Understanding Personal Bankruptcy Behavior: A Structural Model With Emphasis on Labor Supply and Health Insurance Enrollment Decisions

PRELIMINARY AND INCOMPLETE

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1. Motivation

In 2010, almost one-sixth of the Americans aged between 45 and 53 or their spouses had filed bankruptcy at least once in their lives, among which one-fifth had filed bankruptcy twice or more. Even though bankruptcy filing is a drastic event that millions of Americans face in their lives, this topic is not well studied in the economics literature. To the extent of our knowledge this is the first paper analyzing personal bankruptcy behavior in a dynamic lifecycle framework. We aim to analyze the joint decision of labor supply, consumption, bankruptcy filing and health insurance enrollment using the National Longitudinal Survey of Youth 1979 (NLSY79) data. This allows us to measure the effectiveness of current bankruptcy laws and generate policy recommendations.

Table 4 documents five main reasons for bankruptcy filing: job loss, health care bills, credit misuse, marital disruption and lawsuit/harrasment. All these reasons are built into our model to have a clear understanding of the personal bankruptcy behavior. Specifically, we treat labor supply and health insurance as decision variables and the rest of the documented reasons as stochastic processes.

2. Literature

There is no paper in the literature other than Mahoney (2012) examining the interaction of health insurance and bankruptcy. In his set-up, bankruptcy serves only as an implicit health insurance option. That is an insufficient abstraction when the focus is on understanding the bankruptcy behavior, as in our paper, since health care bills is only one of the many reasons why people file bankruptcy. Moreover, as discussed in Section 3.2.2, health insurance and bankruptcy cannot be used as substitutes for three-fourth of the uninsured. Unlike Mahoney (2012), we analyze the joint bankruptcy and health insurance enrollment decisions.

Gruber (2008) provides a good summary about the uninsured in the U.S. Chakravarty and Rhee (1999) examines the effects of five bankrupcty filing reasons provided in the Panel Study of Income Dynamics (PSID)[1] on the individual bankruptcy decision using a multinomial logit setting. This paper is useful to get a rough understanding of the bankruptcy behavior even though the results are not that reliable since correlations among bankruptcy filling reasons are implicitly assumed to be zero with the choice of the multinomial logit setting.

Chatterjee et al. (2007) present a general equilibrium model with a bankruptcy option and study the steady state properties of such an economy.

Domowitz and Sartain (1999) estimate the bankruptcy choice decisions in a nested logit model using cross sectional data.

3. Background

3.1 Bankruptcy Facts

In our working sample, 15.7 percent of respondents or their spouses filed bankruptcy at least once[2] and 17.8 percent of that group filed for bankruptcy two times or more. We cannot identify the exact number of bankruptcy filings since the question asked has 3 possible answers; "zero", "one" and "twice or more". Only 9.7 percent of the observed bankruptcies is due to a business failure in our sample.

There are two common methods to file bankruptcy: Chapter 7 and 13. Chapter 7 is often referred as "Fresh Start." The bankruptcy trustee gathers and sells the debtor's nonexempt assets and uses the proceeds of the assets to pay holders of claims (creditors) in accordance with the

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[1] These reasons can be found in Table 4.

[2] Note that our working sample is limited to respondents with at most one marriage. See Section 5.1 for details.

provisions of the Bankruptcy Code. That may result in foreclosure of a property. Chapter 13 is a type of debt consolidation which enables individuals with regular income to develop a plan to repay all or part of their debts. Under this chapter, debtors propose a repayment plan to make installments to creditors over three to five years. The most significant advantage of Chapter 13 is the opportunity to save properties from foreclosure. 60.5 percent of the bankruptcies in our sample are type of Chapter 7, and 33.8 percent of Chapter 13. Only 3.5 percent of the observed bankruptcies are due to other types, i.e. Chapters 9,11, 12 and 15. Our current focus is on Chapter 7.

Figure 1: Bankruptcy Age Distribution in NLSY79 for Singles
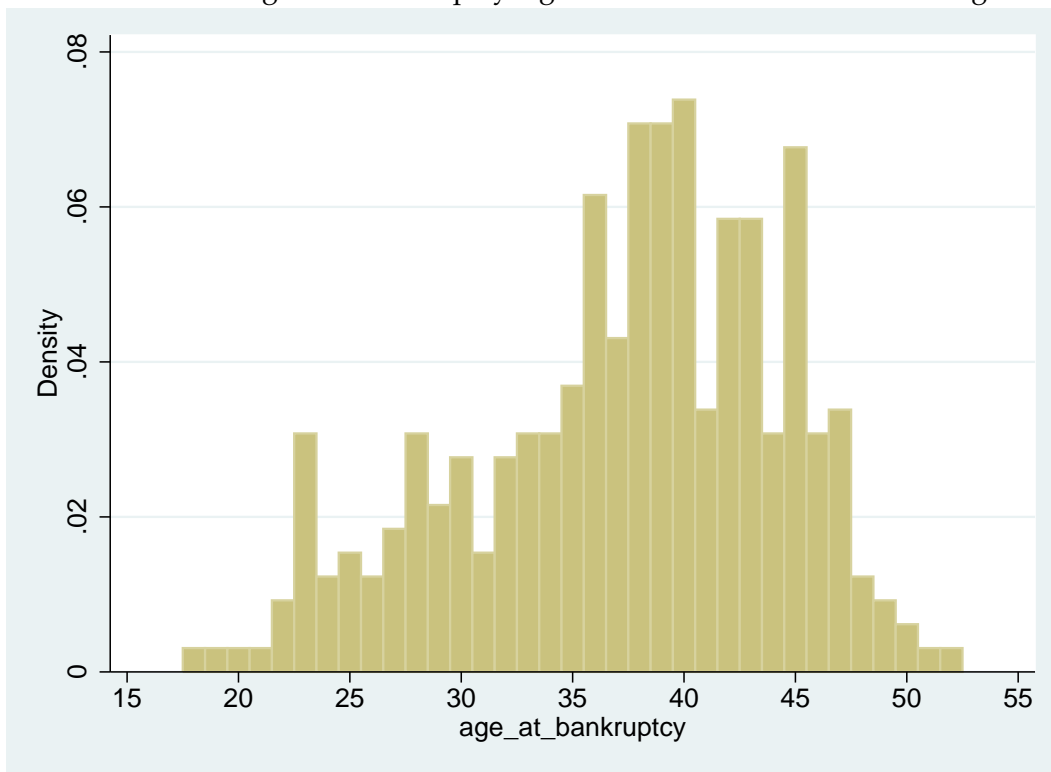
The retrospective bankruptcy question asked in NLSY79 is about the respondent and his/her spouse. If the respondent is single at the time of the survey, we can identify that he/she is the one who filed for bankruptcy. Figure 1 presents the distribution of age at bankruptcy for this group. If the respondent is married both at the time of survey and the year of bankruptcy, we can treat this case as a family decision.[3] Figure 2 provides the age distribution at bankruptcy for such

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[3]Married couples can choose to file joint or individual bankruptcy petitions which brings up questions about the optimal petition type. There is no information in NLSY79 on what type of petitions married respondents filed for bankruptcy. We assume that married couples only file joint bankruptcy petitions throughout this paper.

Figure 2: Bankruptcy Age Distribution in NLSY79 for Married Respondents
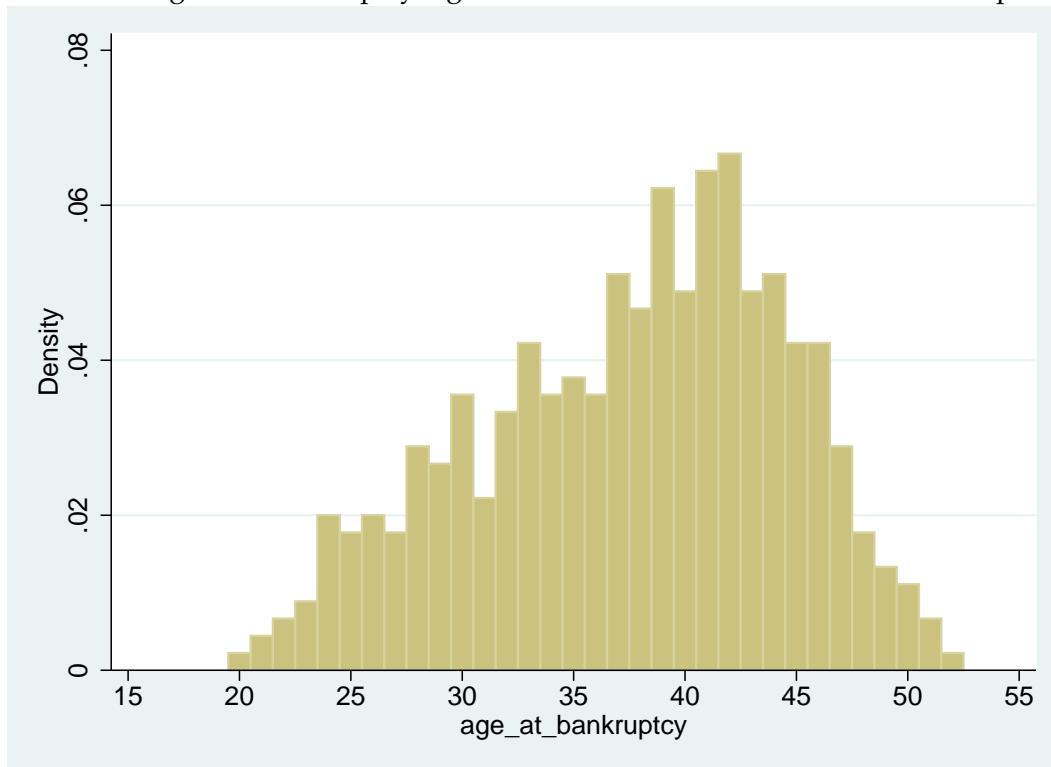
respondents.[4] Note that NLSY79 consists of individuals initially aged $14 - 22$ in 1979 who were $45 - 53$ in 2010. The peak is around the age 40 in both of these figures.

Table 1 provides the summary statistics of some select variables by the number of bankruptcies filed. We see that bankruptcy filing is negatively associated with education and positively associated with being black and female on average.

Table 2 presents the estimation results of a simple logit model to get an idea about the correlation between ever filing bankruptcy and select variables. Even though we observe three different bankruptcy filing categories in the data, we refrain from running a multinomial logit model since the random disturbances of the selection equations for filing bankruptcy once and twice or more should be correlated. Being male and college graduate are negatively and significantly correlated with the bankruptcy behavior.[5] Blacks file for bankruptcy significantly more than whites. This analysis is useful to determine which type variables we should include in our structural model.

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[4]If the respondent is married at the time of the survey and not at the year of the bankruptcy, we cannot identify which spouse filed bankruptcy.

[5]Further investigation showed that there is not any significant difference in bankruptcy filing behavior between respondents having $16 - 17$ and $18+$ years of education (who hold post-graduate degrees).

Table 1: Sample Means (Standard Deviatons) of Select Variables by the Number of Bankruptcy Filing

Variable	Number of Bankruptcy Filing			
	0	1	2+	All
Black	0.308	0.398	0.452	0.324
	(0.462)	(0.490)	(0.500)	(0.468)
Hispanic	0.159	0.169	0.151	0.160
	(0.366)	(0.375)	(0.359)	(0.367)
White	0.532	0.433	0.397	0.516
	(0.499)	(0.496)	(0.491)	(0.500)
Male	0.510	0.405	0.341	0.492
	(0.500)	(0.491)	(0.476)	(0.500)
Highest Years of Education Completed				
11 years or less	0.072	0.095	0.103	0.076
	(0.259)	(0.293)	(0.305)	(0.265)
12 − 15 years	0.624	0.738	0.722	0.642
	(0.484)	(0.440)	(0.450)	(0.480)
16 years or more	0.303	0.167	0.175	0.282
	(0.460)	(0.374)	(0.381)	(0.450)
Sample size	3,789	580	126	4,495

Table 2: Logit Regression of Ever Filed Bankruptcy on Select Variables

Ever declared bankruptcy		
Black	0.361^{***}	0.095
Hispanic	0.140	0.122
Male	-0.479^{***}	0.084
Highest Years of Education Completed		
11 Years or Less	0.149	0.150
16 years or more	-0.702^{***}	0.110
Constant	-1.466^{***}	0.077
Number of Observations	4,495	
Log-likelihood without covariates	-1954.3	
Log-likelihood with covariates	-1899.5	

Notes: 1-) Robust standard errors are presented. 2-) ***: significant at 1 percent. 3-) White is the reference group for race, and 12 − 15 years (high school graduates or college dropouts) is the reference group for education.

The state asset exemption laws for bankruptcy are provided in Table 3 (from Mahoney (2012)). Retirement income is fully exempt almost everywhere. "Wildcard no homestead" is applicable to people who did not use their homestead exemption. "Wildcard" can be applied to any asset.

Table 3: Asset Exemption Laws by State

State	Homestead	Vehicle	Retirement	Other financial assets	Wildcard	Wildcard no homestead	Federal available	Homestead exemptions for town lots in 1920
			Contemporaneous exemptions					
Alabama	10,000	0	Unlimited	0	6,000	6,000	No	2,000
Alaska	67,500	7,500	Unlimited	3,500	0	0	No	n/a
Arizona	150,000	10,000	Unlimited	300	0	0	No	4,000
Arkansas	Unlimited	2,400	40,000	0	500	500	Yes	2,500
California--system 1	75,000	4,600	Unlimited	1,825	0	0	No	5,000
California--system 2	0	2,975	Unlimited	0	19,675	19,675	No	n/a
Colorado	90,000	6,000	Unlimited	0	0	0	No	2,000
Connecticut	150,000	3,000	Unlimited	0	2,000	2,000	Yes	1,000
Delaware	0	0	Unlimited	0	500	500	No	0
District of Columbia	Unlimited	5,150	Unlimited	0	17,850	17,850	Yes	n/a
Florida	Unlimited	2,000	Unlimited	0	2,000	2,000	No	n/a
Georgia	10,000	7,000	Unlimited	0	11,200	11,200	No	1,600
Hawaii	40,000	5,150	Unlimited	0	0	0	Yes	n/a
Idaho	50,000	6,000	Unlimited	0	1,600	1,600	No	5,000
Illinois	15,000	2,400	Unlimited	0	4,000	4,000	No	1,000
Indiana	0	0	Unlimited	0	20,000	20,000	No	600
Iowa	Unlimited	1,000	Unlimited	0	200	200	No	n/a
Kansas	Unlimited	40,000	Unlimited	0	0	0	No	n/a
Kentucky	10,000	5,000	Unlimited	0	2,000	2,000	No	1,000
Louisiana	25,000	0	Unlimited	0	0	0	No	2,000
Maine	70,000	10,000	Unlimited	0	12,800	12,800	No	500
Maryland	0	0	Unlimited	0	22,000	22,000	No	0
Massachusetts	1,000,000	1,400	Unlimited	1,250	0	0	Yes	800
Michigan	7,000	0	Unlimited	0	0	0	No	1,500
Minnesota	200,000	7,600	Unlimited	0	0	0	Yes	n/a
Mississippi	150,000	0	Unlimited	0	10,000	10,000	No	3,000
Missouri	15,000	6,000	Unlimited	0	1,250	1,250	No	1,500
Montana	200,000	5,000	Unlimited	0	0	0	No	n/a
Nebraska	12,500	0	Unlimited	0	0	5,000	No	2,000
Nevada	400,000	30,000	1,000,000	0	0	0	No	5,000
New Hampshire	200,000	8,000	Unlimited	0	8,000	8,000	Yes	500
New Jersey	0	0	Unlimited	0	2,000	2,000	Yes	1,000
New Mexico	60,000	8,000	Unlimited	0	1,000	4,000	Yes	1,000
New York	20,000	0	Unlimited	0	10,000	10,000	No	1,000
North Carolina	13,000	3,000	Unlimited	0	8,000	8,000	No	1,000
North Dakota	80,000	2,400	200,000	0	0	15,000	No	n/a
Ohio	10,000	2,000	Unlimited	800	800	800	No	1,000
Oklahoma	Unlimited	6,000	Unlimited	0	0	0	No	n/a
Oregon	33,000	3,400	15,000	15,000	800	800	No	n/a
Pennsylvania	0	0	Unlimited	0	600	600	Yes	300
Rhode Island	200,000	20,000	Unlimited	0	0	0	Yes	0
South Carolina	10,000	2,400	Unlimited	0	0	2,000	No	1,000
South Dakota	Unlimited	0	500,000	0	4,000	4,000	No	n/a
Tennessee	7,500	0	Unlimited	0	8,000	8,000	No	1,000
Texas	Unlimited	0	Unlimited	0	60,000	60,000	Yes	5,000
Utah	40,000	5,000	Unlimited	0	0	0	No	2,000
Vermont	150,000	5,000	Unlimited	1,400	8,400	8,400	Yes	2,000
Virginia	0	4,000	35,000	0	32,000	32,000	No	500
Washington	40,000	5,000	Unlimited	0	4,000	4,000	Yes	1,000
West Virginia	0	4,800	Unlimited	0	51,600	51,600	No	1,000
Wisconsin	40,000	0	Unlimited	2,000	10,000	10,000	Yes	n/a
Wyoming	20,000	4,800	Unlimited	0	0	0	No	2,500
Federal	18,500	5,900	Unlimited	0	20,450	20,450	n/a	n/a
Averages*	58,821	4,884	298,333	501	6,592	7,073	27%	1,679

Notes: Contemporaneous exemptions for couples filing jointly from Elias (2007) and historical exemptions for couples filing jointly from Goodman (1993). Under contemporaneous law, California residents can choose between system 1 and 2 and residents can choose federal exemptions in states where federal exemptions are available. Wildcard no homestead exemption is available to households which do not take the homestead exemption. For the historical exemptions, states that did not exist and states that had acre-based exemptions are denoted as n/a. States that did not have homestead exemptions are assigned a value of zero.
*Excludes states with unlimited or n/a exemptions.

3.2 The Reasons of Filing Bankruptcy

Table 4 documents the reasons to file for bankruptcy exploiting the 1996 PSID data, which provides retrospective information on bankruptcy filings.[6] We explore these reasons in two categories: insurable risk and uninsurable risk. Health care bills can (at least partially) be insured by purchasing health insurance, while the other four reasons are typically not insurable.

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[6]In obtaining this table, we only consider the respondents aged $31-39$ years old at the time of the survey to have a subsample consistent with the NLSY79 sample. The proportions of the types of bankruptcies (i.e. Chapter 7, 13 or other chapters) observed over time are almost the same with NLSY79. Note that NLSY79 does not provide any information on the reasons to file for bankruptcy.

Table 4: Reasons to File for Bankruptcy

Reason	N	%
1. Job loss	34	19.5%
2. Marital disruption	36	20.7%
3. Health care bills	30	17.2%
4. Debts too high / Credit card misuse	69	39.7%
5. Lawsuit / Creditor Harassment	5	2.9%

3.2.1 Uninsurable Risk

In the model, we include a stochastic wage process with persistence to capture unemployment. If the wage is too low, the agent will choose not to work. We do not model involuntary unemployment at this stage.

The relation between bankruptcy and marital disruption is two-fold. First, having a divorce may cause bankruptcy. This is due to the financial burden a divorce might bring in terms of legal fees, child support, alimony and supporting a household with only one income afterwards rather than two. Moreover, couples having overwhelming debt may have marital problems leading to divorce due to financial stress. Table 5 presents the marriage and divorce rates by the bankruptcy behavior. The divorce rate increases with the number of bankruptcies. While 12.3 percent of the observed divorces for people who ever filed bankruptcy happen in the year of bankruptcy, these people on average stay married for 10.1 years corresponding to an average yearly divorce rate of 9.9 percent. We model marriage and divorce exogenously as a stochastic process and model the financial consequences of them in our model.

Table 5: Marriage and Divorce Rates over the Sample Period by Bankruptcy

# of Filed Bankurptcies	Marriage Rate	Divorce Rate
0	77.5	23.4
1	82.9	34.1
2+	87.3	35.5

The risk associated with credit misuse or lawsuit/harassment is modeled as other expenses in the model.

3.2.2 Insurable Risk

Unlike many other developed countries in the world, the United States does not have universal health care system. This is why health care bills are one of the main reasons for bankruptcy filings

in the U.S.

Cohen et al. (2011) reports that 18.2 percent of the non-elderly population in the U.S. did not have any health insurance coverage at a particular point-in-time during 2010.[7] This corresponds to 48.2 million people. Moreover, 22.5 percent of the non-elderly population were uninsured for at least some part of the year, and 13.3 percent were uninsured for the entire year.[8] These statistics highlight the dynamic nature of uninsurance. Even though the uninsured can get emergency healthcare regardless of their ability to pay in Medicaid participating hospitals with emergency rooms under the Emergency Medical Treatment and Active Labor Act (EMTALA), Kaiser Family Foundation (2011b) reports that the uninsured typically forgo or delay preventive or needed care due to its cost.[9] This may lead to serious health problems later on in their lives. Some of those uninsured who receive emergency treament, and to a much lesser extent non-emergency treatment, are not able to pay their bills and end up filing bankruptcy.[10]

Table 6: Source of Health Insurance (HI)

	Respondent HI	Spouse HI
Provided by Respondent's or Spouse's Employer	86.9%	88.7%
Purchased Directly From an Insurance Company	5.8%	35.2%
Medicaid	5.3%	1.9%
Other	2.1%	4.2%

Table 6 presents the source of health insurance in our sample. It is evident that the health insurance coverage is mostly tied to the employers in the U.S. For married respondents, 71.8 percent of employer provided health insurance is related to their own employers.[11] Around 25 percent of the employers who provide health insurance pay all the premiums.

Medicaid is a means-tested program, targeting mostly children, single mothers, pregnant women, and disabled elderlies. Schneider et al. (2002) reports that less than one-third of low-income parents and one-seventh of low-income childless adults were eligible for Medicaid in

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[7]The reported rate of uninsured in 2010 from our sample is 15.8 percent. The discrepancy is due to the reason that NLSY79 only includes people aged $45 - 53$ in 2010 due to its structure.

[8]These statistics correspond to 59.6 and 35.4 million people, respectively.

[9]Anderson (2007) shows that uninsured are charged 2.5 times more on average than what most public and private health insurers actually pay for healthcare.

[10]Hadley et al. (2008) reports that the cost of the uncompensated care for the uninsured was around 56$ billion to the economy in 2008. Almost 75 percent of this cost was financed by the federal and state government through indirect funds to the hospitals. These funds in fact are not well-targeted to the hospitals providing care more to the uninsured. The remaining portion of the cost is mostly subsidized by private philanthropy, and physians' donated time and forgone profits.

[11]The same statistic is 59.0 percent for spouses.

Figure 3: Health Insurance Enrollment Rates by Asset Levels
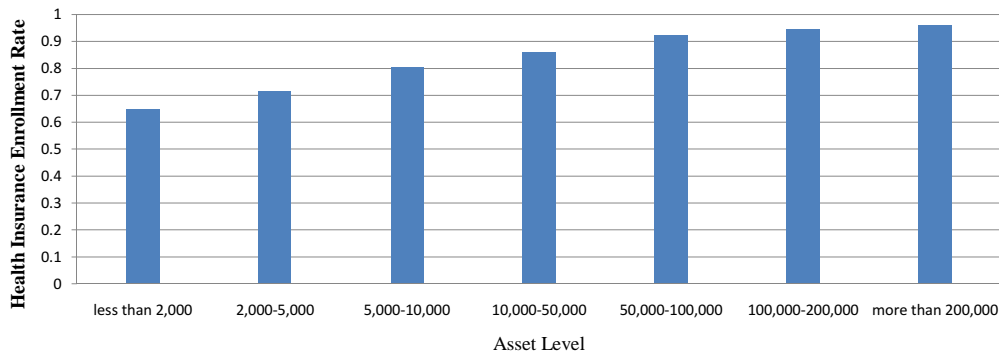
Note: The asset levels are adjusted using CPI-U with 2010 as the base year.

2001.[12] Only 2 percent of the males with a health insurance is covered by Medicaid in our sample.

There are three possible explanations of choosing to stay uninsured. Lack of financial resources to afford a health insurance might be one reason. Secondly, the U.S. insurance market can be actuarially unfair so that some healthy people may choose to stay uninsured rather than paying a health insurance premium. Finally, bankruptcy can be used as an implicit health insurance where the financial risk of being uninsured is capped by the seizable assets.[13]

The likelihood of being uninsured decreases with the asset level as shown in Figure 3. Around 35 percent of the people with an asset level of less than $2,000 are uninsured. Due to their low level of assets, it is possible for them to be short of money in case of a negative shock which might result in bankruptcy filing.

Kaiser Family Foundation (2011a) reports that 61 percent of the uninsured are from families with one or more full-time workers and 16 percent are from families with part-time workers, and most of them are not offered employer-provided coverage. NLSY79 asks about the reason of staying uninsured in 2008 and 2010. The categories are 'cost is too high', 'lost medicaid', 'employer does not offer health insurance', 'lost job', 'divorced', 'refused coverage' and 'other reasons'. The people in the first two categories can be thought as the ones who cannot afford a private health insurance. They constitute 75 percent of the sample, or in other words, at most 25 percent of the sample may choose to use bankruptcy as an implicit health insurance option. This suggests that health insurance and bankruptcy cannot be used as substitutes for most of the uninsured. Table 7 provides further evidence for that demonstrating the health insurance enrollment rates before, in,

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[12]Low-income refers to families with income below 200% of the federal poverty level.

[13]Paternalism and redistribution are the widely accepted arguments for the necessity of bankruptcy.

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Table 7: Health insurance enrollment in, before, or after the year filing bankruptcy.

Category	Before	In	After	Sample Average
Respondent has health insurance	82.0%	83.2%	80.9%	84.3%
Spouse has health insurance	84.2%	84.4%	82.3%	91.1%
Children have health insurance	86.0%	83.3%	84.6%	90.1%

and after the year filing bankruptcy.

3.3 The consequence of filing bankruptcy

In NLSY79 data, conditional on applying for a credit or a loan, the probability of being turned down is 49.2% for those who declared bankruptcy before, 20.1% for others. For those who didn't apply for a credit, the ratio of those who thought of applying but changed their mind in fear of rejection is 28.8% for those who declared bankruptcy before, 13.3% for others.

We model the consequence of filing bankruptcy as a higher interest rate at borrowing and a lower wage as in Chatterjee et al. (2007).

4. Model

We currently focus on male individuals. Consider a male representative with time-invariant characteristics Q seeking to maximize the expected lifetime utility at any age t, living in a state with bankruptcy exemption level, z.[14] The individual characteristics Q includes race (black or white) and education (high school or college). The initial age starts from $t = 18$ for high school graduates and $t = 22$ for college graduates.

4.1 Risks

Each individual faces four different types of uncertainty, some of which are insurable while others not.

The first type of uncertainty is the marital status, $d_t \in \{0, 1\}$, with 1 being married and 0 otherwise (single or divorced). The transition of the marital status, $PD\left(d_t | d_{t-1}, Q, t\right)$, is assumed to be an exogenous and age dependent process. We assume that divorce ($d_{t-1} = 1$, $d_t = 0$) results in losing of half of the present assets or debts A_t.

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[14]We suppress the subscript i to save notation.

The second type of uncertainty is related to health status and medical expenses. The health status, $H_{t-1} \in \{0,1\}$ with 1 being good, evolves according to an exogenous transition process, $PH\left(H_t|H_{t-1}, Q, d_t, t\right)$. The out of pocket medical expenses m_t follows

$$
\begin{aligned}
\ln m_t &= min\left\{ (x_t^m \pi_m + \xi_t^m) + (1-\sigma_j)\left((x_t^m \pi_m + \xi_t^m) - \varsigma_j\right) \mathbb{1}\left\{(x_t^m \pi_m + \xi_t^m) \geq \varsigma_j\right\}, \varrho_j\right\} \quad (1)\\
\xi_t^m &= \phi_m \xi_{t-1}^m + \epsilon_t^m, \ \epsilon_t^m \sim N(0, \sigma_m^2) \quad (2)
\end{aligned}
$$

where σ_j denotes the co-insurance payment, ς_j denotes the annual deductible and ϱ_j denotes the out-of-pocket maximum for health insurance type j.

The third type of uncertainty comes from the labor market. At age t, each individual receives a wage offer w_t,

$$
\begin{aligned}
\ln w_t &= x_t^w \pi_w + \xi_t^w \quad (3)\\
\xi_t^w &= \phi_w \xi_{t-1}^w + \epsilon_t^w, \ \epsilon_t^w \sim N(0, \sigma_w^2) \quad (4)
\end{aligned}
$$

where $x_t^w = \left\{Q, t, t^2, H_t, s_t\right\}$.[15]

The fourth type of uncertainty is summarized by a stochastic other expenses process. These other expenses, o_t, includes expenses involved with credit misuse, or lawsuit or harassment. It is modeled as

$$
\ln o_t = x_t^o \pi_o + \epsilon_t^o, \ \epsilon_t^o \sim N(0, \sigma_o^2) \quad (5)
$$

where $x_t^w = \left\{Q, t, t^2, H_t, d_t, s_t\right\}$.

Only the risk of medical expenses is partially insurable by health insurance. Each individual has access to a private health insurance with premium p_1. With probability $q(w_t)$, each employed individual has a choice to purchase the employer provided health insurance with a premium level p_2.

A married individual receives a deterministic spouse income

$$
\ln(ys_t) = ys(Q, t, w_t) \quad (6)
$$

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[15] s_t is the bankruptcy flag, discussed in the next section.

4.2 Bankruptcy

At age t, the marital status d_t and the health status H_t are first realized. Each individual then receives a wage offer w_t (with ζ_t^w realized) and the realization of the access to the employer provided health insurance $epi_t \in \{0,1\}$. The individual decides whether to take the wage offer ($l_t = 0$) or not ($l_t = 1$). If he works and the employer provides health insurance option ($epi_t = 1$) then he decides whether and which health insurance (private or employer provided) to purchase ($i_t = 0, 1$ or 2), otherwise he decides whether or not to purchase private health insurance ($i_t = 0$ or 1).

The medical expenses shock ζ_t^m and the other expenses shock ϵ_t^o are then realized. At this point each individual decides whether or not to file for bankruptcy ($b_t \in \{0,1\}$) if applicable and the resulting consumption decision (c_t). Upon declaring bankruptcy the debts (m_t and o_t) are discharged, and any excess asset beyong the exemption level is relinquished. Filing bankruptcy is also costly. It incurs a fixed filing cost τ and a higher interest rate $r_b > r$ for borrowing,[16] as well as a potential wage loss in (3).

If at age t, one individual has not filed bankruptcy before, then the bankruptcy status is $s_t = 0$. If this individual decides to file bankruptcy at this age ($b_t = 1$), he carries a bankruptcy flag into next age, $s_{t+1} = 1$. One individual cannot file bankruptcy if already carrying the bankruptcy flag ($s_t = 1$). The bankruptcy flag dissolves at a rate λ. The transition is summarized in Table 8.

Table 8: Bankruptcy status transition

		$b_t = 0$	$b_t = 1$
$s_t = 0$		$s_{t+1} = 0$	$s_{t+1} = 1$
$s_t = 1$	$s_{t+1} = \begin{cases} 0, & \text{with prob } \lambda \\ 1, & \text{with prob } 1 - \lambda \end{cases}$		prohibited

Each individiual faces a budget constraint

$$
A_{t+1} = \begin{cases} A_t' - m_t - o_t - c_t, & \text{if } s_t = 0 \ \& \ b_t = 0 \\ min\{A_t' - \tau, \ z\} - c_t, & \text{if } s_t = 0 \ \& \ b_t = 1 \\ A_t' - m_t - o_t - c_t, & \text{if } s_t = 1 \ \& \ b_t = 0 \end{cases} \tag{7}
$$

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[16] A second bankruptcy cannot be filed within the seven years following the previous one, so it is still possible to get credit.

where

$$
\begin{aligned}
A'_t \;=\; & (1+r\mathbf{1}\left\{s_t = 0 \text{ or } A_t \geq 0\right\} + r_b \mathbf{1}\left\{A_t < 0 \;\&\; s_t = 1\right\}) \left(1 - \frac{1}{2}\mathbf{1}\left\{d_{t-1} = 1, d_t = 0\right\}\right) A_t \\
& + y s_t \mathbf{1}\left\{d_t = 1\right\} + w_t \left(1 - l_t\right) - p_1 \mathbf{1}\left\{i_t = 1\right\} - p_2 \mathbf{1}\left\{i_t = 2\right\}
\end{aligned}
$$

is the asset after the realization of the marital status, the labor supply decision and the health insurance decision.

Each individual also faces a borrowing constraint

$$
A_{t+1} \geq \underline{A}_{t+1} \tag{8}
$$

where $\underline{A}_{t+1}$ is the borrowing limit at age t.

In the case that one individual is not able to finance a positive consumption, he can choose to apply for government welfare program and get the consumption floor c_{min}. In such a case, this individual consumes c_{min} and carries $\underline{A}_{t+1}$ into next age.[17]

4.3 Preferences

The period utility is assumed to be

$$
u_t\left(c_t, l_t\right) = \frac{\left(\left(1 - \rho d_t\right) c_t\right)^{1-\eta}}{1 - \eta} + a_l l_t \tag{9}
$$

where c_t is the household level consumption. Married couples benefit from economies of scale in consumption, $\rho \in \left(0, \frac{1}{2}\right)$.

Age age t each individual solves the following problem

$$
V_t\left(X_t\right) = \max_{l_t, i_t, b_t, c_t} u_t\left(c_t, l_t\right) + \beta V_{t+1}\left(X_{t+1}\right) \tag{10}
$$

where $X_t = \left\{Q, z, A_t, d_{t-1}, d_t, H_t, \xi_t^w, \xi_t^m, \epsilon_t^o, s_t\right\}$ is the set of state variables.

Here Q and z are type variables. We discritize the bankruptcy exemption, z, using 5 grid points. In other words, we have 20 grid points for type variables. In solving the model, we discritize the autoregressive components in the wage process and the medical expenses process into a Markov

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[17]The borrowing limit is negative therefore the welfare program does not provide a "fresh start" as the bankruptcy program.

process with 5 grid points using the Rouwenhorst method (Kopecky and Suen (2010)). The other expenses are discritized into 5 grid points as well. Moreover, we discretize the assets using 10 grid points. Subsequently, we end up with 400,000 state points.[18]

At age 65 the individual retires and starts collecting social security benefit which is a function of the wage offer w_{65}. All individuals become eligible for Medicare at age 65. The terminal utility for a retiree is modeled as

$$b(A_{65}) = b_0 \frac{(A_{65} + 35w_{65} + b_1)^{1-\eta}}{1 - \eta} \tag{11}$$

5. Data

5.1 Individual

There are 12,686 respondents who were $14 - 22$ years old when they were first interviewed in 1979 in the NLSY79 data. Questions about bankruptcy declaration and whether it is related to business failure are asked in 2004, 2008 and 2010. Since we are modeling bankruptcy behavior, we drop 4,499 respondents from the sample without any bankruptcy information.[19] We drop 2,860 respondents who had more than one spouse by 2004, 34 respondents who were interviewed in and had more than one spouse by 2008 but not interviewed in 2004, 6 respondents who were interviewed in and had more than one spouse by 2010 but not interviewed in 2004 and 2008, and drop 656 person year observations having a second spouse after 2004. There are two resons for this. First, we do not have an eloborate model of marriage. Second, the bankruptcy related questions in the sample are asked at the household level retrospectively considering the present spouse. Moreover, for the cases the bankruptcy filed before the current marriage, it is not possible to identify whether the respondent or his/her spouse filed it. We also drop 108 respondents because of inconsistent education information and 1 because of an inconsistent gender response.

NLSY79 does not directly ask if the respondents are disabled or having Medicare due to their health conditions. We want the health insurance to be a choice variable in our operating sample. This is why we need to drop the disabled. NSLY79 asks if the respondent's health limits the kind or amount of work they could do on a job for pay. We assume that the respondents who gave a positive answer to at least one of these two questions in at least one-fourth of the interviews they took are disabled[20] and drop such 495 respondents. NLSY79 does not ask about Tricare coverage,

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[18]$= (Q) \, 4 \times (z) \, 5 \times (A_t) \, 10 \times (d_{t-1}) \, 2 \times (d_t) \, 2 \times (H_t) \, 2 \times (\xi_t^w) \, 5 \times (\xi_t^m) \, 5 \times (\xi_t^o) \, 5 \times (s_t) \, 2.$

[19]In other words, we keep people who are present in any of the 2004, 2008 and 2010 samples.

[20]In doing this calculation, we omit the years of pregnancy for females if they gave a positive answer to one of the

which is provided to family members of the military retirees and active duty service members. However, we observe the weeks spent in the military for the respondents in the data. We assume that the respondents who spent more than 20 weeks in the military in a single year more than one-fourth of the interviews are military members and drop such 117 respondents. Unfortunately, we cannot control for the Tricare insurance through the spouse. We do a robustness check for different cut-off values in determining the disabled and military members.

We drop 15 respondents having insufficient bankruptcy information, and 14 terminal person-year observations without bankruptcy information. Non-U.S citizens living in the U.S. typically have restricted access to the credit market or face different insurance premium levels. For that reason, we drop 222 non-U.S. citizens[21] and respondents with unknown citizenship status. Finally, we drop 16 respondents who resided outside of the U.S. for at least 8 years since 1988.[22] We end up with an operating sample of 4, 495 respondents. If we observe different reported bankruptcy dates for a single bankruptcy case, we use the closest observation to the bankruptcy year to minimize the recall bias. If two bankruptcy dates with a single reported bankruptcy case are far away from each other, we assume that there is a mistake in the reported number of bankruptcies and consider these dates as two separate bankruptcy cases. Best judgment is used in cleaning the ever bankrupt and bankruptcy date variables.

5.2 Variables

We define the correspondent's wage income from NLSY79 as the total income from wages and salary plus the total income from business and farm. The spouse's income is defined in the same way.

5.3 Health insurance

Since 1996, the MEPS (Medical Expenditure Panel Survey) collects state-level health insurance premium data, but a age category. We can get the age-dependent premium data from eHealthInsurance, and then assume linear mapping.

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two questions.

[21]The health insurance enrollment rate is 13 percentage points higher for U.S. citizens.

[22]Residence information before 1988 is only available through restricted geocode data.

6. Estimation

We use indirect inference to estimate the model parameters.

The estimation involves two stages. In the first stage, we model the following data generating processes:

1. The marital status transition process $\{d_t\}$ and the health status transition process $\{H_t\}$.

2. The probability of employer providing health insurance option $Pr(epi_t = 1)$.

3. Health insurance premium, co-insurance payment ratio, annual deductible and out-of-pocket maximum $\{p_j, \sigma_j, \varsigma_j, \varrho_j\}_{j=1,2}$ are estimated from MEPS.

4. The medical expenses process $\{m_t\}$. NLSY79 does not have medical expenses data. We estimate the medical expenses distribution from the MEPS.

5. The other expenses process $\{o_t\}$. NLSY79 has information on credit misuse (debts, credit card balance) and other income.

6. The risk-free interest rates r and r_b, time preference β, and the probability of getting out of bankruptcy status λ will also be pre-set.

7. The bankruptcy exemption level, z, is constructed at the state level.

In the second stage, we apply the indirect inference to estimate the remaining parameters in the model.

6.1 Parameter Estimates

In progress!

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