapter 7 filing or dismissed. In the latter case, state collection laws apply.

A debtor's payoff from completing Chapter 13 is directly related to payments,  $P$ , made under a confirmed plan and is given by  $-P$ . Since payments (if any) made outside Chapter 13 are not

---

<sup>17</sup> The mean recovery rate on unsecured debt is 17% while the median is 0%. The mean and median recovery rate on unsecured debt conditional on discharge are 38% and 25%, respectively. As discussed in footnote 14, the secured creditors recover their claims in full by our construction of the data. Although the actual recovery rate on secured claims is actually lower because of the possibility of cram down on non-mortgage secured debt, we expect the actual recovery rate on the secured debt to be not too different from 100% since most of the secured debt is mortgage debt which cannot be crammed down.

recorded in our data set, the payoff from options that do not involve Chapter 13, including informal default and conversion to Chapter 7, must be estimated. We allow this payoff to depend on a debtor’s (predetermined) characteristics,  $Z$ , and denote it by  $\bar{V}(Z)$ . Aside from excess income, denoted by  $X$ , and the amount owed to creditors at the time of default, denoted by  $B$ , variables in  $Z$  include information obtained from the docket sheets such as the amount the debtor owes in arrears or the recovery rate he is proposing.

Since the law requires that all of a debtor’s excess income be applied to the repayment plan, debtors have little say over per period plan payments and these are treated as exogenous. We saw in the previous section that debtors’ income is monitored using their W-2 tax forms and that outlays for basic maintenance allowed less than a 2 percent share for discretionary expenses. Debtors’ decisions then effectively reduce to choosing whether or not to file for bankruptcy under Chapter 13 and, if so, what plan length in years,  $L$ , to propose. Debtors must also potentially decide, at a later stage in the bankruptcy process, whether or not to continue with a confirmed plan given changes in their state. We restrict proposed plan lengths to take either the value three or five,  $L \in \{3, 5\}$ . 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). Hence, we shall refer to debtors as choosing either short-term plans or long-term plans and, in the remainder of the analysis, we let  $L = \{3, 5\}$ .

Once a plan is proposed, a trustee must decide whether or not to confirm the proposed plan. We let the dummy variable  $C$  take the value one when a plan is confirmed and zero otherwise. In addition, we let  $P(C|L; Z)$  denote the probability that characterizes the trustee’s confirmation decision. The likelihood of having a plan confirmed is made conditional on the debtor choosing a plan of length  $L$  and his characteristics  $Z$ . The debtor takes the confirmation rule followed by the trustee as given. In choosing what plan to propose, he recognizes that its duration has a bearing on the confirmation outcome. By the time they file for bankruptcy, debtors in default do not have much leeway under the law to obtain the discharge that bankruptcy affords them. The interpretation of bankruptcy law, however, is not entirely unambiguous from the standpoint of the trustee and the rule that we estimate allows for some variation in the interpretation of its provisions.

In practice, a debtor’s excess income will be subject to changes within the plan resulting from fluctuations in the debtor’s circumstances. 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 are not documented and, therefore, unavailable to the researcher. Nevertheless, we can gain insight into these changes by modeling variations in excess income during bankruptcy as being governed by latent variables to be estimated. Specifically, we assume the existence of additive shocks to excess income,  $\eta \in \mathfrak{H} = [-\infty, \infty)$ , that can arise at any time  $\tau \in [0, L]$ . At date  $\tau$ , the debtor has already contributed  $X\tau$  to the plan. Therefore, if per period payments  $X + \eta$  are made during the remainder of a plan of length  $L$ , total plan payments are given by  $X\tau + (L - \tau)(X + \eta)$ .

Even if a Chapter 13 plan is initially confirmed by the trustee, this plan may nonetheless be later dismissed when the shock  $\eta$  is realized. As an example, consider the case where a debtor’s income unexpectedly increases while under Chapter 13. The law specifically requires that this increase in income be reflected in payments made under the existing plan.<sup>18</sup> Therefore, any attempt to keep payments unchanged by the debtor, say by arguing for a raise in maintenance expenses, may well result in a dismissal of the case depending on the trustee’s view of the argument. Alternatively, suppose that a debtor’s income unexpectedly falls while under Chapter 13. Depending on whether this fall constitutes genuine hardship in the eyes of the trustee, he may well decide to dismiss the

---

<sup>18</sup>See Li and Sarte (2006) for a discussion of this contingency.

initial bankruptcy plan. Thus, we denote the probability that a case is dismissed following the particular realization of a shock  $\eta$  at time  $\tau$  by  $\theta(\eta, \tau, L, Z)$ .

If a plan is dismissed at  $\tau$  after being initially confirmed, then total payments made under Chapter 13 are given by  $P = X\tau$  and the payoff to the debtor is  $-X\tau + \bar{V}(Z')$ , where  $Z'$  reflects the filer's new characteristics after  $\tau$ . In particular, after the shock  $\eta$  is received, excess disposable income is  $X' = X + \eta$  and the filer's remaining unpaid debt is  $B' = B - X\tau$ . Notice that  $Z'$  depends on  $\eta$  and  $\tau$ , although not explicitly acknowledged in the notation for expositional ease. If the plan is not dismissed after the shock  $\eta$  is realized and the debtor stays with Chapter 13, then  $P = \min\{X\tau + (L - \tau)(X + \eta), B/(1 - \phi)\}$ . The expression for  $P$  in this case reflects the fact that payments made under Chapter 13 never exceed the amount owed. Because the trustee receives a fee that reflects a percentage,  $\phi$ , of payments made under the plan, a debtor repays his debts in full only if  $P \geq B/(1 - \phi)$ . Even if a plan is not dismissed by the trustee at  $\tau$ , it is possible that upon the realization of  $\eta$ , the change in a debtor's situation may dictate voluntarily exiting Chapter 13. Whether or not this is the case depends on a comparison of payoffs associated with continuing with the plan after  $\tau$  or opting out. Because the debtor has already made payments  $X\tau$  at the time  $\eta$  is realized, if  $-\min\{X\tau + (L - \tau)(X + \eta), B/(1 - \phi)\} < -X\tau + \bar{V}(Z')$ , he simply exits Chapter 13 and stops making payments. In contrast, if  $-\min\{X\tau + (L - \tau)(X + \eta), B/(1 - \phi)\} \geq -X\tau + \bar{V}(Z')$  and the plan is not dismissed after date  $\tau$ , the debtor always stays with Chapter 13 and makes payments in the amount of  $\min\{X\tau + (L - \tau)(X + \eta), B/(1 - \phi)\}$ .

## 5.1 Discharge and Recovery Rate Outcomes Under Chapter 13

When an initial plan proposal is dismissed outright by the trustee, the debtor's case is terminated without a discharge. We let the dummy variable  $D$  take on the value one when the debtor obtains a discharge and zero otherwise. When a proposed plan is never confirmed, creditors do not collect anything under Chapter 13. The recovery rate under Chapter 13, denoted by  $R \in [0, 1]$ , is then zero. Creditors who recover nothing under Chapter 13 may nevertheless be able to collect a positive amount outside bankruptcy or under Chapter 7. While our analysis is specifically concerned with outcomes under Chapter 13, section 7 also provides overall recovery rate estimates based on different assumptions regarding what creditors can potentially recover outside Chapter 13. Next, consider the case where a plan is initially confirmed by the trustee. Several outcomes are then possible.

As explained above, once a plan is initially confirmed, the debtor begins to carry it out and makes payments to offset his debts. As his circumstances change, the trustee re-evaluates the plan. If the plan is dismissed at a later stage  $\tau \in [0, L]$ , the debtor fails to obtain a discharge,  $D = 0$ , and creditors' recovery rate is then given by  $X\tau(1 - \phi)/B$ . If, as the plan progresses, variations in the debtor's situation are such that the trustee sees no reason to dismiss the case, the debtor still has to make a decision as to whether to continue with Chapter 13. If  $-\min\{X\tau + (L - \tau)(X + \eta), B/(1 - \phi)\} \geq -X\tau + \bar{V}(Z')$  upon the realization of  $\eta$ , the debtor brings the plan to conclusion and obtains a discharge,  $D = 1$ . The recovery rate in this case is either  $R = 1$  if the debtor has repaid his debts in full or  $[X\tau + (L - \tau)(X + \eta)](1 - \phi)/B$  otherwise. If instead,  $-\min\{X\tau + (L - \tau)(X + \eta), B/(1 - \phi)\} < -X\tau + \bar{V}(Z')$  once the shock  $\eta$  is realized, the debtor fails to obtain a discharge (since he chooses to opt out of Chapter 13),  $D = 0$ , and creditors recover the fraction  $X\tau(1 - \phi)/B$  of their loans. An illustration of the bankruptcy process and its potential outcomes is given in Figure 4. With this description in hand, we can now turn to the formal statement of the debtor's problem.

## 5.2 The Debtor's Problem

When a debtor initially chooses to file under Chapter 13, he proposes a plan of length  $L$ . If the plan is not initially confirmed by the trustee, the case is dismissed and the debtor receives a payoff of  $\bar{V}(Z)$ . If the plan is confirmed, the debtor begins to make payments and obtains a payoff denoted by  $V(L, Z)$ . Hence, at the time of filing, a debtor chooses  $L$  so as to maximize his expected payoff,

$$\max_{L \in \mathcal{L}} P(C = 1|L; Z)V(L, Z) + (1 - P(C = 1|L; Z))\bar{V}(Z), \quad (1)$$

where, given the environment we have just described,

$$\begin{aligned} V(L, Z) = & E_{\eta, \tau}[\theta(-X\tau + \bar{V}(Z')) \\ & + (1 - \theta) \max\{-X\tau + \bar{V}(Z'), -\min\{X\tau + (L - \tau)(X + \eta), \frac{B}{1 - \phi}\}\}] \end{aligned} \quad (2)$$

and  $\theta = \theta(\eta, \tau, L, Z)$ . We assume that shocks to excess income while under Chapter 13 are governed by the distribution function  $f_{\eta}(\eta|L; Z)$ . The distribution describing the time at which this shock occurs is given by  $f_{\tau}(\tau|L; Z)$ . The expectations in equation (2) are then taken with respect to these distributions. The first term in square brackets captures the fact that with probability  $\theta(\eta, \tau, L, Z)$ , the debtor is dismissed at date  $\tau$ , in which case he has already made payments in the amount  $X\tau$  and he obtains the payoff  $\bar{V}(Z')$ . The second term indicates that with probability  $1 - \theta(\eta, \tau, L, Z)$ , the trustee does not dismiss the case at  $\tau$ . The debtor can then decide whether or not to voluntarily exit his plan depending on how his circumstances have changed after  $\tau$ . Note that if  $L$  is the chosen plan, then it must be the case that  $V(L, Z) \geq \bar{V}(Z)$ . If it were the case that  $V(L, Z) < \bar{V}(Z) \forall L \in \mathcal{L}$ , a debtor would simply not file under Chapter 13 in the first place and resort instead to his best outside option.

## 6 Econometric Specification

In this section, we derive the likelihood function that represents the basis for the estimation of our structural model. The contribution to the likelihood function of each debtor in our sample is equal to the probability of observing the vector of (endogenous) events  $(L, C, R, D)$  conditional on the vector of (exogenous) debtor characteristics,  $Z$ , and the model's parameters,  $\beta$ .<sup>19</sup> Given the optimization decisions faced by debtors under Chapter 13, the likelihood of each debtor can be written as

$$P(L, C, R, D|Z, \beta) = P(L|Z, \beta)P(C|L; Z, \beta)E_{\eta, \tau} [P(R, D|C, L, \eta, \tau; Z, \beta)]. \quad (3)$$

The remainder of this section addresses each of the component on the right-hand side of (3).

To reconcile any potential discrepancy between the model's predictions and observed plan length choices, we allow for the fact that debtors evaluate the probability of first obtaining confirmation of a proposed plan,  $P(C = 1|L; Z, \beta)$ , using information that is unavailable to the econometrician. A debtor's health or educational status, for instance, may influence the trustee's decisions in a way that is not directly observable. We denote by  $\varepsilon_L$  a multiplicative error term that lets us differentiate between the debtors' probability assessment of initial plan confirmation and the analogous evaluation

<sup>19</sup>The expected payoff from filing under Chapter 13 is also endogenous in the model. 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.

made by the econometrician. Hence, we have that the true conditional probability of confirmation is given by

$$P(C = 1|L, \varepsilon_L; Z, \beta) = Q(C = 1|L; Z, \beta)\varepsilon_L, \quad (4)$$

where  $Q(C = 1|L; Z, \beta)$  reflects the econometrician's assessment of initial plan confirmation and is parameterized below. We assume that  $\varepsilon_L$  is characterized by the distribution  $G_L(\varepsilon_L)$  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 assessment of having a proposed plan first confirmed uses more information than is available to the econometrician, there is no *a priori* reason why the econometrician's estimate of  $P(C = 1|L; Z, \beta)$  should be biased. Therefore, we require that  $E(\varepsilon_L) = 1 \forall L$  which immediately implies that

$$P(C = 1|L; Z, \beta) = E[P(C = 1|L, \varepsilon_L; Z, \beta)] = Q(C = 1|L; Z, \beta). \quad (5)$$

Let  $\widehat{L}$  denote the observed plan length that solves the debtor's problem (1). Given the assumptions maintained in the previous subsection, it must then be the case that

$$\begin{aligned} Q(C = 1|\widehat{L}; Z, \beta)\varepsilon_{\widehat{L}}V(\widehat{L}, Z) &+ (1 - Q(C = 1|\widehat{L}; Z, \beta)\varepsilon_{\widehat{L}})\bar{V}(Z) \\ &\geq Q(C = 1|L; Z, \beta)\varepsilon_LV(L, Z) + (1 - Q(C = 1|L; Z, \beta)\varepsilon_L)\bar{V}(Z) \end{aligned} \quad (6)$$

for all  $L \in \mathfrak{L}$  and where  $V(\cdot)$  is given by equation (2). It follows that if  $V(L, Z) \geq \bar{V}(Z)$ ,

$$P(\widehat{L}|\varepsilon_{\widehat{L}}; Z, \beta) = P\left(\varepsilon_L \leq \frac{Q(C = 1|\widehat{L}; Z, \beta)\varepsilon_{\widehat{L}}(V(\widehat{L}, Z) - \bar{V}(Z))}{Q(C = 1|L; Z, \beta)(V(L, Z) - \bar{V}(Z))} \middle| \varepsilon_{\widehat{L}}\right), \quad (7)$$

which is simply  $G_L\left(\frac{Q(C=1|\widehat{L};Z,\beta)\varepsilon_{\widehat{L}}(V(\widehat{L},Z)-\bar{V}(Z))}{Q(C=1|L;Z,\beta)(V(L,Z)-\bar{V}(Z))} \middle| \varepsilon_{\widehat{L}}\right)$  and, moreover,

$$P(\widehat{L}|Z, \beta) = \int_{\mathcal{E}_{\widehat{L}}} P(\widehat{L}|\varepsilon_{\widehat{L}}; Z, \beta)dG_{\widehat{L}}(\varepsilon_{\widehat{L}}). \quad (8)$$

If  $V(L, Z) < \bar{V}(Z)$  and  $V(\widehat{L}, Z) \geq \bar{V}(Z)$ , equation (7) is always satisfied and  $P(\widehat{L}|Z, \beta) = 1$ . As mentioned in footnote 20, the expected payoff  $V(\widehat{L}, Z)$  from filing under Chapter 13 is also endogenous in the model. Specifically for the debtor to be observed in the data set, we must have  $V(\widehat{L}, Z) \geq \bar{V}(Z)$ . Thus if  $V(\widehat{L}, Z) < \bar{V}(Z)$  then  $P(\widehat{L}|Z, \beta) = 0$ .

Given the expressions in (5) and (8) for  $P(C|\widehat{L}; Z, \beta)$  and  $P(\widehat{L}|Z, \beta)$  respectively in equation (3), it remains only to derive expressions for the last term,  $E_{\eta, \tau}[P(R, D|C, \widehat{L}, \eta, \tau; Z, \beta)]$ . This involves keeping track of the different discharge and recovery rate outcomes that are generated by debtors' decisions contingent on the shocks  $\eta$  and  $\tau$ . Conditional on the trustee's initial confirmation decision and the plan length chosen by the debtor, a debtor's recovery rate and discharge outcomes depend only on his decision to carry out his plan in full if allowed to continue after date  $\tau$ . From the perspective of a debtor for whom  $\eta$  and  $\tau$  have been revealed, this decision is deterministic. From the perspective of an econometrician, however, the debtor's recovery rate and discharge outcomes are random and depend on the structure of the model used to study the data. In our model, for example, a case that is not discharged after initial confirmation reflects either that the case was later dismissed by the trustee or that the debtor chose to voluntarily exit the plan. The derivations that allow us to identify bankruptcy outcomes associated with different debtor decisions, and hence to obtain explicit expressions for  $E_{\eta, \tau}[P(R, D|C, \widehat{L}, \eta, \tau; Z, \beta)]$ , are given in Appendix A.

In the end, the likelihood function we seek to maximize is given by

$$\mathcal{L} = \prod_{i=1}^N P(\widehat{L}_i, C_i, R_i, D_i | Z_i, \beta), \quad (9)$$

where  $N$  refers to the number of debtors in our data set.

In order to carry out the maximization of the likelihood function (9), 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,  $Q(C|L; Z, \beta)$ , the probability of dismissal after the shocks  $\eta$  and  $\tau$  are realized,  $\theta(\eta, \tau, L, Z, \beta)$ , the payoff associated with options outside Chapter 13,  $\bar{V}(Z)$ , the density functions that govern the shocks  $\eta$  and  $\tau$ ,  $f_\eta(\eta|L; Z, \beta)$  and  $f_\tau(\tau|L; Z, \beta)$  respectively, and the distribution of  $\varepsilon_L$ ,  $G_L(\varepsilon_L)$ . Choosing parametric forms for these functions first requires that we be explicit about the variables in  $Z$ .

For each debtor, we include the following exogenous variables in the estimation of  $Q(C|L; Z, \beta)$ : total assets as a fraction of debt in default at the time of filing, *ratio\_asset\_debt*; arrears accumulated on secured debt, including unpaid mortgage and auto loans, as a fraction of total debt in default, *ratio\_arrears\_debt*; monthly rent or mortgage payments as a fraction of monthly income, *ratio\_rent\_mortgage\_inc*; whether medical debts exceed 10 percent of total debt in default, *medical\_debt*; the debtor's tenure with respect to his current job, *job\_tenure*, measured in years (if the debtor is unemployed, this number takes the value of zero); whether the debtor's most recent annual income at the time of filing is above state median income, *inc\_above\_med*; whether the debtor has previously filed for bankruptcy and is thus a "repeat filer," *repeat\_filer*; attorney experience in handling bankruptcy cases, *attorney\_exp*, measured as whether the in-sample frequency (i.e. the number of cases) associated with the attorney representing the debtor exceeds 20 out of a total of 165 cases; the debtor's choice of plan length (3 or 5 years), *p\_paylength*; whether the debtor is eligible for Chapter 7 bankruptcy, *eligible\_7* and the proposed recovery rate defined as total proposed payments over total debt in default, *p\_recovery\_rate*.

We posit that  $Q(C|L; Z, \beta)$  is given by the logistic function,

$$Q(C = 1|L; Z, \beta) = \frac{e^{q(L; Z, \beta)}}{1 + e^{q(L; Z, \beta)}}, \quad (10)$$

where

$$\begin{aligned} q(L; Z, \beta) = & \beta_0^c + \beta_1^c(\text{ratio\_asset\_debt}) + \beta_2^c(\text{ratio\_arrears\_debt}) + \beta_3^c(\text{ratio\_rent\_mortgage\_inc}) \\ & + \beta_4^c(\text{medical\_debt}) + \beta_5^c(\text{job\_tenure}) + \beta_6^c(\text{inc\_above\_med}) \\ & + \beta_7^c(\text{repeat\_filer}) + \beta_8^c(\text{attorney\_exp}) + \beta_9^c(\text{p\_paylength}) + \\ & + \beta_{10}^c(\text{eligible\_7}) + \beta_{11}^c(\text{p\_recovery\_rate}), \end{aligned}$$

and the  $\beta_i^c$ 's are parameters to be estimated. To ensure that the implied conditional probability of plan confirmation,  $P(C = 1|L; Z, \beta)$ , lies in  $[0, 1]$ , the support of  $\varepsilon_L$  must be bounded. Specifically, we require that  $\mathcal{E}_L = [0, \frac{1}{Q(C=1|L; Z, \beta)}]$ . In addition, we assume that  $\varepsilon_L$  is characterized by the power distribution,  $G_L(\varepsilon_L) = [\varepsilon_L Q(C = 1|L; Z, \beta)]^{\varphi_L}$ . Our assumption that  $E(\varepsilon_L) = 1 \forall L$  then requires that  $\varphi_L = \frac{Q(C=1|L; Z, \beta)}{[1 - Q(C=1|L; Z, \beta)]}$ . These restrictions, therefore, tie down both the shape and the support of  $G_L(\varepsilon_L)$ .

We use the same set of exogenous variables in estimating the probability of dismissal,  $\theta(\eta, \tau, L, Z, \beta)$ , except that we replace the proposed recovery rate, *p\_recovery\_rate*, with the recovery rates obtained upon discharge, *discharge\_recovery\_rate* and upon dismissal, *dismiss\_recovery\_rate*, since shocks

that may have affected the debtor after initial confirmation are known to the trustee at that stage. In particular, *discharge\_recovery\_rate* 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* 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. If the trustee dismisses a debtor after shocks to excess income are realized, payments up to that point will be all that creditors recover from this debtor under Chapter 13. In addition, we include the shocks  $\tau$  and  $\eta$  directly in the estimation since they potentially affect the trustee's dismissal decision independently of their implications for recovery rates. Specifically, a trustee may well dismiss a filer whose excess disposable income unexpectedly falls, even if the implied change in recovery rate is small, when the decrease in disposable income is interpreted as an attempt on the part of the filer to artificially inflate basic maintenance expenses. As with  $Q(\cdot)$ , we let a logistic function describe the probability of dismissal,

$$\theta(\eta, \tau, L, Z, \boldsymbol{\beta}) = \frac{e^{d(L; Z, \boldsymbol{\beta})}}{1 + e^{d(L; Z, \boldsymbol{\beta})}}. \quad (11)$$

where

$$\begin{aligned} d(L; Z, \boldsymbol{\beta}) = & \beta_0^d + \beta_1^d(\text{ratio\_asset\_debt}) + \beta_2^d(\text{ratio\_arrear\_debt}) + \beta_3^d(\text{ratio\_rent\_mortgage\_inc}) \\ & + \beta_4^d(\text{medical\_debt}) + \beta_5^d(\text{job\_tenure}) + \beta_6^d(\text{inc\_above\_med}) \\ & + \beta_7^d(\text{repeat\_filer}) + \beta_8^d(\text{attorney\_exp}) + \beta_9^d(\text{p\_paylength}) \\ & + \beta_{10}^d(\text{eligible\_7}) + \beta_{11}^d(\text{discharge\_recovery\_rate}) \\ & + \beta_{12}^d(\text{dismiss\_recovery\_rate}) + \beta_{13}^d\eta + \beta_{14}^d\tau. \end{aligned}$$

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

$$\bar{V}(Z, \boldsymbol{\beta}) = \beta_1^D(\text{arrear}) + \beta_2^D(\text{assets}) + \beta_3^D(\text{unsecured\_debt}), \quad (12)$$

where *arrear*, *assets* and *unsecured\_debt* denote a debtor's arrears accumulated on secured debt, assets, and total unsecured debt respectively. This specification allows for the possibility that debtors' payoff outside Chapter 13 decrease with both the amount of debt they carry and the amount of assets that would have otherwise been protected under Chapter 13.

In order to limit the number of parameters to be estimated, we assume that  $\tau$  has a simple power distribution and is independent of  $Z$  so that

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

Finally, we let a normal distribution describe the distribution of  $\eta$ ,

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

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. These bankruptcy outcomes in turn feed back into the expected payoff from a given plan length choice and, therefore, whether a debtor even chooses to file for bankruptcy in the first place and, if so, whether he carries out his



plan in full.

Descriptive statistics for the variables in  $Z$  are reported in Table 3. We discussed some of these variables including assets, arrears, unsecured debt, and repeat filer in the previous section. Regarding the other variables, monthly rent or mortgage payments average a little under \$850 a month, which amounts to about 31 percent of monthly income. For about 8.5 percent of filers, medical debt constitutes over 10 percent of their total debt in default. As noted earlier, this is likely a lower bound given the way we identify medical debt. 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 5 months. A little over 1 percent filers did not hire an attorney. Those who did tended to hire experienced attorneys judging from the number of in-sample cases these attorneys handled, with a mean and median of 94 and 108 cases respectively. The majority of filers proposed long repayment plans (over 4 years), with the proposed recovery rates over 65 percent.

## 7 Results

Tables 4, 5, and 6 present the maximum likelihood estimates of the model's parameters. Specifically, Table 4 presents the maximum likelihood estimates of the parameters of the confirmation probability  $Q(C = 1|L; Z, \beta)$  given by 10, and Table 5 presents the estimates of the parameters of the dismissal probability  $\theta(\eta, \tau, L, Z, \beta)$  given by 11. Since the cases that are not confirmed are dismissed at the outset, one might expect these parameter estimates to have the opposite signs. However, this need not be the case because the dismissal probability is estimated using a subsample of debtors with initially confirmed plans and who have already paid part of their obligations.

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 is 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? Together with the answers to these questions, we can indirectly answer how particular debtor attributes affect creditor recovery rates.

Table 4 indicates that, all else equal, long-term plans are more likely to be initially approved by the trustee than short-term plans. Longer plans typically imply higher proposed recovery rates in our sample. Independent of the proposed recovery rate, the probability that plan is confirmed is higher when the proposed plan length is longer. In addition, as can be seen from Table 5 longer plans make it less likely that the plan is dismissed.

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.

From Tables 4 and 5 it can be seen that having 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 confirmation of the plans, and allowing the plans 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, and

makes it more difficult to pay the arrears in full, and therefore, less likely to pass the feasibility test.

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 longer job tenure. Consistent with this, longer job tenure increases the probability that the trustee will confirm his 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, 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 who is 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 non-strategic cause (for example health problems) is the reason for multiple bankruptcy filings. Although the econometrician does 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 the debtors in the second category are unlikely to propose fair plans.

Having an experienced attorney helps to have a plan confirmed in the first bankruptcy stage, 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 have 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 whether the fee is paid to himself/herself directly by the debtor or by the Chapter 13 trustee. The court then approves only a fee that 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 and hence, less fees that can 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 5 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  $\tau$ , 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  $\eta$  since increases in excess disposable income raise creditors' recovery rate.

We estimate that on average, debtors who file for short-term plans actually experience a less negative shock to annual excess income during bankruptcy, although the variation in experiences for those debtors is considerable. The parameters governing the distributions of  $\eta$  and  $\tau$  are reported in Table 6 and are all statistically significant at the 1 percent level. Figure 5 illustrates the distributions of these shocks for long and short-term filers. Specifically the excess income of debtors with short term plans reduce by \$464 while the excess income of debtors with long term plans reduce by \$704, on average. While these amounts are small, it does not imply that the actual recovery rate will be

close to the proposed recovery rate. The standard deviation of  $\eta$  conditional on a short-term plan is 3217 while the standard deviation conditional on a long-term plan is 3395, 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 be close to zero.

Finally, Table 6 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, the distribution of creditor recovery rates. For example, given that we have identified being a repeat filer as a significant variable in the trustee's confirmation and dismissal decisions, what then 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, in the raw data, one cannot possibly condition on being a repeat filer only while insuring that debtors are otherwise identically distributed in every other dimension. In contrast, the model allows us to create a data 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 how the distribution of recovery rates changes depending on whether, in addition, these debtors are assumed to be repeat filers using the estimated model.<sup>20</sup>

Figure 6, 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 percent of debtors repaying between 0 to 20 percent of their debt. In contrast, only 41 percent of debtors are associated with the lowest recovery rates among first-time filers. More generally, creditors recover 38 percent of what they are owed on average from first-time filers but only 31 percent from repeat filers. Similarly, Figure 6, 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 percent of their debt (arrears being equal to 25 percent of debt corresponds to the 25<sup>th</sup> percentile in the raw data) are associated with a 35 percent average recovery rate, and 44 percent of those debtors repay between 0 and 20 percent of their debt. In contrast, when debtors hold arrears equal to 69 percent of their debt (arrears being equal to 69 percent of debt corresponds to the 75<sup>th</sup> percentile in the raw data), the average recovery rate falls to 25 percent while the measure of debtors repaying less than 20 percent increases by 16 percentage points.<sup>21</sup> 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

<sup>20</sup>See Diermeier, Eraslan, and Merlo (2003) and Eraslan(2008) for alternative applications of this procedure in a political economy context and in a Chapter 11 bankruptcy environment, respectively.

<sup>21</sup>More specifically, we first calculate the 25<sup>th</sup> percentile and the 75<sup>th</sup> percentile of the distribution for the ratio of arrears to debt in default. We then bootstrap a data 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 25<sup>th</sup> percentile of the distribution in the raw data. Next, we repeat this procedure and construct another data of artificial debtors with the values for the ratio of arrears to debt is set to the 75<sup>th</sup> percentile of the distribution in the raw data.

measure essentially determines what debtors can potentially repay depending on the plan length they choose. Debtors in the lowest 25<sup>th</sup> percentile, those with excess income representing 8 percent of their debt, repay 23 percent of what they owe on average. Debtors in the highest 25<sup>th</sup> percentile, those whose excess income represent 19 percent of their debt, are associated with a significantly higher 42 percent average recovery rate.<sup>22</sup>

Figure 7 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 6. 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 percent, with a substantial almost 74 percent of debtors repaying less than 20 percent of their debt and only 3 percent repaying more than 80 percent. At the other extreme, the distribution of recovery rates for “good types” conditions on being a first-time filer, having low arrears, and high excess income relative to debt. This distribution is associated with a much higher 51 percent average recovery rate, with only 31 percent of the debtors repaying between 0 and 20 percent of their debt and 34 percent of debtors repaying at least 80 percent. In sum, comparing Figure 7 to Figure 2, it emerges clearly that specific debtor characteristics have a considerable influence on recovery rates.

## 7.2 Importance of Shocks in Bankruptcy

We saw in Table 5 that shocks  $\eta$  and  $\tau$  played a significant role in the trustee’s reevaluation of previously confirmed cases. In the model, these shocks represent either bad or good luck that affect debtors while in bankruptcy including, for instance, loss of employment, divorce, or unforeseen expenses for basic maintenance. To some degree, we might also interpret these shocks as a stand in for aspects of debtors’ behavior that we are unable to identify due to lack of data. For example, because all of a debtor’s excess income contributes to his bankruptcy plan, he may decide at some later stage to lower work effort wherever employed. Should this result in a loss of income, and because expenses for basic maintenance are fixed, excess income available to repay creditors would then have to fall. While we do not have access to data that can directly confirm this hypothesis, a trustee may decide to dismiss a bankruptcy plan based on his inference that the plan is not being carried out in good faith. This would provide an additional justification for the fact that the likelihood of dismissal decreases with  $\eta$  in Table 5. In either case, however, a question arises as to the importance of subsequent changes in debtors’ conditions, whether truly exogenous or self-generated, for Chapter 13 outcomes.

To answer this question, Table 7 provides a comparison of Chapter 13 outcomes between our benchmark model and the model estimated without latent variables  $\eta$  and  $\tau$ . 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 decline. 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 positive effect resulting from the more favorable characteristics of short-plan filers have. Furthermore, without being affected by changing circumstances while in bankruptcy, all debtors with confirmed plans are eventually discharged. We

---

<sup>22</sup>The method for constructing the data with artificial debtors is similar to that used in creating Figure 6 panels A and B.

find that 81 percent of debtors in our sample are discharged absent shocks as opposed to only 46 percent in the benchmark model. Furthermore, absent any income shocks, debtors are able to repay on average 48 percent of their debt as opposed to 29 percent 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 of these figures focuses on key aspects of Chapter 13 bankruptcy that we have been emphasizing, namely 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  $\chi^2$  test,

$$N \sum_{j=1}^K \frac{[f(j) - \hat{f}(j)]^2}{f(j)} \sim \chi_{K-1}^2,$$

where  $f(\cdot)$  denotes the empirical density function, or histogram, of a given endogenous variable and  $\hat{f}(\cdot)$  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 8, 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  $\chi^2$  goodness-of-fit test does not reject the model at conventional significance levels. Panels B and C of Figure 8 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  $\chi^2$  goodness-of-fit tests cannot reject the model at conventional significance levels. Finally, we can see from Figure 8, panel D, that the shape of the distribution of recovery rates produced by the model matches closely that of the corresponding empirical distribution. The model tends to underpredict somewhat 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  $\chi^2$  goodness-of-fit test does not reject the model at standard significance levels.

## 8 Policy Analysis

Recent changes in 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 state median income 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”<sup>23</sup>. Using the structural model we estimated, we now explore the quantitative effects of such a change on Chapter 13 outcomes.

---

<sup>23</sup>See 11 U.S.C § 1325(b)(4)(A)(ii).

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

Table 8 summarizes the effects implied by requiring debtors with above state median income to file for five-year plans. It should be noted that, following the policy change, debtors who had initially filed for short-term plans, but who no longer have that option, may well decide to exit Chapter 13 altogether rather than file for a five-year bankruptcy plan. Put another way, and recalling equation (2), debtors for whom  $V(L = 3) \geq \bar{V}(Z)$  in the benchmark model may well have  $V(L = 5) < \bar{V}(Z)$  if forced to make the higher payments implied by a five-year plan. Since  $\bar{V}(Z)$  denotes the payoff obtained outside Chapter 13, these debtors would then exit Chapter 13 bankruptcy. In fact, the model indicates that this effect is somewhat muted in this policy experiment as only one percent 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 that above median income debtors all file for five-year plans does not make a financial fresh start more likely for that subset of debtors in addition to not necessarily making creditors better off. In particular, the recovery rate rate increases from 31 to 33 percent. The reason for these findings is that debtors concerned by the policy change had already carefully weighed the decision to file for a short-term plan, given the shocks to which they are subjected in bankruptcy, against the likelihood of having their plans confirmed. As they are required to file for five-year plans, these debtors are now committed to a given level of income for basic maintenance over a longer period. As such, they become less able to postpone dealing with unforeseen shocks which, on average, lead to a greater reduction in excess income than if they had been committed to a three-year plan (recall Figure 5). On net, the leftward shift in the distribution of shocks to excess income offsets the fact that debtors are committed to longer plans so that the policy change has little effect on creditor recovery rates.

We should also note that, although the policy change lowers Chapter 13 filing rate by one percent for above median income debtors, findings in the overall sample are not materially affected. This follows from the fact that debtors whose income exceed state median income do not represent a large fraction debtors in Chapter 13. Specifically, these debtors represent 23 percent 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 risk and 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.<sup>24</sup>

## 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 percent 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.

---

<sup>24</sup>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 US 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 conditioning on the observed distribution of the debtor characteristics.

In principle, this policy change does not necessarily force targeted debtors to remain longer in bankruptcy and, therefore, gets around exposing them to the associated fall in excess income implied by the BAPCPA experiment above. Table 9, however, suggests that when confronted with this alternative policy change, a considerable fraction of debtors (13 percent) now find it optimal not to file under Chapter 13 in the first place. In other words, by requiring a higher proposed recovery threshold in order to obtain confirmation of a case, many debtors find the payoff derived from being in bankruptcy under a given plan,  $V(L; Z)$ , to be less than that from resorting to an outside option. 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 creditor recovery rate under this policy experiment falls slightly from 0.31 to 0.29 for 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 percent 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 now opt 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 repaid 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 make 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 the new BAPCPA law. 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 then chose not to file for Chapter 13 was sizeable. 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. Although our concern in this paper is with understanding what drives Chapter 13 outcomes and, outside Chapter 13, we model the payoff to debtors as an indirect utility, a question remains as to how overall recovery rates are affected by recovery rates outside Chapter 13.<sup>25</sup>

To answer this question, it would be ideal to have access to the kind of detailed micro data we were able to compile for Chapter 13 cases but for Chapter 7 debtors, as well as for debtors to whom state collection laws apply. Such micro data, however, is currently unavailable at this stage. At a more aggregated level, Flynn, Bermant, and Hazard (2002) observe that during the year ended June 30, 2002, in approximately 96 percent of Chapter 7 filings, the case closes without any funds being collected by the trustee and distributed to creditors. From the remaining 4 percent of “asset”

---

<sup>25</sup>Moreover, without additional structure, we cannot at this stage link assumptions about recovery rates outside Chapter 13 to debtors’ payoffs outside that Chapter.

cases that close after disbursement, secured creditors and general unsecured creditors each receive about 25 percent of these disbursements, while the remaining 50 percent of funds are used to cover various costs associated with bankruptcy including trustee and outside attorney fees (13 percent), administrative costs (10 percent), trustee compensation (6 percent), other professional fees and expenses (5 percent) and prior chapter costs (5 percent). In general, studies report a zero percent average return to creditors from Chapter 7 filers. Indeed, this is what motivated BAPCPA to push debtors into Chapter 13 in the first place.

Table 10 presents overall recovery rate calculations based on the assumption that debtors outside Chapter 13 repay either 10 or 20 percent of their debts. The table considers the experiment where above state median income debtors must propose at least a 30 percent 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 10 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 9, 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 Concluding Remarks

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 found that whether debtors are first-time filers, their arrears at the time of filing, and income in excess of that required for basic maintenance, all significantly affected the distribution of creditor recovery rates. The analysis further underscored 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 predicted that the more stringent provisions of Chapter 13 recently adopted into law, in particular those that forced subsets of debtors to file for long-term plans, would not materially affect creditor recovery rates and would not potentially make discharge more likely for that subset of debtors. This finding also emerged 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, as well as our attempt to focus the discussion on BAPCPA, we do not model simultaneously households' bankruptcy and chapter choice decisions. At this point, the payoff 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. For now, we leave this work to future research.



## References

- Aguirregabiria, V., and P. Mira. 2010. "Dynamic Discrete Choice Structural Models: A Survey." *Journal of Econometrics* 156(1), 38-67.
- Athreya, K. 2002. "Welfare Implications of the Bankruptcy Reform Act of 1999." *Journal of Monetary Economics*, 49(8), 1567-95.
- Athreya, K., X. S. Tam, and E. R. Young. 2012a. "A Quantitative Theory of Information and Unsecured Credit." *American Economic Journal: Macroeconomics*, 4(3), 153-183.
- Athreya, K., X. S. Tam, and E. R. Young. 2012b. "Debt Default and the Insurance of Labor Income Risk." *FRB Economic Quarterly*, 98(4), 255-307.
- Chatterjee, S., D. Corbae, M. Nakajima, and J. Rios-Rull. 2007. "A Quantitative Theory of Unsecured Consumer Credit with Risk of Default." *Econometrica*, 75(6), 1525-1589.
- Diermeier, D., H. Eraslan and A. Merlo. 2003. "A Structural Model of Government Formation." *Econometrica*, 71(1), 27-70.
- Domowitz, I. and R. L. Sartain. 1999. "Determinants of the Consumer Bankruptcy Decision." *Journal of Finance*, 54(1), 403-20.
- Drozd, L. A. and J. B. Nosal. 2008. "Competing for Customers: A Search Model of the Market for Unsecured Credit." Working Paper, University of Wisconsin.
- Eckstein, Z. and K. Wolpin. 1989. "The Specification and Estimation of Dynamic Stochastic Discrete Choice Models." *Journal of Human Resources*, 24(4), 562-598.
- Elul, R. and N. Subramanian 2002. "Forum-Shopping and Personal Bankruptcy." *Journal of Financial Services Research*, 21(3), 233-55.
- Fay, S., E. Hurst, and M.J. White. 2002. "The Household Bankruptcy Decision." *American Economic Review*, 92(3), 706-18.
- Filer, L.H., and J.D. Fisher. 2005. "The Consumption effects Associated with Filing for Personal Bankruptcy." *Southern Economic Journal*, 71(4), 837-54.
- Flynn, E., Gordon B., and S. Hazard. 2002. "Bankruptcy By the Numbers: Chapter 7 Asset Cases." *American Bankruptcy Institute Journal*, 21, 22.
- Grant, C. 2003. "Evidence on the Effect of U.S. Consumer Bankruptcy Exemptions." Working paper.
- Gropp, R., Scholz J. K. , and M.J. White. 1997. "Personal Bankruptcy and Credit Supply and Demand." *Quarterly Journal of Economics*, 112(1), 217-51.
- Gross, D.B., and N.S. Souleles. 2002. "Explaining the Increase in Bankruptcy and Delinquency: Stigma versus Risk-Composition." *Review of Financial Studies*, 15(1), 319-47.
- Li, W. 2007. "What Do We Know About Chapter 13 Personal Bankruptcy Filings?" *Business Review*, Federal Reserve Bank of Philadelphia, 4th Quarter.

- Han, S. and W. Li. 2007. "Fresh Start or Head Start? The Effect of Filing for Personal Bankruptcy on Labor Supply." *Journal of Financial Services Research*, 31(2), 123-152.
- Li, W., and P-D.G. Sarte. 2006. "U.S. Consumer Bankruptcy Choice: the Importance of General Equilibrium Effects." *Journal of Monetary Economics*, 53(3), 613-631.
- Lin, E. Y. and M. J. White. 2001. "Bankruptcy and the Market for Mortgage and Home Improvement Loans." *Journal of Urban Economics*, 50(1), 138-62
- Livshits, I., J. MacGee, and M. Tertilt. 2007. "Consumer Bankruptcy: A Fresh Start." *American Economic Review*, 97(1), 402-418.
- Livshits, I., J. MacGee, and M. Tertilt. 2011. "Costly Contracts and Consumer Credit." Working Paper 17448, National Bureau of Economic Research.
- Keane, M. 2010. "Structural vs. Atheoretical Approaches to Econometrics." *Journal of Econometrics*, 156(1), 3-20.
- Nelson, J.P. 1999. "Consumer Bankruptcy and Chapter Choice: State Panel Evidence." *Contemporary Economic Policy*, 17(4), 552-566.
- Norberg, S., and A. Velkey. 2007. "Debtor Discharge and Creditor Repayment in Chapter 13." *Creighton Law Review*, 39(3), 473-477.
- Porter, K. 2011. "The Pretend Solution; An Empirical Study of Bankruptcy Outcomes." *Texas Law Review*, 90, 103-162.
- Rust, J. 1994. "Estimation of Dynamic Structural Models, Problems and Prospects: Discrete Decision Processes," in C. Sims (ed.) *Advances in Econometrics*. Sixth World Congress, Cambridge University Press.
- Sanchez, J. M. 2010, "The IT Revolution and the Unsecured Credit Market." Federal Reserve Bank of St. Louis Working Paper 2012-042B.
- Sullivan, T.A., E. Warren, and J.L. Westbrook. 1999. "As We Forgive Our Debtors." New York: Oxford University Press.
- Sullivan, T.A., E. Warren, and J.L. Westbrook. 2000. "The Fragile Middle Class." Yale University Press. New Haven and London.
- Warren, E. 2003. "Who Uses Chapter 13?" in *Consumer Bankruptcy in Global Perspective* 269, Ian Ramsay ed., Oxford: Hart Publishing.
- Warren, E. 2005. "Illness and Injury as Contributors to Bankruptcy." *Health Affairs(Project Hope)*, W5.
- Wedoff, E. R. 2007. "Major Consumer Bankruptcy Effects of BAPCPA." *U. Ill. L. Rev.*, 31.
- White M.J. 2001. "Bankruptcy and Small Business." *Regulation*, 24(2), 18-20.

**Appendix A:** Derivation of the conditional probabilities associated with recovery rate and discharge outcomes.

There are two basic cases that need to be considered,  $C = 0$  and  $C = 1$ . For ease of presentation, we omit debtors' attributes,  $Z$ , and parameters,  $\beta$ , from the notation in the derivations below. First, when a plan is dismissed outright, it immediately follows that debtors fail to obtain a discharge and that creditors collect nothing under Chapter 13. Hence,

$$P(R, D|C = 0, L) = \begin{cases} 1 & \text{if } R = 0 \text{ and } D = 0 \\ 0 & \text{otherwise} \end{cases} \quad (13)$$

independently of the shocks  $\eta$  and  $\tau$ .

Next, consider the case of proposed plans that are initially confirmed,  $C = 1$ , so that

$$P(R, D|C = 1, L) = E_{\eta, \tau}\{P(R, D|C = 1, L, \eta, \tau)\}. \quad (14)$$

When a plan is initially confirmed by the trustee, the debtor begins Chapter 13 in earnest and will likely experience changing circumstances as he goes through the bankruptcy process. As he is subjected to shocks  $\eta$  and  $\tau$ , a re-evaluation of his plan takes place. The debtor can then exit Chapter 13 and fail to obtain a discharge in two ways: i) his case is dismissed by the trustee, with probability  $\theta(\eta, \tau|L)$ , or ii) if not dismissed by the trustee, he may voluntarily opt out of Chapter 13 (when  $-\min\{X\tau + (L - \tau)(X + \eta), B/(1 - \phi)\} < -X\tau + \bar{V}(Z')$ ). In either case, the observed recovery rate is  $R = \frac{X\tau(1-\phi)}{B}$ , from which we deduce that  $\tau = \frac{BR}{X(1-\phi)}$ . It follows that

$$P(R = 0|C = 1, L) = f_{\tau} \left( \frac{BR}{X(1-\phi)} \right) \frac{B}{X(1-\phi)} \times E_{\eta} \left\{ \theta \left( \eta, \frac{BR}{X(1-\phi)} \middle| L \right) + \left[ 1 - \theta \left( \eta, \frac{BR}{X(1-\phi)} \middle| L \right) \right] \times 1(-P < -X\tau + \bar{V}(Z')) \right\}, \quad (15)$$

where  $P = \min\{X\tau + (L - \tau)(X + \eta), B/(1 - \phi)\}$  and  $1(\cdot)$  is an indicator function that takes the value 1 when the statement in parenthesis is true.

Should a debtor continue and complete his plan once the shocks  $\eta$  and  $\tau$  are realized, because the trustee sees no reason to dismiss it and  $-\min\{X\tau + (L - \tau)(X + \eta), B/(1 - \phi)\} \geq -X\tau + \bar{V}(Z')$ , we observe full debt repayment only if  $X\tau + (L - \tau)(X + \eta) \geq \frac{B}{1-\phi}$  or, alternatively,  $\eta \geq \frac{B - LX(1-\phi)}{(L-\tau)(1-\phi)}$ . Therefore,

$$P(R = 1, D = 1|C = 1, L) = E_{\tau, \eta \geq \frac{B - LX(1-\phi)}{(L-\tau)(1-\phi)}} \left\{ [1 - \theta(\tau, \eta|L)] 1 \left( -P \geq -X\tau + \bar{V}(Z') \middle| \eta \geq \frac{B - LX(1-\phi)}{(L-\tau)(1-\phi)} \right) \right\}, \quad (16)$$

where, as before,  $P = \min\{X\tau + (L - \tau)(X + \eta), B/(1 - \phi)\}$ . When a debtor carries out his plan in full and  $\eta < \frac{B - LX(1-\phi)}{(L-\tau)(1-\phi)}$ , the recovery rate will be such that  $0 \leq R < 1$ . In particular,  $R = \frac{X\tau + (L-\tau)(X+\eta)}{B/(1-\phi)}$  so that, in that case,

$$P(R, D = 1|C = 1, L) = E_{\tau} \left\{ f_{\eta} \left( \frac{R \frac{B}{1-\phi} - LX}{(L-\tau)} \right) \frac{B}{(L-\tau)} \left[ 1 - \theta \left( \frac{R \frac{B}{1-\phi} - LX}{(L-\tau)}, \tau \middle| L \right) \right] \times 1(-P \geq -X\tau + \bar{V}(Z')) \right\}, \quad (17)$$

where  $P = \min\{X\tau + (L - \tau)(X + \eta), B/(1 - \phi)\}$ . This completes the derivation of the likelihood function.

**TABLE 1**

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

**TABLE 2**

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

\*Three-Year Plans are defined as plans less than or equal to 48 Months

**TABLE 3**

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
proposed paylength (months)	55.6	8.78	60	32	60
proposed recovery rate	0.66	0.4	0.6	0.01	1.

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

**TABLE 4**

MAXIMUM LIKELIHOOD ESTIMATES		
<i>Initial Confirmation Probability, <math>Q(C L; Z, \beta)</math></i>		
Parameter	Estimate	Definition
$\beta_0^c$	0.079 (0.391)	constant.
$\beta_1^c$	-0.015 (0.013)	assets as a fraction of debt in default at the time of filing.
$\beta_2^c$	-1.696*** (0.276)	arrears accumulated on secured debt.
$\beta_3^c$	-1.042** (0.492)	rent or mortgage payments as a fraction of monthly income.
$\beta_4^c$	0.011 (0.277)	whether medical debt exceeds 10 percent of total debt in default.
$\beta_5^c$	0.028*** (0.01)	job tenure.
$\beta_6^c$	0.237 (0.181)	whether the debtor's annual income is above state median income.
$\beta_7^c$	-0.388** (0.165)	whether the debtor has previously filed for bankruptcy.
$\beta_8^c$	0.005*** (0.001)	attorney experience in handling bankruptcy cases.
$\beta_9^c$	0.471*** (0.071)	plan length.
$\beta_{10}^c$	0.083 (0.140)	proposed recovery rate.

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

**TABLE 5**

MAXIMUM LIKELIHOOD ESTIMATES		
<i>Dismissal Probability, <math>\theta(\eta, \tau, Z, \beta)</math></i>		
Parameter	Estimate	Definition
$\beta_0^d$	-2.366*** (0.303)	constant.
$\beta_1^d$	0.065*** (0.020)	assets as a fraction of debt in default at the time of filing.
$\beta_2^d$	3.916*** (0.447)	arrears accumulated on secured debt.
$\beta_3^d$	4.046*** (0.830)	rent or mortgage payments as a fraction of monthly income.
$\beta_4^d$	-6.326*** (1.845)	whether medical debt exceeds 10 percent of total debt in default.
$\beta_5^d$	-0.019*** (0.007)	job tenure.
$\beta_6^d$	-0.814*** (0.263)	whether the debtor's annual income is above state median income.
$\beta_7^d$	1.458*** (0.287)	whether the debtor has previously filed for bankruptcy.
$\beta_8^d$	0.006*** (0.002)	attorney experience in handling bankruptcy cases.
$\beta_9^d$	-0.291*** (0.044)	plan length.
$\beta_{10}^d$	0.006 (0.007)	recovery rates to be obtained upon discharge.
$\beta_{11}^d$	-0.856** (0.376)	recovery rates to be obtained upon dismissal.
$\beta_{12}^d$	-0.980*** (0.337)	dollar amount of the shock to excess income.
$\beta_{13}^d$	-1.078*** (0.090)	timing of the shock to excess income.

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

**TABLE 6**

MAXIMUM LIKELIHOOD ESTIMATES		
Parameter	Estimate	Definition
<i>Utility from Dismissal</i>		
$\beta_1^D$	-5.875** (2.463)	arrears accumulated on secured debt.
$\beta_2^D$	-4.470*** (1.662)	assets.
$\beta_3^D$	-0.669 (0.427)	unsecured debt.
$f_\tau(\tau L; \beta)$		
$\beta_3^\tau$	0.546*** (0.027)	parameter of the distribution of $\tau$ when proposed paylength is 3.
$\beta_5^\tau$	0.315*** (0.014)	parameter of the distribution of $\tau$ when proposed paylength is 5.
$f_\eta(\eta L; \beta)$		
$\beta_{0,3}^\eta$	-464.039*** (31.036)	mean of the distribution of $\eta$ when proposed paylength is 3.
$\beta_{1,3}^\eta$	3217.090*** (81.360)	standard deviation of the distribution of $\eta$ when proposed paylength is 3.
$\beta_{0,5}^\eta$	-703.762*** (20.572)	mean of the distribution of $\eta$ when proposed paylength is 5.
$\beta_{1,5}^\eta$	3395.419*** (47.959)	standard deviation of the distribution of $\eta$ when proposed paylength is 5.

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

**TABLE 7**

EFFECTS OF CHANGES IN DEBTORS' CONDITIONS		
Whole Sample	Benchmark Model	Model Without $\eta$ and $\tau$
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 8**

IMPLEMENTING BAPCPA REQUIRED 5-YEAR PLANS		
<b>Above Median Income Debtors</b>	Benchmark Model	Experiment
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	0.48
Mean Recovery Rate	0.31	0.33
<b>Whole Sample</b>		
Confirmation Rate	0.82	0.82
Discharge Rate	0.42	0.41
Mean Recovery Rate	0.28	0.29

**TABLE 9**

IMPOSING A 30 PERCENT RECOVERY RATE THRESHOLD		
<b>Above Median Income Debtors</b>	Benchmark Model	Experiment
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
<b>Whole Sample</b>		
Confirmation Rate	0.82	0.80
Discharge Rate	0.42	0.40
Mean Recovery Rate	0.28	0.27

**TABLE 10**

IMPOSING A 30 PERCENT RECOVERY RATE THRESHOLD				
<b>Above Median Income Debtors</b>	Outside Recovery Rate: <i>0.10</i>		Outside Recovery Rate: <i>0.20</i>	
	Benchmark Model	Experiment	Benchmark Model	Experiment
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 Chap. 13	0.31	0.29	0.31	0.29
Overall	0.35	0.35	0.40	0.40
<b>Whole Sample</b>				
Mean Recovery Rate	0.34	0.33	0.39	0.39

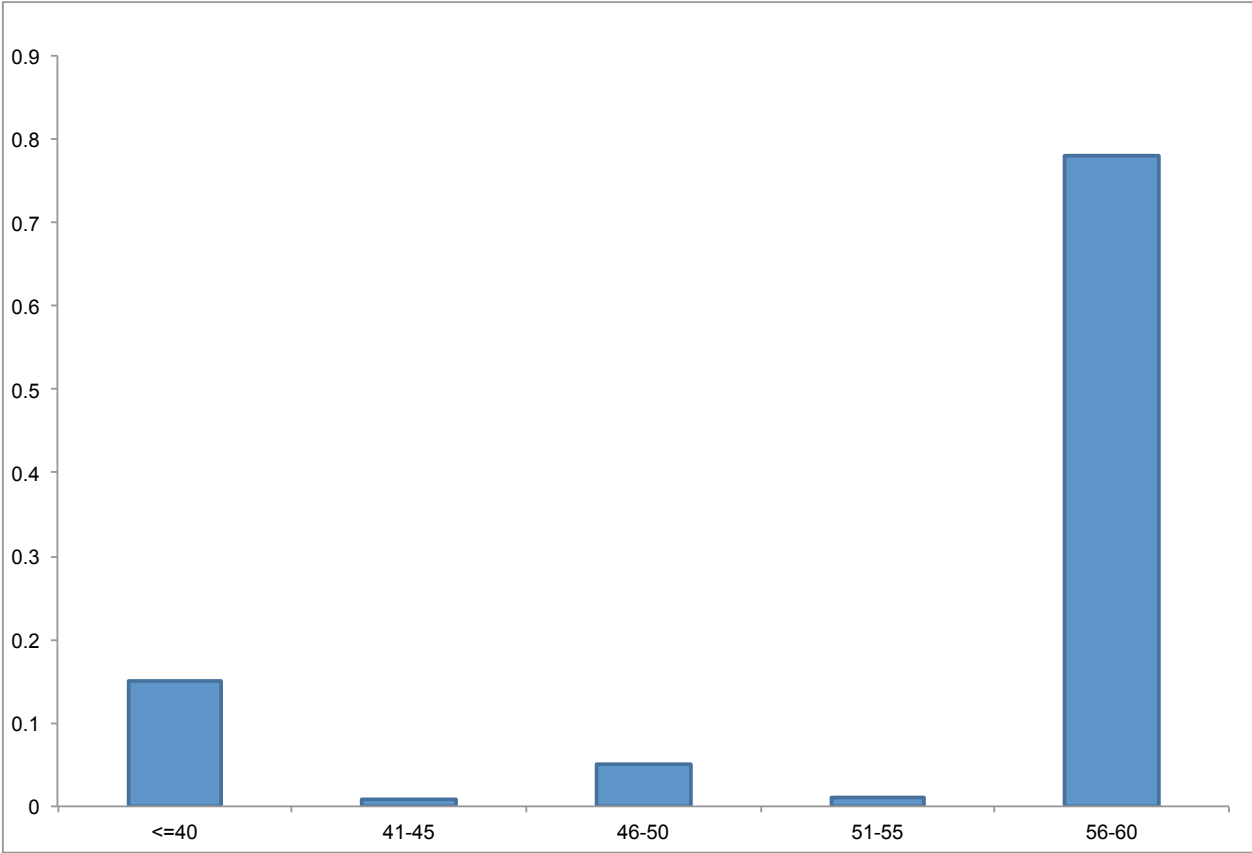
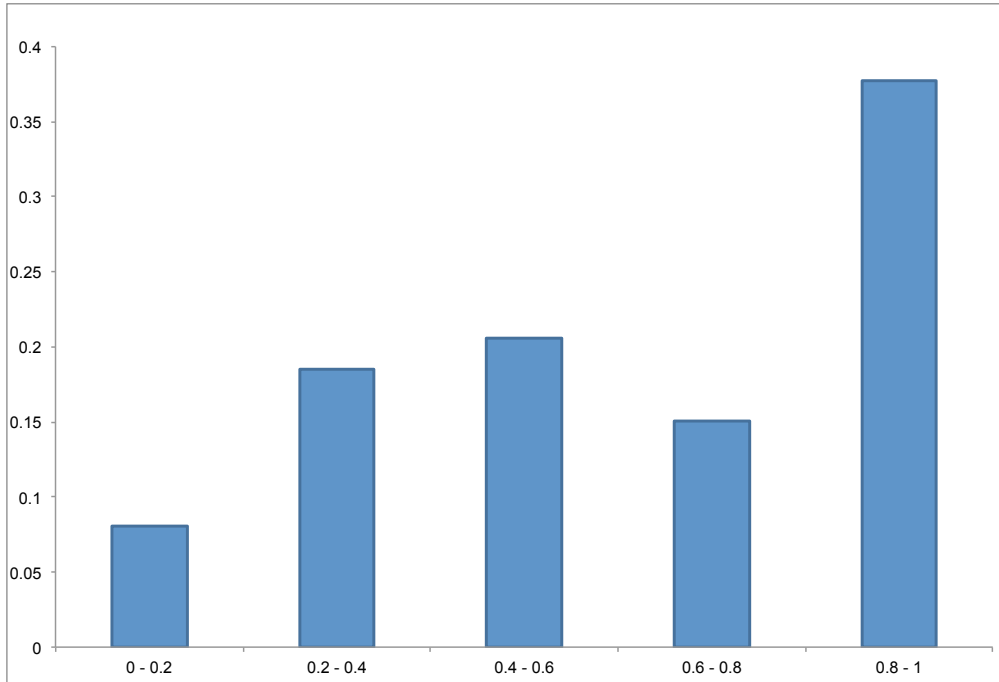
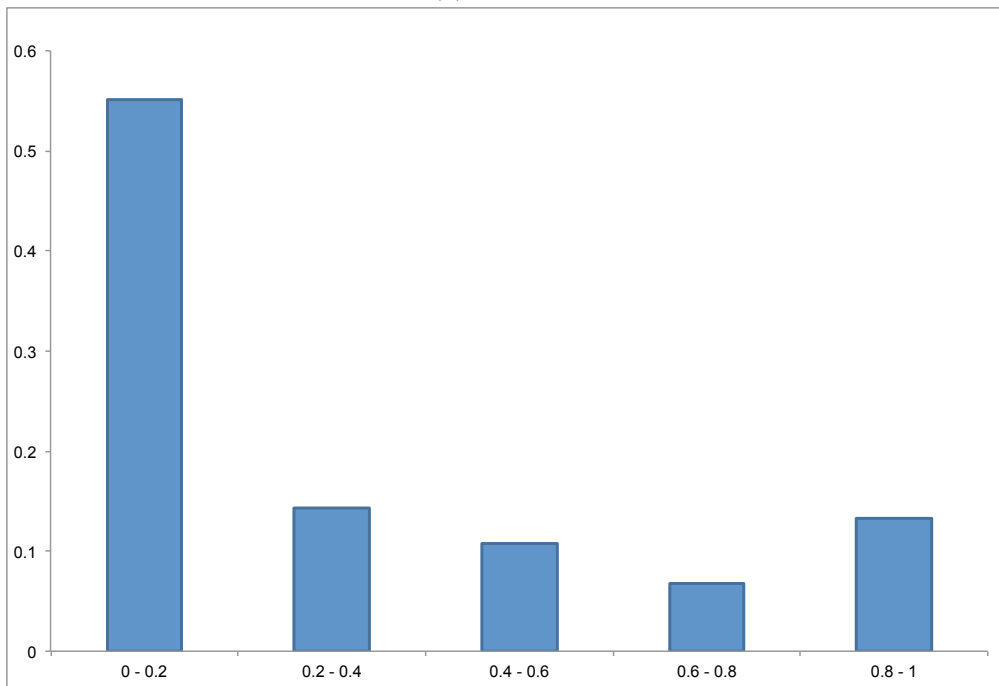


Figure 1: Distribution of Proposed Plan Length

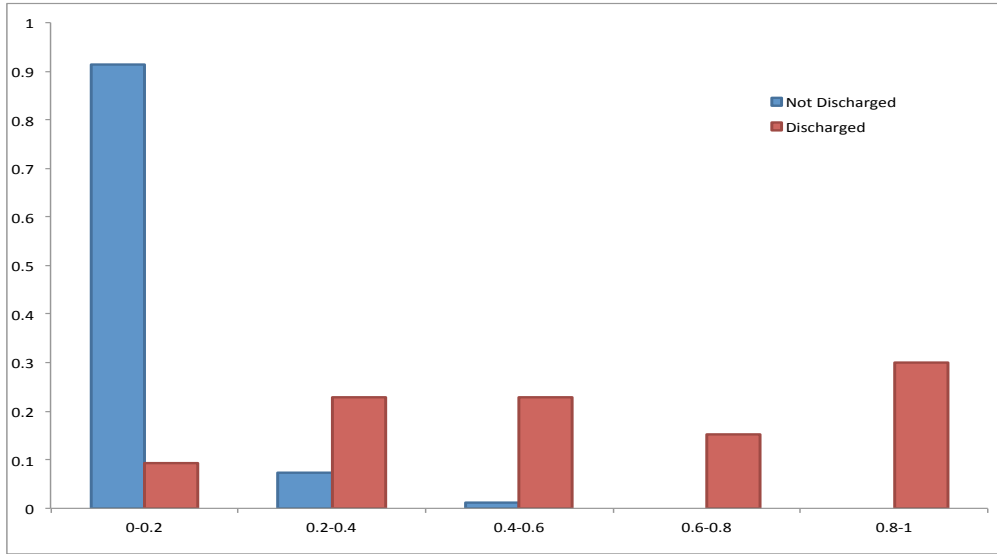


(a) Proposed

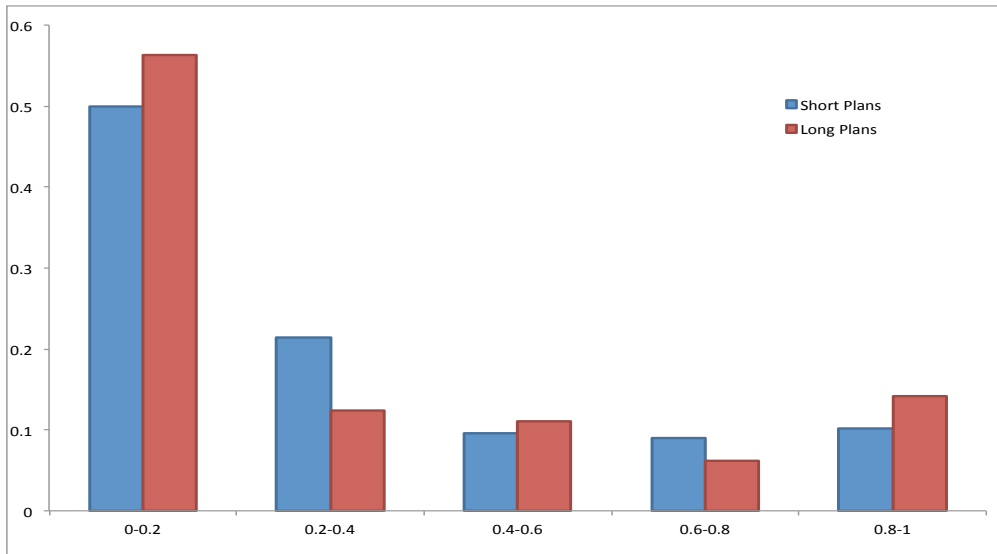


(b) Actual

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

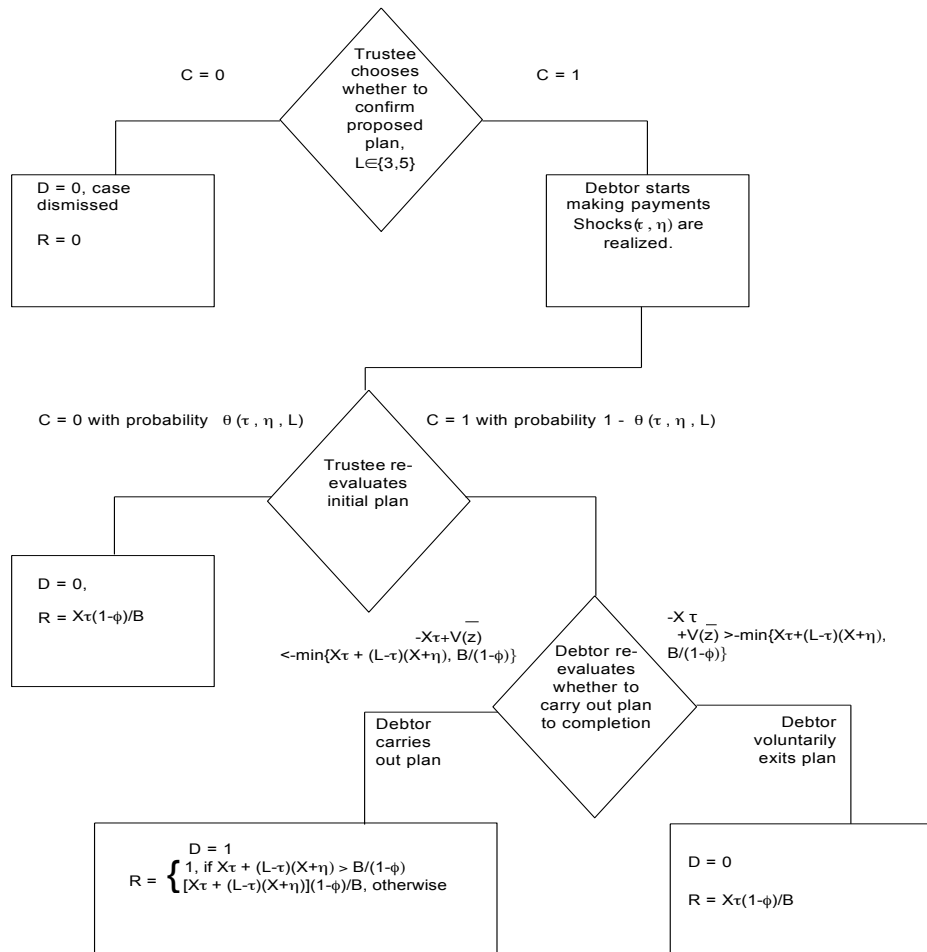


Figure 4: U.S. Personal Bankruptcy Law Under Chapter 13

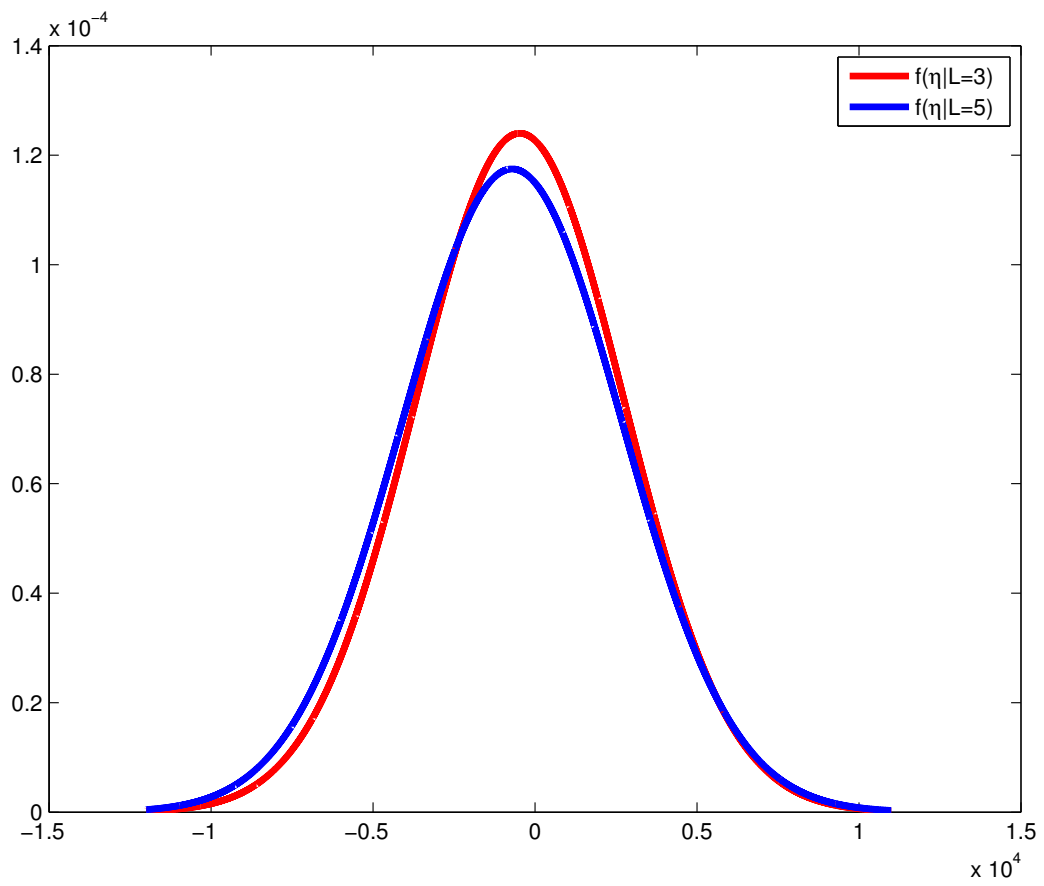
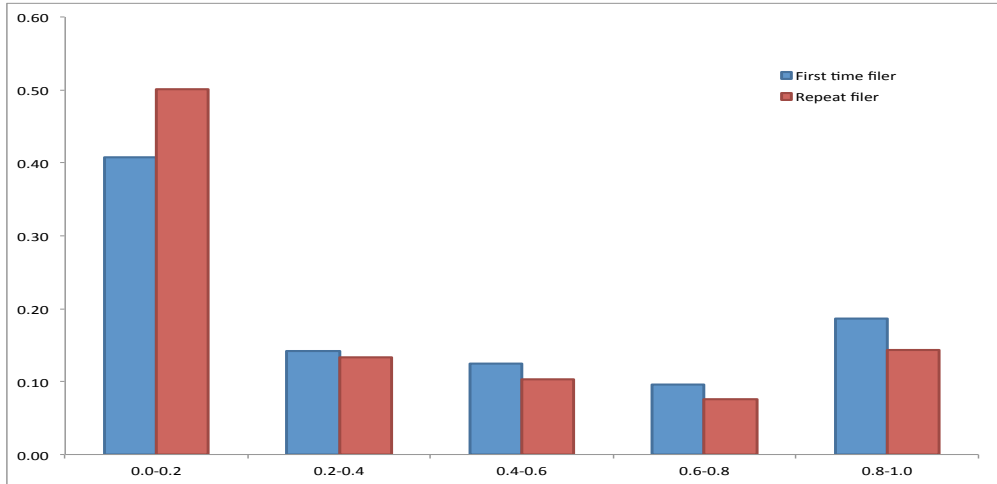
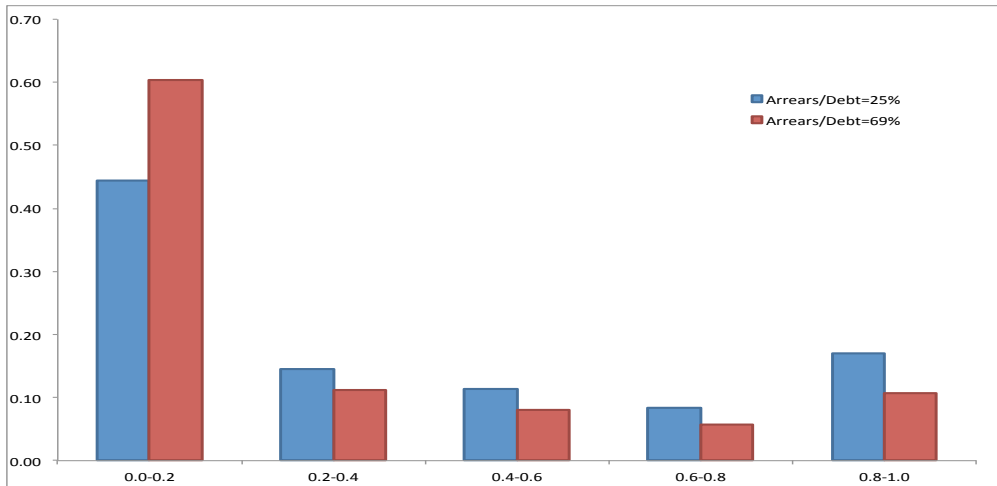


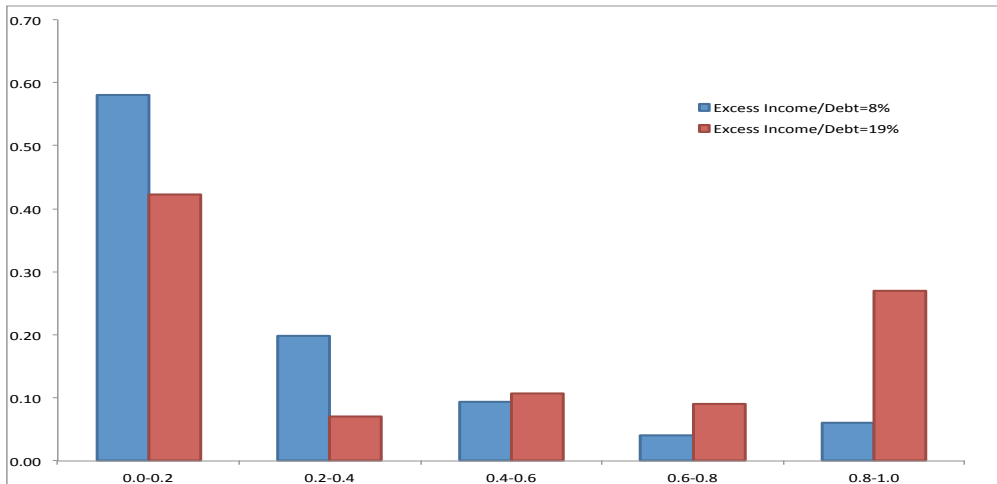
Figure 5: Variations in Debtors' Conditions While in Bankruptcy



(a) Recovery Rate Conditional on Bankruptcy Experience



(b) Recovery Rate Conditional on Arrear Burden



(c) Recovery Rate Conditional on Ability to Pay

Figure 6: Model Generated Conditional Distributions of Recovery Rates

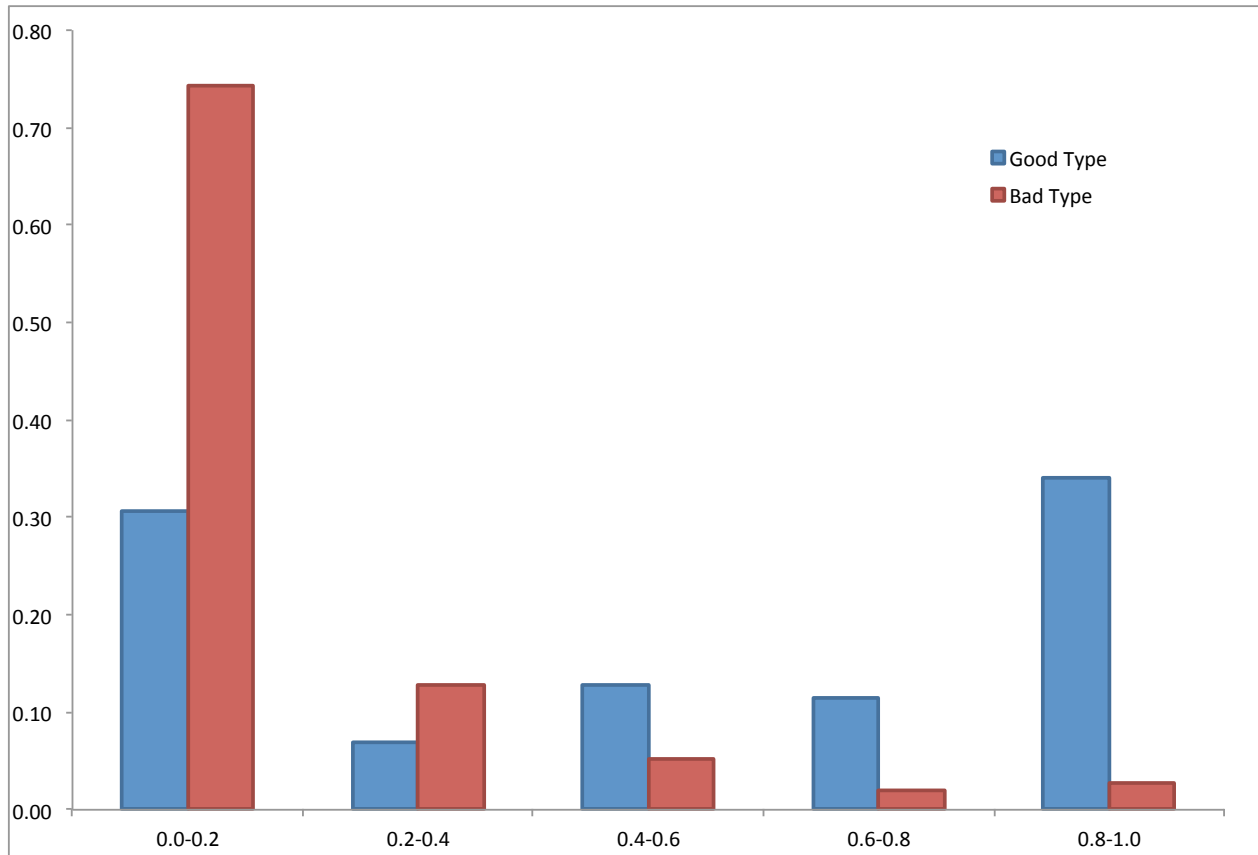


Figure 7: Distributions of Recovery Rates for Extreme Debtor Types



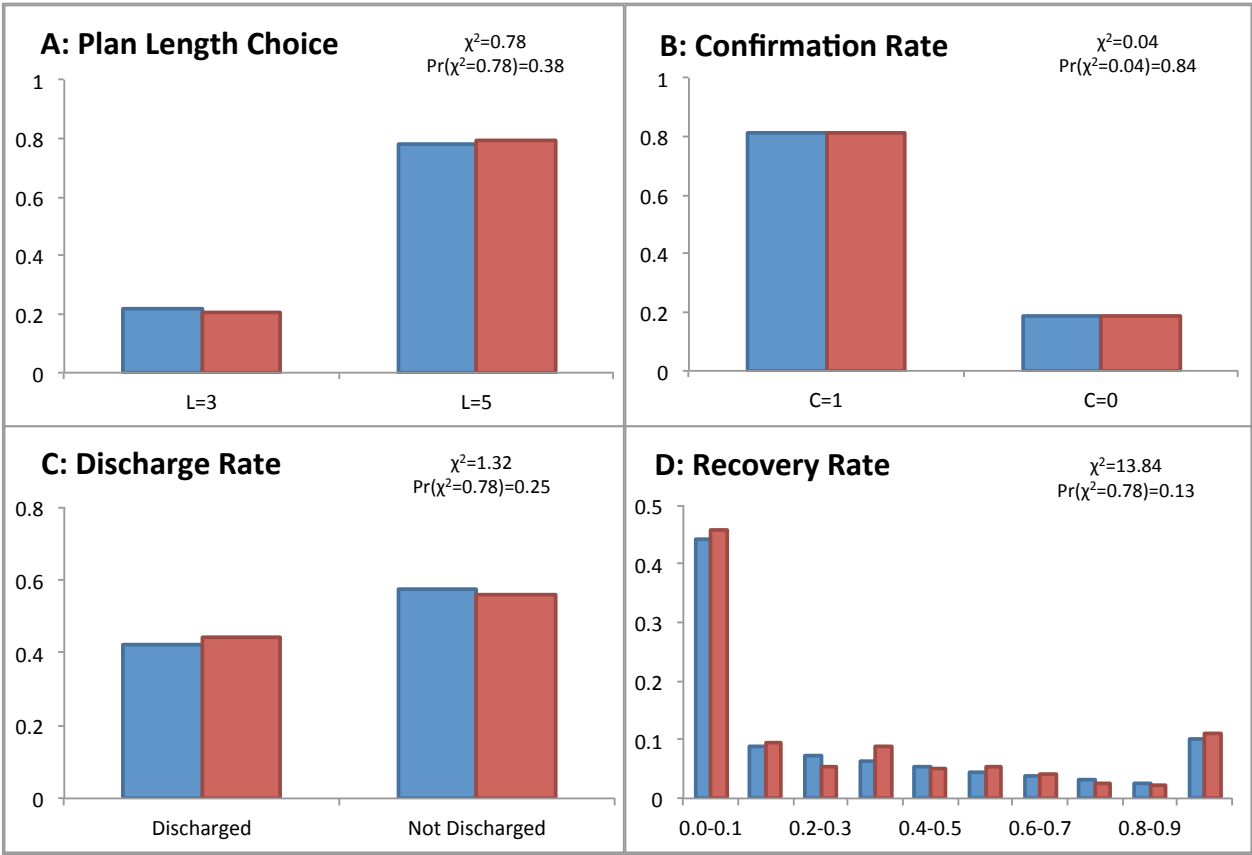


Figure 8: Model Fit: left columns: model, right columns: data