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Consumer Bankruptcy: A Fresh Start

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Abstract

There has been considerable public debate on the relative merits of alternative consumer bankruptcy rules. The option to discharge one's debt provides partial insurance against bad luck, but by driving up interest rates makes life-cycle smoothing more difficult. We construct a quantitative model of consumer bankruptcy to address this trade-off. We argue that such a model should have three key feature: a life-cycle component, idiosyncratic earnings uncertainty and expense uncertainty (exogenous negative shocks to household balance sheets). We further show that transitory and persistent earnings shocks have very different implications for evaluating bankruptcy rules – while persistent shocks make bankruptcy option desirable, transitory shocks have the opposite implication. Our findings suggest that the current US bankruptcy system may be desirable for reasonable parameter values.

Keywords: Consumer Bankruptcy, Fresh Start, Life Cycle.

JEL Classifications: E21, E49, G18, K35

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Consumer Bankruptcy: A Fresh Start

Abstract

There has been considerable public debate on the relative merits of alternative consumer bankruptcy rules. The option to discharge one's debt provides partial insurance against bad luck, but by driving up interest rates makes life-cycle smoothing more difficult. We construct a quantitative model of consumer bankruptcy to address this trade-off. We argue that such a model should have three key feature: a life-cycle component, idiosyncratic earnings uncertainty and expense uncertainty (exogenous negative shocks to household balance sheets). We further show that transitory and persistent earnings shocks have very different implications for evaluating bankruptcy rules – while persistent shocks make bankruptcy option desirable, transitory shocks have the opposite implication. Our findings suggest that the current US bankruptcy system may be desirable for reasonable parameter values.

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1 Introduction

There has been considerable public debate on the relative merits of alternative consumer bankruptcy rules. In the U.S., this debate has led to the introduction of legislation which would make it more costly for households to declare bankruptcy (see Sullivan, Warren, and Westbrook (2000) for more details). In contrast, public debate in many European countries has led to the introduction of legislation which has made it easier for households to declare bankruptcy. Up until the 1990's, legislation permitting the discharge of consumer debt were non-existent in Germany and most European countries (Alexopoulos and Domowitz (1998), Niemi-Kiesilainen (1997)). The inability to declare bankruptcy meant that unlucky debtors could not discharge their debt, remaining liable for past obligations indefinitely. Recently, a number of continental European countries have introduced limited reforms which allow a partial discharge of debt under certain (restrictive) conditions.

This paper contributes to this debate by quantitatively analyzing two different consumer bankruptcy arrangements. The first system captures key features of Chapter 7 of the U.S. bankruptcy code. We refer to this system as a "Fresh Start" system (FS), since debtors can discharge their debt via bankruptcy and continue their lives free of their existing debt burden. The second system is motivated by a continental European system. In this system, consumer bankruptcy restructures a consumer's debt payments and limits the amount of income that can be garnished from a bankrupt's wage. We term this a "No Fresh Start" system (NFS).

The quantitative evaluation of consumer bankruptcy laws involves an assessment of the magnitude of two opposing forces. On the one hand, bankruptcy weakens agents' ability to commit to repaying their debt in the future which limits their ability to smooth consumption across time. On the other hand, in incomplete markets environments, bankruptcy increases households' ability to smooth across states as it introduces some contingency into debt contracts. The easier it is for consumers to discharge their debt, the greater the insurance against "bad luck" such as divorce, job loss or medical problems. Thus, consumer bankruptcy laws can help consumers smooth their consumption across states at the cost of distorting their ability to smooth over time (see Zame (1993) or Dubey, Geanakoplos, and Shubik (2000)).[1] This trade-off implies that any evaluation of bankruptcy regimes must consider the quantitative costs of borrowing constraints vs. the value of insurance against "bad luck."

We undertake our quantitative analysis using a heterogeneous agent life cycle model. Each period, households realize their labor income, make a consumption-savings decision and decide whether or not to file for bankruptcy, taking the bankruptcy rule as given. A bankruptcy rule specifies the amount that can be garnished from households who default, whether discharge of debt is granted, and the "waiting period" before a second bankruptcy is possible. Households can borrow (and save) via one period non-contingent bonds with perfectly competitive financial intermediaries. Intermediaries are able to observe a household's current income, current level of borrowing and age. An equilibrium result is that the price of debtors' bonds varies with their current income, age and level of borrowing. In this paper, we abstract from durable goods and focus on the market for *unsecured* consumer credit.[2]

An important question is how to model the cost of defaulting. We incorporate two costs that are frequently mentioned in the literature. One punishment is future exclusion from credit markets. In our model, this corresponds to the inability to borrow and save within the default period. However, we do not exclude agents from the credit market for any further periods. Although bankruptcy shows up on a

[1]A related literature has focused on the implications of economies with complete contingent claims markets and limited enforcement (see Kehoe and Levine (1993) and Kocherlakota (1996)).

[2]A study cited by the National Bankruptcy Review Commission (1997, p. 136) reported that 95 percent of Chapter 7 cases yielded no assets which could be liquidated to repay creditors. Moreover, most of the 5 percent of cases that did have assets which could be liquidated were business cases. This suggests that abstracting from the seizure of durable goods is reasonable given that our focus in this paper is on Chapter 7 bankruptcy.

consumer's credit report for 10 years, many banks specialize in lending to former bankrupts. The second punishment is that part of the consumer's income may be seized when bankruptcy is declared. This is intended to capture the "good faith" requirement of the US bankruptcy code, which can be interpreted as requiring a certain time of repayment before a borrower can file for bankruptcy.

The quantitative model is able to replicate the (age-specific) bankruptcy filing rates and the debt-to-earnings ratio in the U.S. economy fairly well. We conduct a variety of experiments to assess whether the FS system is a desirable bankruptcy system for the U.S. The point of comparison is always the system where FS is not an option (NFS). Our findings suggest that, for reasonable parameter values, the FS system may indeed improve welfare in the U.S. We find that the consumption profile is steeper in the FS system, while the variance of consumption is smaller under the FS system for most age-groups. This finding is in line with the intuition that FS facilitates insurance across states, while NFS makes life-cycle smoothing easier.

We find that the welfare conclusion are sensitive to both the nature and extent of uncertainty as well as to the life-cycle profile of earnings and family size. In our model, households face two types of uncertainty: income and expense uncertainty. Expense shocks refer to uninsured medical bills, divorce costs or unplanned children.[3] We find that if we ignore expense shocks, then a bankruptcy arrangement that severely limits the discharge of debt is better than a U.S. Fresh Start system.[4]

We allow both for persistent and transitory income shocks and find that

- larger transitory shocks make NFS more preferable relative to FS.
- the more persistent are income shocks, the more attractive is FS.
- the welfare implications are non-monotone in the variance of the persistent shock.

[3]These shocks are frequently cited by bankrupts as the cause of their bankruptcy.

[4]One caveat is in order. In our experiments, we take the size of expense shocks as independent of the bankruptcy system. This may be important as households may choose not to purchase insurance if they believe that they can discharge the expenses that result if they are unlucky.

Finally, we find that the life-cycle profiles of earnings and family size matter. If the income profile is flat, then FS becomes extremely attractive, as there is less need for borrowing.

Despite the extensive policy debates on the merits of different bankruptcy laws, relatively little work has been done to quantify the uncertainty households face and the effects of alternative consumer bankruptcy provisions. Li (2001) and Repetto (1998) examine two period models where households face uncertainty about their productivity in the second period of their life. Athreya (2000) and Athreya (2002) build on earlier work by Aiyagari (1994) and others to quantitatively analyze the effects of bankruptcy laws in an exchange economy with incomplete markets. Athreya (2002) finds that eliminating consumer bankruptcy would improve welfare, as the gains from relaxing borrowing constraints exceeds the benefits of the insurance provided by bankruptcy. Li and Sarte (2002) introduce production and a partially exempt asset into this framework and analyze the consumers choice of Chapter 7 versus 13. In contrast to Athreya (2002), they find that eliminating the bankruptcy option is welfare reducing in the U.S. However, they conclude that amending the current U.S. bankruptcy code to allow for means testing would lead to small welfare gains.

In addition to expense shocks, a crucial difference between these papers and our work is the modelling of bond prices. Athreya (2000), Athreya (2002), Li (2001), Li and Sarte (2002) and Repetto (1998) assume that all agents can borrow at the same interest rate. This implies that intermediaries could make positive profits by deviating from the equilibrium allocation. To get around this implausible outcome, we allow interest rates to depend on the type of an agent and on the amount borrowed.

Chatterjee, Corbae, Nakajima, and Rios-Rull (2002) also allow interest rates to vary with borrowers' characteristics and find that introducing means-testing into the FS system would lead to welfare gains. There are two main differences between their paper and ours. First, we use a life-cycle model and we argue that this is important for the welfare conclusions. Second, we directly parameterize the expense shocks we feed into our numerical experiments by looking at data on uninsured medical expenses, divorce and unexpected children. Finally, in a similar framework, Pavan (2003) incorporates durables and examines the effects of cross-state variations in exemption levels on bankruptcy filings.

The paper is organized as follows. Some background on bankruptcy in the U.S. is given in section 1.1. Section 2 describes the model. The benchmark parameterization and results are presented in Section 3. In Section 4 we explore the importance of various types of uncertainty. Section 5 concludes.

1.1 Consumer Bankruptcy in the U.S.

This section provides some background information on the details of American consumer bankruptcy law, on the characteristics of a typical bankrupt, as well as on the main causes of bankruptcy reported by bankrupts.

American households can choose between two bankruptcy procedures: Chapter 7 and Chapter 13. Approximately 70 percent of consumer bankruptcies are filed under Chapter 7. Under Chapter 7, all unsecured debt is discharged in exchange for non-collateralized assets above an exemption level. However, debtors are not obliged to use any future income to repay debts. Debtors who file under Chapter 7 are not permitted to refile under Chapter 7 for six years, although they may file under Chapter 13. Filers must pay the bankruptcy court filing fee (roughly $200) and the cost of legal advice which typically range from $750 to $1,500 (Sullivan, Warren, and Westbrook (2000)). A typical chapter 7 bankruptcy takes about 4 months.

Chapter 13 permits debtors to keep their assets in exchange for a promise to repay part of their debt over the next 3 to 5 years. The debtors plan must repay unsecured creditors at least as much as they would have received under Chapter 7. In order to qualify for Chapter 13, individuals must have a regular income and their secured debts must be less than \$807,000 and their unsecured debt cannot exceed \$270,000.

A typical bankrupt is a white lower middle-class woman in her thirties with an extremely high debt-to-income ratio. Sullivan and Warren (1999) report that 40% of all bankruptcies were declared by women, 33% by men, and 28% were joint filings. On average, bankrupt households are 30-50% poorer than the average household. However, debt-to-income ratios are well above average. The main cause of bankruptcy is shocks to income and expenses. Based on a survey of 1991 bankrupts, Sullivan, Warren, and Westbrook (2000) report that 67.5% of fillers claimed the main cause of their bankruptcy to be the loss of a job (multiple responses were permitted). Family issues such as divorce (22.1%), and medical expenses (19.3%) were also frequently cited as the primary cause of bankruptcy (Repetto (1998) reports data from the 1996 PSID with similar results). Other studies have found an even larger role for medical expense. Jacoby, Sullivan, and Warren (2000) study a sample of 1,492 bankruptcies in 1999, and find that 34% of bankrupts owed substantial medical debt while 46% of filers report either a medical reason or substantial medical debt. Domowitz and Sartain (1999) also find that medical debt can account for roughly 30 percent of U.S. consumer bankruptcies.[5]

2 The Environment

We consider an overlapping generations model where households live for J periods. Each generation is comprised of a continuum of households of measure 1. All house-

[5]Fay, Hurst, and White (2002) look at data from the PSID, and regress households bankruptcy decision on a number of potential explanatory variables such as a households debt, income, and assets. They find that including variables such as health problems, unemployment and divorce does not significantly change their results. This leads them to conclude that bad luck is not an important factor in consumer bankruptcies. However, as Luckett (2002) points out, since back luck often affects debts, income and assets directly, the effect of bad luck may be captured in these variables.

holds are ex-ante identical. They maximize discounted life-time utility from consumption. Households face idiosyncratic uncertainty, but there is no aggregate uncertainty. Markets are incomplete: the only assets in this economy are person-specific one-period non-contingent bonds. A crucial element of the model is the households' option to declare bankruptcy.

2.1 Households

Household consume a single good in each period. The preferences are represented by:

$$\sum_{j=1}^{J} \beta^{j-1} u\left(\frac{c_j}{n_j}\right) \tag{2.1}$$

where β is the discount factor, c_j is the total consumption and n_j is the size of a household of age j in equivalence scale units.[6] We assume that $u(\cdot)$ is increasing and concave.

The labor income of household i at age j depends upon its productivity and labor endowment:

$$\begin{aligned} y_j^i &= a_j^i \overline{e}_j \\ a_j^i &= z_j^i \eta_j^i, \end{aligned} \tag{2.2}$$

where a_j^i is the household's stochastic productivity and $\overline{e}_j$ is the deterministic endowment of efficiency units of labor. The household's productivity is the product of a persistent shock z_j^i and a transitory shock η_j^i. The persistent component z is modelled as a finite Markov chain with an age-independent transition matrix $\Pi(z'|z)$. The productivity of an age 1 household is drawn from the stationary distribution. The transitory component η also has finite support and is iid over time.

[6]The importance of changing family size profile in explaining the hump-shaped life cycle consumption profile is widely recognized in the literature (see for example Attanasio and Rios-Rull (1999)).

Households face a second type of uncertainty: They may be hit with an idiosyncratic expense shock $\kappa \geq 0$, $\kappa \in K$, where K is the finite set of all possible expense shocks. The probability of shock κ_i is denoted π_i. An expense shock directly changes the net asset position of a household. Expense shocks are independently and identically distributed, and are independent of income shocks.

2.2 Financial Markets

The borrowing and lending market is perfectly competitive. Financial intermediaries accept deposits from savers and make loans to borrowers. Loans take the form of one period bond contracts. The face value of these loans is denoted by d. Note that d is the amount that is to be repaid, not the amount received today. We use the convention that $d > 0$ denotes borrowing, and $d < 0$ denotes savings. Loans are non-contingent as the face value of the loan is not contingent on the realization of any variable. However, the bankruptcy/default option introduces a partial contingency because households have the option of lowering the face value of their debt via bankruptcy.

When making loans, intermediaries observe the total level of borrowing, the current productivity shock, and the borrower's age. Thus, the interest rate for borrowers can depend upon age, debt level, and current productivity. Let $q^b(d, z, j)$ be the price of a loan issued to a household of age j, with current productivity shock z, and debt d.

Intermediaries solve the static problem of maximizing expected profits every period. They incur a transaction cost τ of making loans, which is proportional to the size of the loan. In equilibrium, perfect competition assures that intermediaries earn zero expected profits on all loans. This implies that the expected value of repayments must equal the cost of the loan to the intermediary. Perfect competition also implies that in equilibrium, cross subsidization of interest rates across different types of borrowers will not occur. Further, the interest rate paid to savers does not depend upon the level of savings and is equal to the exogenous risk-free bond price q^s.

2.3 Bankruptcy

A household can declare bankruptcy. A bankruptcy rule is characterized by:

1. A law of motion for the bankrupt household's debt.
2. A repayment rule that specifies the amount of a household's assets and earnings that can be seized by creditors.

In addition to losing the seized income specified in the bankruptcy rule, bankrupts cannot save or borrow during the default period.[7]

We consider two laws of motion for the debt of bankrupt households. The first law of motion, which we term the **Fresh Start (FS)** system, specifies full discharge of all debts. That is, no seizure of future income is possible. This rule captures the key feature of Chapter 7. As in Chapter 7, we do not allow the households to declare bankruptcy twice within six years. Since households may receive large expense shocks after filing, we assume that households who have large debts but are ineligible to file can "default" but will not have its debt discharged unil six years has passed since its last filing.

The second system, which we term **No Fresh Start (NFS)**, is motivated by European bankruptcy laws.[8] The NFS system captures the idea of life-long liability for debt, a key feature of the traditional bankruptcy laws (or lack thereof) in Europe.[9] In this regime, there is no discharge of debt. Instead, a bankrupt's outstanding debt (i.e. after seizure of income) is rolled over at a specified rate of interest $\bar{r}$. This system resembles a repayment plan under which a bankrupt can retain a given fraction of

[7]Prohibiting saving is meant to capture the seizure of assets in a Chapter 7 bankruptcy. However, we find that this restriction is of little consequence, as most bankrupts have no desire to save.

[8]The natural point of comparison – full commitment environment – is not useful in the world with expense shocks. For sufficiently large expense shocks, no feasible allocation exists in a world with incomplete markets and full commitment.

[9]It should be noted that several European countries have changed their laws in the late 1990s.

their earnings and roll over their debt at a lower interest rate than they could access via the market.

We consider (costless) linear garnishment of earnings during the default period. The total amount garnisheed and transferred to creditors is $\Gamma = \gamma y$, where y is earnings and $\gamma \in [0, 1]$ is the marginal rate of garnishment.

2.4 Timing within the Period

The timing within a period is as follows. At the beginning of the period, each household realizes its productivity and expense shocks. If the household receives an expense shock κ, then the debt of the household is increased (or savings decreased) by κ. The household then decides whether to file for bankruptcy or not. If the household files for bankruptcy, the amount that is garnisheed is deducted from the earnings, and the consumer is allowed to spend the remainder.

Households who declare bankruptcy are unable to save in the period they declared bankruptcy, so they consume all earnings net of garnishment. The new debt level depends on the bankruptcy rule. Households who do not declare bankruptcy choose their net asset holdings for the following period and their current consumption.

2.5 Consumer Problem

At each date, the household chooses whether to default, current consumption and next period's debt (savings), taking the bond price schedule as given. We define the consumer's problem recursively. In the Fresh Start environment, we use four distinct value functions. V is the value of a period that neither follows a bankruptcy nor involves a current bankruptcy while $\bar{V}$ is the value of declaring bankruptcy. Since we assume that bankruptcy cannot be declared two periods in a row[10], we need two

[10]In our parameterization, we assume that each period lasts 3 years. To capture the U.S. code, we thus have to prohibit bankruptcy in the period immediately following default.

more value functions for the period after a bankruptcy: W is the value of the period following a bankruptcy, where a household is not permitted to file again. However, a household may choose to default on the realized value of an expense shock. In this case, the household's current income is garnisheed and its debt is rolled over at the fixed interest rate $\bar{r}$: the value of this state of the world is $\bar{W}$.

The value of repaying debts of an age j consumer with debt d and shock realization (z, η, κ) in a period not following bankruptcy is:

$$\begin{aligned} V_j(d, z, \eta, \kappa) = & \max_{c, d'} \left[u\left(\frac{c}{n_j}\right) + \beta E \max\left\{V_{j+1}(d', z', \eta', \kappa'), \bar{V}_{j+1}(z', \eta')\right\}\right] \\ & \text{s.t. } c + d + \kappa \leqslant \bar{e}_j z\eta + q^b(d', z, j)d' \end{aligned} \tag{2.3}$$

where $\bar{V}$ is the value of bankruptcy:

$$\begin{aligned} \bar{V}_j(z, \eta) = & \ u\left(\frac{c}{n_j}\right) + \beta E \max\left\{W_{j+1}(z', \eta', \kappa'), \bar{W}_{j+1}(z', \eta', \kappa')\right\} \\ & \text{where } \quad c = \bar{e}_j z\eta - \Gamma, \qquad \Gamma = \gamma \bar{e}_j z\eta \end{aligned} \tag{2.4}$$

where W is the value of repaying debts in the period following bankruptcy:

$$\begin{aligned} W_j(z, \eta, \kappa) = & \max_{c, d'} \left[u\left(\frac{c}{n_j}\right) + \beta E \max\left\{V_{j+1}(d', z', \eta', \kappa'), \bar{V}_{j+1}(z', \eta')\right\}\right] \\ & \text{s.t. } c \leqslant \bar{e}_j z\eta + q^b(d', z, j)d' - \kappa \end{aligned} \tag{2.5}$$

and $\bar{W}$ is the value of not repaying debts in the period following bankruptcy:

$$\begin{aligned} \bar{W}_j(z, \eta, \kappa) = & \ u\left(\frac{c}{n_j}\right) + \beta E \max\left\{V_{j+1}(d', z', \eta', \kappa'), \bar{V}_{j+1}(z', \eta')\right\} \\ & \text{where } \quad c = \bar{e}_j z\eta(1 - \gamma), \qquad d' = (\kappa - \gamma \bar{e}_j z\eta)(1 + \bar{r}) \end{aligned} \tag{2.6}$$

When the constraint sets in problems (2.3) and (2.5) are empty, the corresponding value function is equal to $-\infty$.

Let $I_j(d, z, \eta)$ denote the decision to declare bankruptcy of a consumer age j with total debt d and current productivity shocks z, η. In equilibrium, borrowers default only if the value of bankruptcy is *strictly* greater than the value of repayment.

The corresponding problem for the No Fresh Start environment can be stated with a single value function:

$$\begin{aligned} V_j^{NFS}(d,z,\eta,\kappa) = & \max_{c,d',I}\left[u\left(\frac{c}{n_j}\right) + \beta E V_{j+1}^{NFS}(d',z',\eta',\kappa')\right] \\ & \text{s.t. } c + d + \kappa \leqslant \bar{e}_j z\eta + q^b(d',z,j)d', \text{ if } I = 0 \\ & c = (1-\gamma)\bar{e}_j z\eta, \text{ if } I = 1 \\ & d' = \max\{(d+\kappa-\gamma\bar{e}_j z\eta), 0\}(1+\bar{r}), \text{ if } I = 1 \end{aligned} \tag{2.7}$$

2.6 Problem of Intermediaries

Competitive financial markets imply zero expected profits on each loan. Since the law of large numbers holds in our model ex-post realized profits also equal zero. This implies that the price of a bond is determined by the default probability of the issuer and the risk free bond price. Let $\theta(d',z,j)$ denote the probability that a household of age j with current productivity shock z and total borrowing d' will declare bankruptcy tomorrow. Without garnishment and with full discharge of debt, the zero profit condition is $q^b(d',z,j) = (1-\theta(d',z,j))\overline{q}^b$, where $\overline{q}^b\left(=\frac{1}{1+r^s+\tau}\right)$ is the price of a bond with zero default probability. For positive levels of garnishment, this formula needs to be adjusted for how much lenders can recover from a bankrupt. The *bond price for loans under Fresh Start with wage garnishment* is

$$q^b(d',z,j) = (1-\theta(d',z,j))\overline{q}^b + \theta(d',z,j)E(\frac{\Gamma}{d'+\kappa'}|I=1)\overline{q}^b \tag{2.8}$$

where $E(\frac{\Gamma}{d'+\kappa'}|I=1)$ is the expected rate of recovery through garnishment. We follow the convention that when a household defaults, the amount garnisheed is allocated proportionately to the repayment of expense debt and personal bonds.

We need to make further adjustments in the No Fresh Start case as borrowers may be in default for a number of periods. Recall that so long as a household is in arrears, creditors can garnishee a fraction of the earnings in each period. The *bond* *price under No Fresh Start with wage garnishment* is

$$q^{NFS}(d',z,j) = \left[1 - \theta(d',z,j) + \theta(d',z,j)E(\frac{\Gamma + q(d'',z',j+1)d''}{d'+\kappa'}|I=1)\right]\overline{q}^b \quad (2.9)$$

$$\text{where } d'' = \frac{\max\{d'+\kappa'-\Gamma, 0\}}{\bar{q}}$$

The key addition from equation (2.8) is the value of the rolled over household debt $\frac{q(d'',z',j+1)d''}{d'+\kappa'}$. This value is determined by the market value of the rolled over debt.

2.7 Equilibrium

Definition 2.1. *Given a bankruptcy rule and risk-free bond prices $(q^s, \overline{q}^b)$, a recursive competitive equilibrium with Fresh Start is value functions $V, \bar{V}, W, \bar{W}$, policy functions c, d', $I(d,z,\eta)$, a default probability $\theta(d',z,j)$, and a pricing function q^b such that:*

1. *The value functions satisfy the functional equations (2.3) - (2.6), and c, d' and I are the associated optimal policy functions.*

2. *The bond prices q are determined by zero profit condition (2.8).*

3. *The default probabilities are correct: $\theta(d',z,j) = E\left(I_{j+1}(d'+\kappa', z', \eta')\right)$*

Definition 2.2. *A competitive equilibrium with No Fresh Start is defined analogously to above, with the modification that V^{NFS} has to satisfy the functional equation (2.7) and bond prices q^{NFS} are given by equation (2.9).*

Since the value of declaring bankruptcy (2.4) is independent of the debt level and the value of repaying (2.3) is decreasing in the debt level, the bankruptcy decision in a Fresh Start equilibrium follows a simple threshold rule. For every age and income realization, there is a unique level of debt $\bar{d}_j(z,\eta)$ which solves $V_j(\bar{d},z,\eta,0) = \bar{V}_j(z,\eta)$. In equilibrium, households repay their debt d if and only if $d \leqslant \bar{d}$.

This makes proving the existence of equilibrium for the Fresh Start environment quite straightforward. Essentially, given any $\overline{q}^b$, there exists a schedule of bond prices q^b such that intermediaries earn zero profits and the solution to consumer's problem is well defined. A formal proof is provided in Livshits, MacGee, and Tertilt (2003).

We compute the equilibrium prices, value and policy functions by backward induction. We solve the households' problems given the equilibrium prices which incorporate the default decisions in the following period (starting with the last period of life). We compute the optimal decisions using a grid for the possible asset holdings.

3 Benchmark Parameterization and Results

In this section we first outline the choice of benchmark parameter values. We then compare our benchmark experiment to the data and analyze the basic forces at work in our model.

3.1 Benchmark Parameterization

In this section, we briefly outline our choice of functional forms and the benchmark value of our parameters.

Households live for 16 periods. Life begins at age 20 and the length of each of the first fifteen periods is 3 years. The last period corresponds to "retirement" and lasts 6 years. Households face no uncertainty during the terminal period of their life. The period utility function is $u(c) = \frac{c^{1-\sigma}-1}{1-\sigma}$, where $1/\sigma$ is the intertemporal elasticity of substitution. We set the annual discount factor equal to 0.94 ($\beta = 0.94^3$) and $\sigma = 2$. The family size life cycle profile is based on US census data for 1990. We use the average of several studies of equivalence scales (ES), as reported in Fernandez-Villaverde and Krueger (2000), to construct an ES life cycle profile.

The savings interest rate is set equal to 4%, which is the average return on capital reported by McGrattan and Prescott (2000).[11] This implies a risk free return on savings for a three year period of 12.49%. The second component of the borrowing interest rate is the transaction cost. We set this equal to 4%, which is slightly less than the average cost on credit card loans reported by Evans and Schmalnsee (1999).[12] This implies a three year risk free lending rate of $(1.08)^3 - 1 = 25.97\%$.

The parameters associated with bankruptcy, γ, and $\overline{r}$ also need to be specified. The garnishment/repayment rule captures the fact that households typically have to wait some time before defaulting. The U.S. bankruptcy codes specify that borrowers must act in "good faith," so that borrowing and immediately filing for bankruptcy is often denied. The parameter γ is intended to capture this fact by requiring that agents must repay at least some fraction of their debt. Our benchmark value of γ is 0.4. The annual rollover interest rate is set to 20%.

We parameterize the income process using estimates from the literature. The life cycle profile of labor income is based on Gourinchas and Parker (2002). A large literature has estimated the volatility of log earnings using the following structure: The log of the persistent idiosyncratic shock follows an AR(1) process

$$log\, y_j^i = log\, z_j^i + log\, \eta_j^i + log\, g(X_j^i) \tag{3.1}$$
$$ln z_j^i = \rho\, ln\, z_{j-1}^i + \epsilon_j^i$$

where $g(X)$ captures the deterministic component of earnings, $\epsilon_j^i \sim N(0, \sigma_\epsilon^2)$ and $\eta^i \sim N(0, \sigma_\eta^2)$.[13] We set the benchmark annual value of $\rho = 0.99$, $\sigma_\epsilon^2 = 0.007$ and $\sigma_\eta^2 = 0.043$. These values are on the low end of the range of values reported by Storesletten, Telmer, and Yaron (2004), Hubbard, Skinner, and Zeldes (1994), and

[11]This value is slightly lower than the average real return on municipal bonds for the U.S reported by Gourinchas and Parker (2002).

[12]This may slightly overestimate the cost, since lending costs are partially offset by fee charged merchants. This value is comparable to the value used by Davis, Kubler, and Willen (2004).

[13]We are abusing notation here, as the variables defined earlier are discrete, whereas here they are continuous.

Carroll and Samwick (1997).

We have to map these annual values into triennial. For simplicity, we assume that $\rho = 0.99^3$ and that $\epsilon = (1 + \rho + \rho^2) * 0.007 = 0.02$. We discretize the idiosyncratic income shocks using the Tauchen method outlined in Adda and Cooper (2003). The persistent shock is discretized as a five state Markov process, with support $\{z_1, z_2, z_3, z_4, z_5\}$ and age-independent transition matrix $\Pi(z'|z)$. The productivity of an age 1 consumer is drawn from the stationary distribution. When discretizing the transitory shock, we assume that ten percent of the population receives a positive (negative) transitory shock each period, and choose the support to match the variance.

In our experiments, the expense shocks can take three values: $\kappa \in \{0, \kappa_1, \kappa_2\}$. To calibrate the expense shock, we look at data on out-of-pocket medical bills, divorces and unplanned (and unwanted) pregnancies. These expenses are both (i) unexpected and beyond the direct control of a household and (ii) frequently cited by bankrupts as the proximate cause of their bankruptcy. While we provide a brief overview of our estimates of the benchmark value of these shocks below, a more detailed discussion of our methodology can be found in Livshits, MacGee, and Tertilt (2003).

We compute the medical expense shock using data on out-of-pocket spending from the 1996 and 1997 waves of the Medical Expenditure Panel Survey (MEPS) and aggregate data from the US Health Care Financing Administration (HCFA). We also take into account unpaid medical bills (using data from the American Hospital Association (1996)) by attributing a fraction of the discrepancy between medical charges and expenditures to the expense shock for uninsured individuals. The total medical shock is the sum of 1996 and 1997 and our (bootstrapped) estimate of the medical shock for 1998. These shocks are significant, and a small fraction of households have immense medical bills equal to several times average annual income.

Our estimates of the likelihood of "divorce shocks" and "child shocks" are based on aggregate data of the numbers of households, divorces, and unwanted children from 1996 (U.S. Census Bureau (2000)). In calculating the probabilities, we assume these two family events are independent, happen at most once in a 3-year period, and that every household is equally likely to be affected. The annual divorce probability is 1.15%, which amounts to 3.45% per model period. The percentage of U.S. households that is affected by an unplanned and unwanted pregnancy in a given year is 0.355%, which amount to a 1.065% probability in a model period.[14]

Our estimates of the size of these shocks are also based on aggregate date. The cost of a divorce is based on an average legal fee of $5,000 and an estimate of the average loss of economies of scale associated with the breakup of a household.[15] We determine a value for a 3-year divorce shock of $36,558. According to the U.S. Department of Agriculture (1996 annual report), the average annual cost of a young child is $8,000. Assuming that these costs are incurred for 3 years, we have a shock size of $24,000.

Since the divorce and child shock amounts are of similar magnitudes, we combine them into one low expense shock by computing the weighted average. We combine this with households who receive a medical shock of equal size, which are 1.874% of the households. The high expense shock is then solely based on medical bills, and pinned down by the (remaining) right tail of the medical shock distribution.

Table 1 summarizes the expense shocks. The actual values we use are the above values relative to average household disposable income.

[14] We compute the annual number by multiplying total births per household by the fraction of births that people self-report as unwanted, 0.091 (U.S. Census Bureau (2000)).

[15] A typical divorce breaks up a 3-person household into a 1- and a 2-person household, which using data on equivalence scales, implies an effective income drop of 28 percent (Fernandez-Villaverde and Krueger (2000)).

Table 1: Expense Shocks

Shock	magnitude ($)	Magnitude Rel. Avg Income	Probability
κ_1	$32,918	0.264	6.014 % (π_1)
κ_2	$102,462	0.8218	0.46 % (π_2)

3.2 Benchmark Results

The model is quite rich, and can be compared to the data along several interesting dimensions. Table 2 provides results for the benchmark parameters and compares them to U.S. data.[16] In the model, FS is supposed to capture the current U.S. system, while we interpret NFS as a counterfactual experiment: what would happen if bankruptcy option was taken away. We focus on three key statistics: debt relative to household earnings, the fraction of households declaring bankruptcy, and the percent increase in lifetime consumption required to compensate for the difference in welfare between the two policy regimes, equivalent consumption variation (ECV). Here a positive number means that FS is the better system. Our measure of welfare is the ex ante expected utility of an agent about to be born into our economy. All numbers are reported on an annual basis.[17]

Table 2: Benchmark Results

Results	Rule	$\frac{\text{Debt}}{\text{Earnings}}$	Defaults	Better Rule	ECV
Benchmark	FS	7.98%	0.52%	FS	0.045%
	NFS	14.80%	0.33%		
U.S. Data, 1996	FS	8.8%	0.68%	-	-

Our model does fairly well matching the aggregate bankruptcy filings rate as well

[16]One should keep in mind that this is a model of unsecured consumer debt only.

[17]Since each model period corresponds to 3 years, period default rates are divided by 3 while the stock of debt relative to earnings is multiplied by 3.

as the average unsecured debt holdings. The benchmark model implies a debt over earnings ratio of 7.98%. In 1996, unsecured consumer debt in the U.S. was 8.8% of personal disposable income.[18] The lower debt/earnings ratio predicted by the model is reasonable, as 8.8% may overestimate unsecured consumer debt, since it includes some borrowing by small business owners to finance business operations. The benchmark accounts for over three-quarters of the observed bankruptcies, generating an annual default rate of 0.52% compared to 0.68% (673,123 non-business Chapter 7 filings) in 1996. It is worth noting that the number of non-business filings overestimates consumer bankruptcies as it includes filings of unincorporated small businesses.

Table 3: Defaults by Reason

	Low Exp.	High Exp.	No Exp.	Sum
No low Income shock	58.0%	12.9%	5.0%	75.9%
Low persistent income*	6.5%	2.0%	5.3%	13.8%
Low transitory income**	6.6%	1.4%	0.7%	8.7%
Low persistent and transitory	0.7%	0.2%	0.6%	1.5%
Sum	71.8%	16.5%	11.7%	100.0%

* Low persistent income shock = decrease in persistent shock relative to previous period.

**Low transitory shock: lowest of the three possible values.

The pattern of defaults in the model is also broadly consistent with U.S. data. Bankrupts in the model have lower earnings than average. The ratio of the mean income of bankrupts to average household income is 0.55, which is similar to the values reported in Sullivan, Warren, and Westbrook (2000). As can be seen from Table 3, most defaults in the model are accompanied by the realization of a negative expense shock. It is worth noting, however, that most households who receive an expense shock do not declare bankruptcy: Only one in five of households hit by the small expense shock and roughly 50% of the households hit by the large shock declare bankruptcy. This suggests that our expense shocks are not so large that they "force"

[18] We use revolving credit as reported by the Federal Reserve as our measure of unsecured debt.

households into bankruptcy as most households choose to pay the expense shock rather than default.

Our framework also generates several interesting life-cycle implications. As can be seen from panel 1 of Figure 1, our model does a fairly good job of matching bankruptcy rates over the life-cycle.[19] The second panel gives consumption and earnings over the life cycle.[20] In our model consumption tracks earnings fairly closely, as the ability to borrow is limited by the bankruptcy option. The last panel shows that the amount borrowed is hump-shaped in the model. It increases until age 40 and falls continuously thereafter.

In the benchmark economy, welfare is higher under FS than under NFS. This implies that the benefits from increased smoothing across states outweigh the distortion of intertemporal credit markets. The NFS system generates the expected results for defaults (which are lower) and for debt which is roughly double the FS level.

Figure 2 nicely illustrates the trade-off between smoothing across time versus states. The life-cycle consumption profile is somewhat steeper under FS, as the bankruptcy option leads to tighter borrowing constraints than under NFS for the average borrower. On the other hand, the bankruptcy option helps people smooth income across states. Except for the young (where borrowing constraints are especially binding), the variance in log consumption is much lower in the FS system compared to NFS.[21]

Finally, Figure 3 illustrates how the interest rate and the ability to borrow vary over the life-cycle. Consumers in our economy are endogenously borrowing constrained in the sense that even if they increase the face value of the debt, the actual amount

[19]The age-specific filings rates are from Sullivan, Warren, and Westbrook (2000) who use data from their Consumer Bankruptcy Project II (1991, 600 cases, four bankruptcy districts).

[20]Data is from Gourinchas and Parker (2002).

[21]Young people do not benefit much from the bankruptcy option, as they hold little debt which could be discharged.

received does not increase further. In other words, beyond a certain amount, they face an infinite interest rate. Figure 3a shows that the maximum amount that people can borrow is hump-shaped over the life cycle.

Since the interest rate varies with the amount borrowed, there is not a single interest rate for each age group. Instead, we calculate average interest rates by age for a *fixed loan size*. Figure 3b gives such an interest rate life-cycle profile for 4 different loan amounts. The u-shaped interest profiles might seem counter-intuitive as bankruptcy rates are hump-shaped and one might have expected the interest schedule to follow the same patten. Note, however, that one reason for the low default rates for older people is due to the fact that people in these age groups are borrowing very little precisely because borrowing is so expensive. In other words, if old people *were* borrowing as much as people in the middle age groups, then their default rates would be much higher. Middle-aged people, on the other hand, can borrow a given amount at the lowest cost because they have the highest income, and hence repay a bigger fraction of their debt, even if in default (recall the linear garnishment).

4 Importance of Uncertainty and Life Cycle

A key point of this paper is that an evaluation of bankruptcy regimes is sensitive both to the nature and the magnitude of the idiosyncratic uncertainty and to the life-cycle considerations. We now summarize several experiments that shed light on this point.

4.1 Expense Uncertainty

We find that expense uncertainty plays a crucial role in evaluating alternative bankruptcy regimes. When we set expense shocks to zero, life-long liability for debt (NFS) is preferable to permitting the discharge of debt (FS). However, if expense shocks are sufficiently high, then FS is preferable to NFS. In Figure 4, we display two sets of experiments: scaling the magnitudes of both shocks (κ_1, κ_2) and scaling the probabilities (π_1, π_2) by a factor. Fresh Start becomes relatively more attractive as the size of the shock increases (and the attractiveness of FS increases faster in the size of the shock than in the probabilities[22]).

We also find that how we model expense shocks matters. One could argue that expense shocks such as divorce should be proportional to the persistent component of earnings. This concern may be important, as we find that if both expense shock are made proportional (keeping the probabilities and the average size of the shock unchanged), then NFS is better than FS by 0.54% of ECV. The MEPS data, however, suggests that out-of-pocket expenditures are highest for the lowest and the highest earning quintiles. With this in mind, we ran an experiment in which only the small expense shock was proportional to earnings, and found that the advantage of NFS relative to FS came down to 0.13% of ECV.

These findings have two important implications. First, they suggest that it is not implausible that the debt discharge provision in the current U.S. bankruptcy law may be welfare improving. This conclusion differs from that of Athreya (2002) (and others), who abstracts from the expense uncertainty and finds that eliminating bankruptcy in the U.S. would increase welfare.[23] Moreover, our findings lends support to the views advanced by sociologists and lawyers such as Sullivan, Warren, and Westbrook (2000) that bankruptcy plays an important role in providing a safety net against bad luck for Americans.

Secondly, it is important to point out that incorporating expense shocks into an incomplete markets model requires the use of an equilibrium concept which permits default *along the equilibrium path*. When expense shocks are sufficiently large, some people will be simply unable to repay the realized values of expenses (or save enough a priori). The only way to have a non-empty set of feasible allocations is to provide

[22]Note that the expected value of the shock is constant along vertical lines on the graph.

[23]It should be noted that Athreya (2002) also differs from our model in the pricing of debt.

a way for these unlucky people to default on their realized obligations.

4.2 Earnings Uncertainty

Transitory Shocks

Transitory shocks to earnings have little effect on life-time wealth and can be smoothed over time. This makes ability to smooth intertemporally relatively more important than having an option to walk away from debt. As a result, an increase in the variance of temporary shocks would makes NFS more attractive relative to FS.

This intuition is reflected in our experiments. Increasing the variance of the transitory shock η makes NFS more attractive relative to FS.

Table 4: Effects of the Transitory Shock

Var. (σ_η^2)	0	0.014	0.022	0.031	0.043	0.055	0.086	0.129
ECV, %	0.5576	0.3793	0.2974	0.1913	0.0451	-0.1146	-0.5200	-1.0993

The other variables move as one would expect. Under FS, borrowing at first rises as the variance of transitory shocks increase. However, for variances above the benchmark, borrowing declines as households seek to self-insure against the increase in uncertainty. In contrast, borrowing rises monotonically under NFS with the variance in transitory shocks. Bankruptcy filings also rise monotonically, although the change in filings is very small.

Persistent Shocks

Unlike transitory shocks, persistent earnings shocks cannot be easily smoothed over time. Hence, households facing large persistent income shocks tend to favor the insurance aspect of the Fresh Start regime over the intertemporal smoothing aspect of the No Fresh Start. This mechanism becomes more pronounced as persistence of the shock increases. This is illustrated by the results of the experiments reported in

Table 5. Holding the variance of the innovation fixed, increasing the persistence of the income process tends to make FS more attractive relative to NFS. The intuition is that as ρ increases, the "wealth" effect of income innovations become larger. As a result, the value of being able to discharge debt after negative income realizations becomes larger.

Table 5: Effects of the Persistent Shock: ECV FS over NFS, %

$\sigma^2 \backslash \rho$	0.98	0.99	0.995
0.001			-0.088
0.005		-0.084	0.083
0.01		-0.036	0.356
0.02	-0.270	0.045	0.897
0.03	-0.398	0.046	
0.04	-0.562		

The effect of an increase in the variance of the persistent income shock is more nuanced. So long as households hold significant debt, an increase in the variance makes FS more attractive relative to NFS. However, when the variance gets very large, households tend to borrow very little or even accumulate some precautionary savings. In such a world, the insurance advantage of the Fresh Start regime weakens as households have little or no debt on which to default after the realization of a bad earnings shock. This effect can be seen in the first column of Table 5, where increasing the variance makes the Fresh Start relatively less attractive.

4.3 Importance of the Life Cycle

Finally, we provide two experiments that demonstrate that the life-cycle dimension is very important. This shows that a welfare comparison based on a model without a life-cycle component needs to be interpreted with caution.

First, suppose that family size did not vary over the life cycle. This makes FS

Table 6: Importance of Life Cycle Profile

		debt/gdp	bankruptcies	ECV
flat family profile	FS	8.46%	0.517%	– 0.18%
	NFS	16.20%	0.312%	
flat income profile	FS	4.18%	0.423%	+0.57%
	NFS	6.43%	0.143%	

less attractive relative to NFS, because ignoring the hump-shaped family size profile increases the desire of the young to borrow against future high earnings. Note that while aggregate borrowing does increase under FS, it goes up by more in the NFS economy.

Suppose instead that the labor income profile were flat, i.e. there was no life-cycle aspect to earnings. This makes FS much more attractive relative to NFS. The logic is the same: with a flat income profile, there is no need to smooth over time. This is reflected in a much lower level of debt relative to the benchmark economy and a reduction in the ratio of FS to NFS debt.

5 Conclusion

In this paper, we develop a formal model of consumer bankruptcy with a competitive lending market for unsecured credit, and use it to quantitatively analyze different consumer bankruptcy rules. Our model generates interest rates that differ across types of consumers and also depend on a consumer's total debt. For reasonable parameter values, we are also able to match the level of unsecured consumer debt and bankruptcy filings rates fairly well.

There are two key messages with regards to the evaluation of bankruptcy regimes. The first is that the welfare comparison of bankruptcy regimes varies with both the nature and extent of uncertainty that households face over the life cycle. We find that incorporating expense shocks lends some support to the view that the fresh start provisions of the U.S. bankruptcy act is welfare improving. We also find that the life-cycle plays a key role in our analysis. We feel that further work on both improving our measurements of uncertainty and on the details of the modelling the bankruptcy rules might be needed before one can take a stand on the proposed changes to U.S. bankruptcy legislation.

It is also worth noting that there are several aspects which we have abstracted from which deserve attention in future work. One is the extent to which bankruptcy rules affect households' decisions to insure against (or to take actions to mitigate against) expense shocks. This might imply that the shock process itself is endogenous to the system. A second is the effect of durable assets (such as houses, cars) on the market for unsecured credit. While most Chapter 7 bankrupts own no exempt assets, the existence of secured assets may still affect a household's ability to smooth consumption in response to transitory shocks to income and wealth. This is a topic we hope to explore in future work.

References

Adda, J., and R. Cooper (2003): *Dynamic Economics.* MIT Press, Cambrudge, Massachusetts.

Aiyagari, S. R. (1994): "Uninsured Idiosyncratic Risk and Aggregate Saving," *Quarterly Journal of Economics*, 109, 659–84.

Alexopoulos, M., and I. Domowitz (1998): "Personal Liabilities and Bankruptcy Reform: An International Perspective," *International Finance Journal*, 1, 127–159.

Athreya, K. (2000): "Bankruptcy Exemptions, Consumption, and Interest Rates in an Incomplete Insurance Economy," Federal Reserve Bank of Richmond, mimeo.

——— (2002): "Welfare Implications of the Bankruptcy Reform Act of 1999," *Journal of Monetary Economics*, 49, 1567–1595.

Attanasio, O., and J.-V. Rios-Rull (1999): "Consumption Smoothing in Island Economies: Can Public Insurance Reduce Welfare?," University of Pennsylvania, mimeo.

Carroll, C., and A. Samwick (1997): "The Nature of Precautionary Wealth," *Journal of Monetary Economics*, 40(4), 41–71.

Chatterjee, S., D. Corbae, M. Nakajima, and J.-V. Rios-Rull (2002): "A Quantitative Theory of Unsecured Consumer Credit with Risk of Default," *University of Pennsylvania, mimeo.*

Davis, S. J., F. Kubler, and P. Willen (2004): "Borrowing Costs and the Demand for Equity Over the Life Cycle," *mimeo.*

Domowitz, I., and R. L. Sartain (1999): "Determinants of the Consumer Bankruptcy Decision," *The Journal of Finance*, 54(1), 403–420.

Dubey, P., J. Geanakoplos, and M. Shubik (2000): "Default in a General Equilibrium Model with Incomplete Markets," mimeo.

Evans, D., and R. Schmalnsee (1999): *Paying with Plastic: The Digital Revolution in Buying and Borrowing.* MIT Press, Cambridge, Massachusetts.

Fay, S., E. Hurst, and M. j. White (2002): "The Household Bankruptcy Decision," *American Economic Review*, 92(3), 706–718.

Fernandez-Villaverde, J., and D. Krueger (2000): "Consumption and Saving over the Life Cycle: How Important are Consumer Durables?," *mimeo.*

Gourinchas, P.-O., and J. Parker (2002): "Consumption over the Life Cycle," *Econometrica*, 70(1), 47–89.

Hubbard, R., J. Skinner, and S. P. Zeldes (1994): "The Importance of Precautionary Motives in Explaining Individual and Aggregate Saving," *Carnegie-Rochester Conference Series on Public Policy*, 40, 59–125.

Jacoby, M., T. A. Sullivan, and E. Warren (2000): "Medical Problems and Bankruptcy Filings," *Norton Bankruptcy Law Advisor*, 5.

Kehoe, T., and D. Levine (1993): "Debt-Constrained Asset Markets," *The Review of Economic Studies*, 60(4), 865–888.

Kocherlakota, N. R. (1996): "Implications of Efficient Risk Sharing without Commitment," *The Review of Economic Studies*, 63(4), 595–609.

Li, W. (2001): "To Forgive or Not to Forgive: An Analysis of U.S. Consumer Bankruptcy Choices," *Federal Reserve Bank of Richmond Economic Quarterly*, 87(2), 1–22.

Li, W., and P.-D. Sarte (2002): "Chapter 7 or Chapter 13: An Analysis of U.S. Consumer Bankruptcy Choice," *mimeo, Federal Reserve Bank of Richmond.*

Livshits, I., J. MacGee, and M. Tertilt (2003): "Consumer Bankruptcy: A Fresh Start," *Federal Reserve Bank of Minneapolis Working Paper.*

Luckett, C. (2002): "Personal Bankruptcies," in *The Impact of Public Policy on Consumer Credit*, ed. by T. Durkin, and M. Staten, pp. 69–102. Kluwer Academic Publishers.

McGrattan, E. R., and E. C. Prescott (2000): "Is the Stock Market Overvalued?," *Federal Reserve Bank of Minneapolis Quarterly Review*, 24(4), 20–40.

National Bankruptcy Review Commission (1997): "Bankruptcy: The Next Twenty Years. Final Report of the Bankruptcy Review Commission," Discussion paper, http://www.nbrc.gov/reportcont.html.

Niemi-Kiesilainen, J. (1997): "Changing Directions in Consumer Bankruptcy Law and Practice in Europe and USA," *Journal of Consumer Policy*, 20, 133–142.

Pavan, M. (2003): "Consumer Durables and Risky Borrowing: the Effects of Bankruptcy Protection," *University of Pennsylvania, mimeo.*

Repetto, A. (1998): "Personal Bankruptcies and Individual Wealth Accumulation," *mimeo.*

Storesletten, K., C. Telmer, and A. Yaron (2004): "Consumption and Risk Sharing over the Life Cycle," *Journal of Monetary Economics*, 51, 609–633.

Sullivan, T., and E. Warren (1999): "The Changing Demographics of Bankruptcy," *Norton Bankruptcy Law Adviser.*

Sullivan, T. A., E. Warren, and J. L. Westbrook (2000): *The Fragile Middle Class.* Yale University Press, New Haven and London.

U.S. Census Bureau (2000): *Statistical Abstract of the United States,*Washington, D.C.

Zame, W. R. (1993): "Efficiency and the Role of Default When Security Markets are Incomplete," *The American Economic Review*, 83(5), 1142–1164.

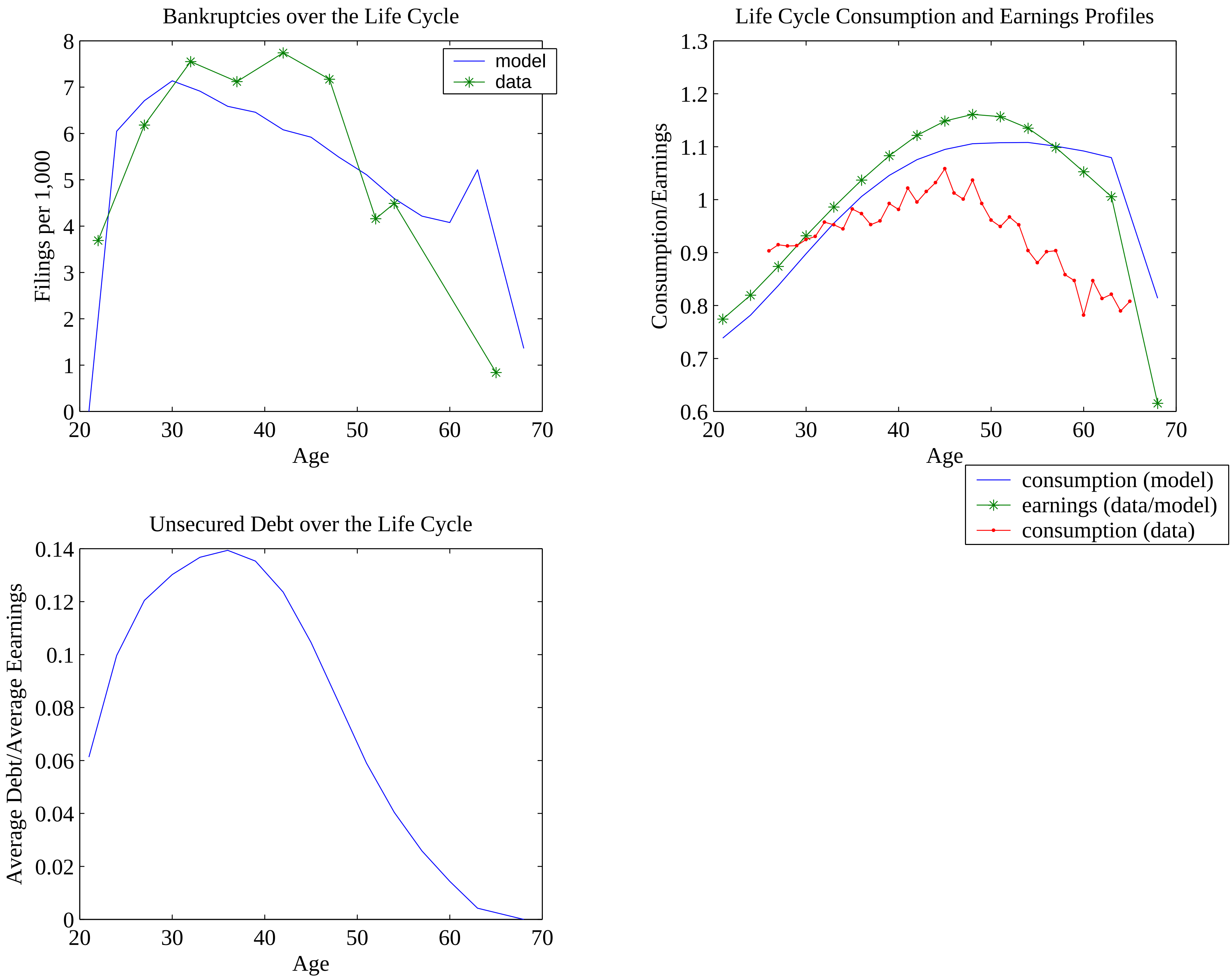

Figure 1: Life-Cycle Implications of FS Bankruptcy System (Benchmark Parameters)

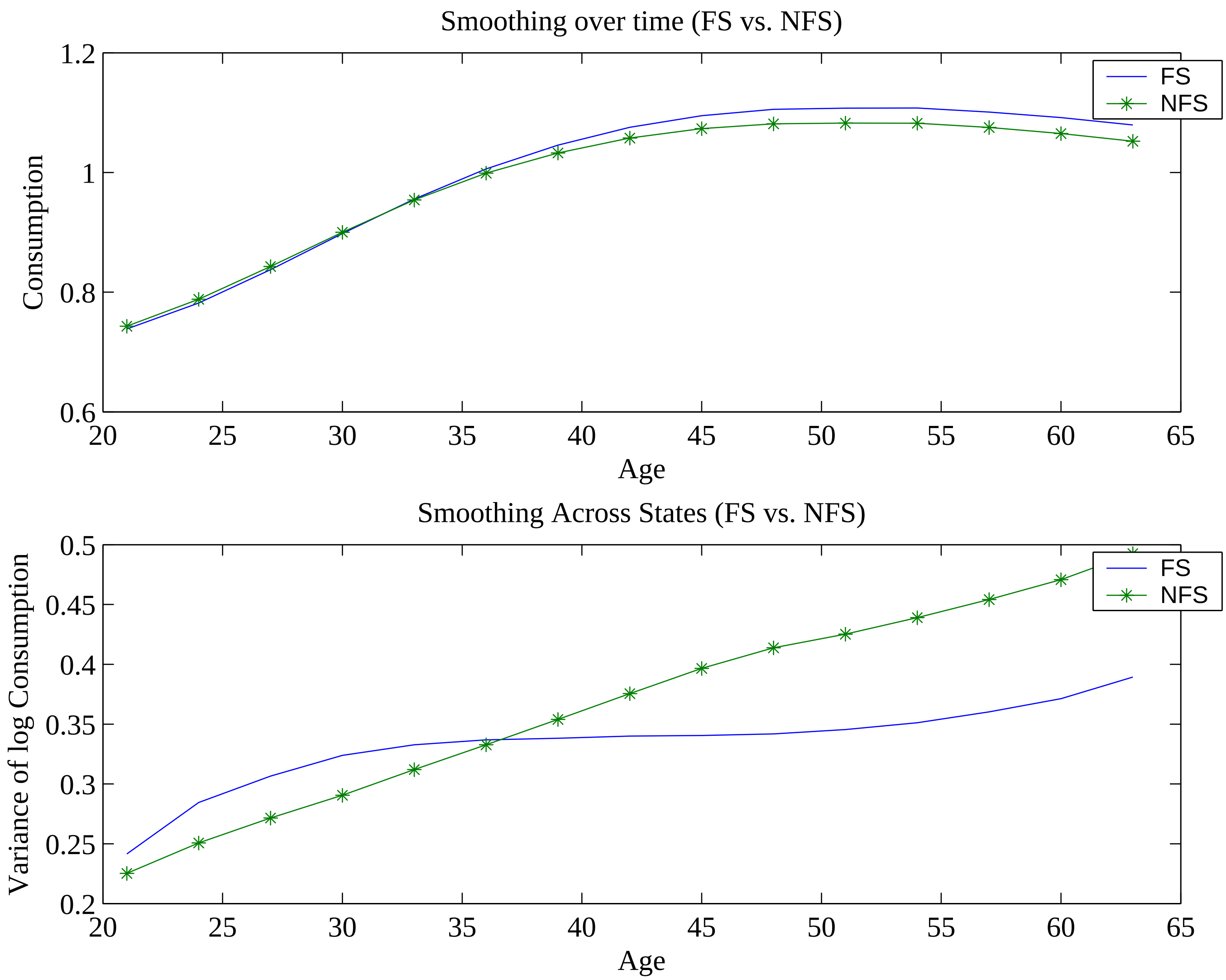

Figure 2: Ability to Smooth in 2 Bankruptcy Regimes

Figure 3a: Borrowing Limits by Age

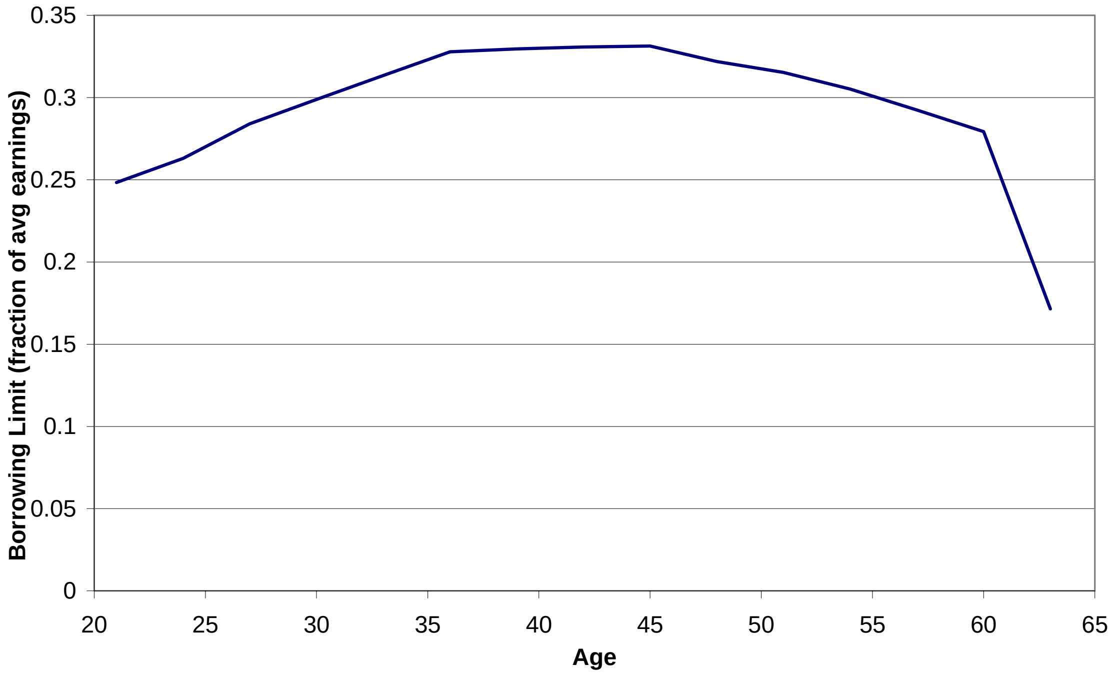

Figure 3b: Interest Rates by Age

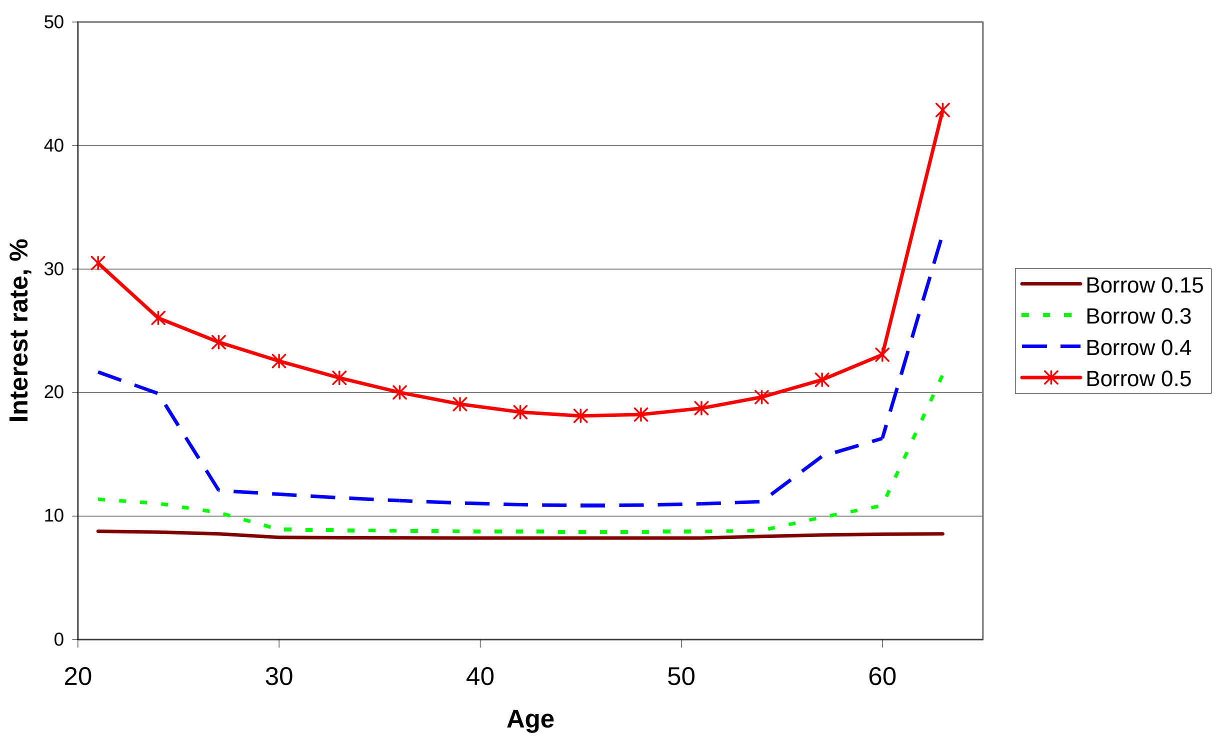

Figure 4: Welfare Gain of FS System by Size of Expense Shocks