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Abstract

In U.S. data, income interruptions, the receipt of public insurance, and the incidence of personal bankruptcy are all closely related. The central contribution of this paper is to evaluate both bankruptcy protection and public insurance in a unified setting where each program alters incentives in the other. Specifically, we explicitly allow for distortions created by the default option and public insurance to affect 1) risk-taking, 2) borrowing, and 3) search effort. Our analysis delivers two striking conclusions. First, we find that U.S. personal bankruptcy law is an important barrier to allowing the public insurance system to improve welfare. Second, contrary to popular belief, we find that increases in the generosity of public insurance will lead to more, not less, bankruptcy.

Keywords: Incomplete Markets, Bankruptcy, Unemployment.

JEL Codes: D52, G33, J64

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1 Introduction

In U.S. data, income interruptions, public insurance, and personal bankruptcy are closely related. Most households are in overt economic distress when they file for bankruptcy, and nearly half receive public insurance at the time of filing (Fisher (2003), Sullivan et al. (2000)). In recent years, several proposals have been advanced to reform both the U.S. personal bankruptcy system and the U.S. public insurance system. Existing work has thus far studied each system in detail, but only in isolation from the other.[1] The central contribution of this paper is to demonstrate that public insurance and personal bankruptcy should be studied jointly. The interactions between these systems are strong and generate surprising implications.

Our analysis delivers two main conclusions. First, we find that the U.S. bankruptcy code is an important barrier to the efficacy of the U.S. public insurance system. In particular, we find that under current bankruptcy law, generous public insurance lowers welfare substantially. However, when default is prohibited, we find that generous insurance regains the ability to improve welfare. Our second main finding is also striking, whereby we find that generous public insurance, instead of sheltering households and reducing financial distress, bolsters the incentives to borrow more, search less, and take larger risks over re-employment. In turn, personal bankruptcy rates *rise* with more public insurance. In sum, for the U.S., personal bankruptcy law limits the ability of the public insurance system to improve welfare, and reverses its ability to reduce financial distress.

Intuitively, any force that makes bankruptcy easier will distort search effort and borrowing. This is noteworthy because, in the U.S., a principal consequence of bankruptcy is that lenders penalize filers by excluding them from credit markets in the future (Musto [2002]). An insured income stream will, however, lower the value of access to credit markets for consumption smoothing and thereby encourage default, all else equal. Furthermore, these incentives also imply that improved insurance may simply make households even more willing to smooth by issuing debt, even when employed. Quantitatively, this is precisely what we find.

Our results for the corrosive effects of easy default can be understood intuitively as follows. Lax bankruptcy law encourages borrowing at the expense of search, as households know that consumption can be shielded through bankruptcy if immediate re-employment does not occur.[2] To the extent that lengthy unemployment spells alter earnings prospects, income risk itself is partially endogenous. This fact is particularly relevant because the

[1] On the former, see Athreya (2002), Athreya (2004), Chatterjee et al. (2002), and Li and Sarte (2002). On the latter, examples include Hansen and Imrohoroglu (1992) and Wang and Williamson (2002).

[2] We will use the words "default" and "bankruptcy" interchangeably in this paper.

predominant share of income insurance schemes are purely public and therefore tax-financed.[3]

Our work is novel along three dimensions. First, a central innovation of our work is to study bankruptcy in a model that incorporates both transitory income risk, as well as the large and persistent income reductions associated with separations from employment (e.g. Ljungqvist and Sargent (1998)). Given that purely transitory risk is well-smoothed by self-insurance, the omission of large persistent risks is not only counterfactual, but also assumes away any role for bankruptcy protection.[4] By contrast, in the presence of long-term income risk, bankruptcy may be useful to households. In particular, households' willingness to smooth transitory fluctuations via borrowing depends critically on whether or not they may suffer severe long-term shocks. Without a default option, a shock that sharply lowers expected future labor income will require a sharp reduction in average consumption. If the household is indebted at the onset of such a shock, the burden of servicing such debt alone will force consumption further downward. In such a world, households will be less willing to use credit to smooth even very transitory shocks. Our work is the first to capture and quantify the role of bankruptcy in enhancing the value of credit markets to households.[5] We find, as evidence for this role, that ignoring long-term risk leads to substantially overstating the gains from eliminating bankruptcy.

The second innovation of this paper is to improve on the modeling of the outside insurance options available to unemployed households. Specifically, we endogenize both credit limits and interest rates on debt, and allow them to respond to changes in default incentives created by public insurance. This follows work by Alvarez and Veracierto (2001), and recently, Young (2004), and Lentz and Tranaes (2004) who each allow for endogenous interest rates, but restrict borrowing via exogenous credit limits. In our model, public insurance alters default risk, and will therefore affect the cost and availability of credit.

The third innovation of our work is that, to our knowledge, we are the first to explicitly capture the increased incentives for risk-taking through borrowing and reduced search created by bankruptcy as a "fall-back" option. In particular, we allow households to affect their own employment prospects and risk of skill-loss through search, especially in the wake of changes to both public insurance and default law. We find that these incentives are important,

[3] Our work respects the insight that insurance programs should be studied as a whole, not in isolation. See, for example, Attansio and Rios-Rull (2000) and Krueger and Perri (2003).

[4] Quantitatively, the power of self-insurance against transitory shocks has been known at least since Deaton (1991).

[5] Our specfication applies strictly to the household *income* process, and is closest to the theoretical motvation given in Zame (1993). Our work differs from the large catastrophic "expense" shocks, or "asset destruction" shocks for which bankruptcy may also prove useful. Such shocks are studied in Livshits et al. (2003) and Chatterjee at al. (2002), respectively. For consistency, we will calibrate our model to exclude bankruptcies attributable to such shocks.

qualitatively and quantitatively.

Several features of U.S. data reveal the important interactions between income risk, public insurance, and personal bankruptcy. For example, Sullivan et al. (2000) find that the median household income of bankruptcy filers in the year of filing is approximately one-third less than their non-bankrupt counterparts. Much of the reduction in income arises from the employment status of filers. Estimates for the unemployment rate among bankruptcy filers are dramatically higher than for the population at large, at between three to four times the national average.[6] Conversely, the bankruptcy rate among the unemployed, at roughly 3.5%, is nearly four times higher than the overall population rate (approximately 1% annually in recent years).

Even if employed at the time of the survey, many bankrupt households report recent unemployment spells. PSID data indicate that 12% of bankruptcy filers in 1995 lost their jobs between 1994-1995 as compared with only 2.15% of non-filers. Bankruptcy filers also have shorter job tenure than non-filers. Median job tenure for the bankrupt population is just two years, compared to 4.7 years for the general population (Bermant and Flynn (2002)). Sullivan et al. (2000) find that more than two-thirds of all households who file for bankruptcy report job-related income disruptions. Thus, the interaction between personal bankruptcy, employment disruptions and public insurance appears to be non-trivial (Fisher (2003)).

The remainder of the paper is organized as follows. In the next section, we lay out a simple textbook model of consumption and savings to clarify the relationship between shock persistence, optimal consumption and debt paths. This simple environment has important implications on the relationship between bankruptcy and long-term income shocks. In Section 3, we extend the simple model to more closely represent households' decisions regarding borrowing and lending and also incorporate unobservable search effort. In Section 4, we provide the details of the parameterization. Section 5 presents the results and identifies combinations of bankruptcy policy and public insurance schemes that improve welfare. Finally, Section 6 concludes and Section 7 contains the Appendix.

[6] Bermant and Flynn (2002) estimate a rate of 19% in 2002 from self-reported unemployment data. We find a rate of 16% from PSID data.

2 Borrowing and The Persistence of Shocks: An Example

Personal bankruptcy is a better substitute for insurance against long-term shocks than short-term shocks. A long-term shock, which changes the present value of future income non-trivially, requires the household to *adjust*, rather than smooth, consumption. By effectively delivering a payment (equal to unsecured debts) to those households who are indebted at the time such a shock occurs, bankruptcy may help smooth consumption in a way not otherwise possible. To more precisely motivate the differential response of borrowing and saving to temporary and persistent income risk, consider the following standard textbook consumption-savings problem.[7] Households solve:

$$\max E_0 \sum_{s=t}^{\infty} \beta^{s-t}(c_s - \frac{\varkappa}{2}c_s^2), \quad \varkappa > 0 \tag{1}$$

s.t.

$$c_s + a_{s+1}/(1+r) \leq y_s + a_s \tag{2}$$

where $\beta \in (0,1)$ is the discount factor, c_s is consumption at time s, a_s is asset holdings at time s, and r is the interest rate. Income, y_s, follows:

$$y_{t+1} - \overline{y} = \gamma(y_t - \overline{y}) + \epsilon_{t+1}, \quad 0 \leq \gamma \leq 1, \quad \text{cov}(\epsilon_t,\epsilon_{t'}) = 0 \quad \forall t \neq t' \tag{3}$$

where ϵ_{t+1} is a serially uncorrelated and unexpected shock to income and γ governs the persistence of the shock. A permanent shock requires $\gamma = 1$. Note that equation 3 can be written as:

$$y_t = \overline{y} + \sum_{s=-\infty}^{t} \gamma^{t-s}\epsilon_s \tag{4}$$

so that the effect of the shock diminishes over time (except when $\gamma = 1$). The optimal period t consumption function for this problem is given by:

$$c_t = rb_t + \overline{y} + \frac{r\gamma}{1+r-\gamma}(y_{t-1} - \overline{y}) + \frac{r}{1+r-\gamma}\epsilon_t \tag{5}$$

Therefore, the desired change in assets in period t is:

$$b_{t+1} - b_t = \gamma\frac{1-\gamma}{1+r-\gamma}(y_{t-1} - \overline{y}) + \frac{1-\gamma}{1+r-\gamma}\epsilon_t \tag{6}$$

[7] See Obstfeld and Rogoff (1996), pp. 79-84.

Equation 6 makes clear that as γ rises, the change in borrowing falls. In the limit, when shocks are permanent, optimal consumption approaches $c_t = rb_t + y_{t-1} + \epsilon_t$, while the change in debt approaches $b_{t+1} - b_t = 0$. If b_t is large, as is the case for the average U.S. household in bankruptcy, at \$19,000, the term "rb_t" will be large for even relatively low interest rates. A long-term shock to an already indebted household therefore makes bankruptcy attractive. Notice that without bankruptcy, the income change forces a one-for-one change in consumption. Moreover, since bankruptcy typically creates exclusion for credit markets, the penalty imposed by exclusion from credit markets shrinks as the persistence of the shock grows. That is, bankruptcy is most valuable to the household precisely when ex-post exclusion is least costly. We now describe the benchmark model.

3 Model

3.1 Preferences

The economy consists of a continuum of ex ante identical, infinitely lived agents with unit mass. Agents maximize the present discounted value of expected lifetime utility under a additively separable utility function in consumption and search effort:

$$E_0 \sum_{t=0}^{\infty} \beta^t \left[u(c_t) + v(1 - n_t) \right]. \tag{7}$$

The discount factor is denoted $\beta \in (0, 1)$, c_t is consumption at time t and $n_t \in [0, 1)$ denotes search effort when unemployed. Employed agents do not search (i.e. $n_t = 0$).

3.2 Endowments

The example of the preceding section makes clear that for understanding bankruptcy, it is important to distinguish risks that are short-term in nature from those that are long-term. Short-term risks include unemployment, temporary illness, reductions in available overtime, etc. Longer-term shocks in our model are aimed at capturing the loss in the level or value of human capital, particularly those associated with prolonged spells of unemployment.

3.2.1 Short-Term Shocks

In any given period, households are either employed or unemployed. Employed households receive random, possibly serially dependent, income $\widetilde{Y}$ in each period. Stochastic income for the employed represent within-household changes in labor supply besides unemployment, such as movements out of the labor force, reductions in labor hours arising from temporary illness, and plant-level variations (due to the availability of overtime work, for example). All employed households face the risk of becoming unemployed, which occurs with i.i.d. probability ρ each period.[8]

Households who are unemployed search for work. However, search effort reduces utility and is not freely observable, making it a source of moral hazard. We denote search effort by $n \in [0,1]$ and let the probability of re-employment in the following period be represented by the (time-invariant) function $\pi^e(n,\omega)$, where $\omega > 0$ is an index of search effectiveness. We specify $\pi^e(n,\omega)$ to be increasing in both n and ω.

Unemployed households, if qualified, receive unemployment insurance (UI) that replaces a fraction θ of their average pre-unemployment labor income, $\overline{Y}$. Qualification for UI depends on the length of the unemployment spell and search effort. Let $\pi_k^{dq}(n,\nu)$, for $k = 1, 2, ...,$ denote the probability of disqualification from UI in the $k+1$-st period of an unemployment spell if effort in the k-th period was n. The parameter ν partially dictates the amount of moral hazard in our model, whereby $\pi_k^{dq}(n,\nu)$ is increasing in ν. Households who are disqualified from UI receive a government transfer of $Y_{\min} > 0$ units of the consumption good. $\mathrm{Y}_{\min}$ represents an aggregate of social insurance (denoted by SI) that non-working households are eligible for, such as welfare and disability insurance. That is, households initially claim UI and only later claim SI, thus capturing the observation that many of those who eventually file claims for longer-term welfare assistance first pass through the UI system.[9]

3.2.2 Long-Term Shocks

Taking long-term risk seriously is crucial, as our focus on bankruptcy requires us to represent the type of risk that default is particularly well-suited to mitigating. We wish to capture the feature that prolonged absences from employment are associated with the risk of large drops in the level and value of human capital. Keane and Wolpin (1997), for example, report that annual rates of skill depreciation are as high as 30% for white-collar workers in the US.[10] Following Ljungqvist and Sargent (1998), we assume that skills probabilistically depreciate with unemployment. Specifically, we assume that households unemployed for J

[8] As in Lentz and Tranaes (2003) and Young (2004), we abstract from on-the-job search. As all jobs are identical, on-the-job search is irrelevant.

[9] It is important to note that some households face a catastrophic event while employed and are immediately classified as disabled, for example. These households are not captured in our model. Nonetheless, it is possible that these households still pass through the UI system.

[10] Similarly, Arulampalam et al.(1998), Corcoran and Duncan (1979), and Kim and Polachek (1994) document the 'scarring' consequences of unemployment spells, and present estimates of the depreciation of human capital arising from interruptions in work.

periods are prone to a long-term shock to their labor productivity with probability π^ℓ.[11] Skill loss makes re-employment less rewarding than prior employment: mean income for employed households who have received long-term shocks is lower than that of other employed households by a factor $\mu < 1$. Households are assumed to regain human capital in subsequent periods with an i.i.d. probability η.[12] We will set π^ℓ and η to match the observed stock of households who face long-term shocks.[13] Appendix 7.1 contains a flowchart illustrating all of the possible outcomes for each household given the shock processes and public insurance schemes described above.

The presence of search, the possibility of human capital loss, and the option of bankruptcy imply that both earnings and earnings *risk* are endogenous in our model. Specifically, as with generous public insurance, the possibility of default may encourage reductions in search effort that in turn lengthen unemployment spells, and thereby increase the risk of long-term shocks to income. By contrast, preceding research such as Zha (2001), Chatterjee et al. (2002), Livshits et al. (2003), Li and Sarte (2002) and Athreya (2002, 2004) all study the consequences of altering current bankruptcy law under exogenous income shock processes that hold earnings risk fixed.

3.2.3 Credit Market Arrangement

In order to smooth consumption, households may borrow on a competitive market and may also default on these loans in the future. A household that is a net borrower pays the rate $r^l(a)$ on a loan of size a. If households choose to save, they are modeled as buying a bond at price q^d, and therefore earn a fixed interest rate $r^d \equiv \frac{1}{q^d} - 1$ on risk-free savings deposits. The return on savings is exogenous.

Borrowing is modeled following Livshits et al. (2003) and Chatterjee et al. (2002). Namely, households are assumed in the current period to issue one-period "bonds." These bonds are sold at a price $q^l(a')$ discounted by the market according to the likelihood of default. The interest rate on loans is therefore $r^l(a) \equiv \frac{1}{q^l(a)} - 1$. While the probability of default depends on many factors, we assume that lenders face a transactions cost δ in processing loans and furthermore can only observe the total debt issuance of a household. Bond prices will therefore be conditioned solely on loan size. In equilibrium, the zero profit condition implies that the difference between the interest rate on loans and that on savings

[11] This also captures depreciations of human capital arising from plant closings or other restructuring where households may not immediately know the likelihood of returning to work. The latter may arise from the strong cyclical component of displacement rates, whereby an agent may not be immediately able to differentiate between a firm-level shock and one that is more aggregate or permanent in nature.

[12] We assume that households can at most be faced with one long-term shock during their lifetime.

[13] Details concerning the parameterization are in Section 4.

must satisfy the following:

$$r^l(a) = \frac{(r^d + \delta)}{(1 - \pi^{bk}(a))} \tag{8}$$

where $\pi^{bk}(a)$ is the equilibrium probability of default given debt level a. We denote interest rates for the entire domain of asset holdings by the function:

$$r(a) = \begin{cases} r^d & \text{if } a \geq 0 \\ r^l(a) & \text{if } a < 0 \end{cases} \tag{9}$$

Beyond denying credit to households who file for bankruptcy, the financial intermediary charges all borrowers in "good standing" the same interest rate schedule.

An innovation of the preceding credit arrangement is that it allows credit constraints to respond to incentives created by public insurance. Quantitative work on U.S. unemployment insurance (UI), such as Wang and Williamson (2002), Alvarez and Veracierto (2001), Lentz and Tranaes (2003) and Young (2004) has investigated the effects of allowing for an outside insurance option such as storage, or a risk-free asset. However, in each of these studies, borrowing is either prohibited, or is allowed only up to exogenous credit limits that remain invariant to policy. In our model, endogenously determined household default risk determines both the cost of loans and the effective limit on borrowing. This allows us to determine the equilibrium provision of outside insurance provided by credit markets, arising both from changes in bankruptcy law or public insurance policy. As a quantitative matter, we find that both credit costs and the generosity of public insurance affect credit markets.

3.2.4 Bankruptcy

Bankruptcy in this model follows the environment in Athreya (2002). We consider only Chapter 7 bankruptcy filings, whereby unsecured debt is discharged. After bankruptcy, the household is not allowed to borrow on the unsecured market for an uncertain period of time. Households may, however, save during this time. Following bankruptcy, a borrowing constrained household is returned to solvency, whereby they may once again borrow and file for bankruptcy, with probability ψ. Given the time-independence of ψ, the average time that a household is borrowing constrained is simply $1/(1-\psi)$. As documented in Dubey et al. (2003) and Athreya (2002), the penalties for bankruptcy filers usually do not transfer wealth from debtors to creditors. Sullivan et al. (2000) find that in at least 95% of Chapter 7 bankruptcies, assets are not sold to satisfy creditors. Let λ denote all costs of bankruptcy beyond credit market exclusion, measured in utility. Therefore, λ includes legal fees, time costs, and any stigma that may be associated with filing for bankruptcy. Given the current average length of credit market exclusion, we set λ to match observed bankruptcy filing rates among households.

3.3 The Household's Problem

We will employ specifications of the income shocks, disqualification function, and long-term shock functions that render the problem recursive in today's income shock, asset level and labor income, and if unemployed, search effort. Therefore, the household's value function is defined on a state vector containing the preceding four objects. Denote credit market status by CS, and after-tax labor income by y. With respect to credit status, households are either solvent (S) or borrowing constrained (BC). Those who have full access to credit markets and have the option to file for bankruptcy are deemed solvent. Borrowing constrained households on the other hand are those who have filed for bankruptcy in the past, but have not yet been readmitted to credit markets. As discussed earlier, the labor income of a household depends on its unemployment status and whether or not it has received a long-term shock.

With respect to asset holdings, $\underline{A_B}$ and $\underline{A_{BC}}$ are limits to net wealth imposed by a credit status applying to newly bankrupt and previously bankrupt households, respectively. The restriction for solvent households will be determined endogenously in equilibrium. For notational convenience, suppression of the dependence of income expectations on current employment status and UI eligibility yields the following recursive representation of the household's problem.[14] The value of being solvent V^S is given as follows:

$$V^S(y,a) = \max[W^S(y,a), W^B(y,a)] \tag{10}$$

where W^S denotes the value of *not* filing for bankruptcy in the current period and satisfies:

$$W^S(y,a) = \max\{u(c) + \beta E V^S(y',a')\} \tag{11}$$

s.t.

$$c + \frac{a'}{1+r(a')} \leq y + a \tag{12}$$

When the household qualifies for bankruptcy and chooses to file, it has its debt removed, pays the non-pecuniary cost λ and then is automatically sent to the borrowing constrained (i.e. "bad credit history") state, where it obtains value V^{BC}. Therefore, the value of filing for bankruptcy, denoted W^B, satisfies

$$W^B(y,a) = \max\{u(c) - \lambda + \beta E V^{BC}(y',a')\} \tag{13}$$

s.t

$$c + \frac{a'}{1+r^d} \leq y \tag{14}$$

[14] As it is inessential to represent it here, we relegate a full description of the set of possibilities for labor income to Section 7.2 of the Appendix. These depend on the precise specifications detailed in Section 4.

$$a' \geq \underline{A_B} \tag{15}$$

To define V^{BC} above, note that borrowing constrained households face a lottery, whereby they are returned to solvency (i.e., they are free to borrow and default in the following period) with probability ψ, or remain restricted from borrowing with probability $(1-\psi)$. Thus, we have:

$$V^{BC}(y,a) = \max\{u(c) + \psi\beta EV^S(y',a') + (1-\psi)\beta EV^{BC}(y',a') \tag{16}$$

s.t.

$$c + \frac{a'}{1+r^d} \leq y + a \tag{17}$$

$$a' \geq \underline{A_{BC}} \tag{18}$$

3.4 Public Insurance and Government

We define a public insurance policy (PIP) to be a collection of all the state-contingent transfer programs undertaken by the government. Therefore, this list is described fully by the minimum income received by unemployed households who are disqualified from unemployment insurance $Y_{\min}$ and the unemployment replacement ratio θ. That is,

$$PIP = \{Y_{min}, \theta\}. \tag{19}$$

The government finances its public insurance policies by taxing labor income at a flat rate (τ), and we restrict attention to cases where total tax revenues equal total expenditures, which is explicitly defined below.

3.5 Equilibrium

We focus on stationary equilibria, defined in the standard manner. We begin by constructing a law of motion for the distribution of households over the state space. While the state of the household evolves over time, only a portion of next period's state is chosen by the household in the current period. The remainder of the state is determined by stochastic shocks occurring at the beginning of the following period. For example, the unemployed solvent household chooses effort n, credit status CS', and assets a', and the unemployed borrowing constrained household chooses only n and a'. In both cases, however, next period's state is partially decided by the employment and productivity shocks.

More generally, let $s' \in S$ be an arbitrary state vector for next period's state from the set of state vectors. Let $x' \subset s'$ be the elements of next period's state chosen directly by the agent, while $e' \subset s'$ are the elements of next period's state determined by shocks. Therefore $s' = (x' \cup e')$. Let Φ be the decision rule for the household determining x', i.e. $x' = \Phi(s)$. Next, let ξ and ξ' denote the distribution of households over the state space in the current and following period, respectively. Given a transition function for the stochastic component, $Q(e'|e)$, as well as Φ and $\xi(s)$, the mass of households at any point s' evolves according to the following map

$$\xi'(s' = (x', e')) = Q(e'|e)\xi(s|x' = \Phi(s)).$$

That is, $\xi'(s' = (x', e'))$ is the mass of households with next period's state $s' = [x', e']$, where $\xi(s|x' = \Phi(s))$ is the mass of households with current state s such that $x' = \Phi(s)$.

This sequence of distributions above can now be seen as the successive iterates of a map $\Gamma(.)$ that is implicitly defined through Φ, $Q(.|.)$, and ξ. Under standard regularity assumptions, $\Gamma(.)$ has a unique fixed point, $\xi^* = \Gamma(\xi^*)$. This fixed point is the stationary distribution ξ^* of households over the state space. However, we seek stationary distributions that satisfy two additional conditions. First, given prices and a tax rate, firm profits are zero, and second, that the government's budget constraint is met. The latter is motivated as follows.

3.5.1 Government Budget Constraint

Let the status of households with respect to the long-term shock be given by the indicator $I_L = \{0, 1\}$, where $I_L = 1$ denotes those who have received the long-term shock. Given a stationary distribution, the income base from which taxes are collected consists of the measure of all employed households $\chi^e(I_L)$. Therefore, $\chi^e(I_L = 1) \equiv \int_0^1 f(I_L(i) = 1|e)di$, where $f(I_L(i) = 1|e)$ is the conditional probability that household i has status $I_L = 1$ if it is employed. Correspondingly, $\chi^e(I_L = 0) \equiv \int_0^1 f(I_L(i) = 0|e)di$ yields the mass of employed households with $I_L = 0$. We write $\chi^e(.)$ as a function of the long-term shock because income among the employed depends on both the purely temporary shock and the long-term shock. Government expenditure on UI depends on the amount of income replaced $(\theta\overline{Y})$ and the measure of unemployed households qualified to receive UI benefits, $\chi^{uq}(I_L)$, whose size is determined by summing the measures of qualified unemployed households with and without the long-term shock, $\chi^{uq}(I_L = 1)$ and $\chi^{uq}(I_L = 0)$ respectively. Expenditure on minimal public insurance is based on $Y_{\min}$ and the measure of unemployed disqualified households $\chi^{udq}(I_L)$. Given $\chi^{uq}(I_L = 1)$ and $\chi^{uq}(I_L = 0)$ and the transfer to each group, total expenditure on unemployment insurance, $G_{\exp}$, is given by:

$$G_{\exp} = \chi^{uq}(I_L)\theta\overline{Y} + \chi^{udq}(I_L)Y_{min}.$$

Similarly, total government revenues, G_{rev}, is given by:

$$G_{rev} = \tau\overline{Y}[\chi^e(I_L = 0) + \mu\chi^e(I_L = 1)]$$

Therefore, the government's per-period budget constraint is:

$$\tau\overline{Y}[\chi^e(I_L = 0) + \mu\chi^e(I_L = 1)] = \chi^{uq}(I_L)\theta\overline{Y} + \chi^{udq}(I_L)Y_{min}. \tag{20}$$

This leads to the following definition.

> **Definition**: Given a $PIP = \{Y_{min}, \theta\}$, an equilibrium of this model is a tax rate τ, an interest rate function $r^l(a)$, value functions $\{V^{BC}, V^S, W^B, W^S\}$, household laws of motion $\{\Phi\}$, and a stationary distribution $\{\xi^*\}$ implying time-invariant populations $\{\chi^e(I_L), \chi^{uq}(I_L), \chi^{udq}(I_L), \chi^S, \chi^{BC}\}$, of employed, unemployed, solvent, and borrowing constrained households respectively, such that the zero-profit condition holds (equation 8) and the government balances its budget (equation 20).

3.5.2 Welfare Measurement

Our welfare measure is standard and follows Aiyagari and McGrattan (1998). Specifically, we measure the percent change in consumption at all dates and states that would make a household indifferent between being assigned to state (CS, y, a) according to either the equilibrium stationary distribution of the state prevailing under a given policy or the one prevailing under the benchmark setting. This increment/decrement to consumption is denoted by ϕ. A negative value for ϕ implies that households are worse off under the policy relative to the benchmark. Let V^{pol} and V^{bench} denote expected welfare under a proposed policy and under the benchmark setting, respectively. With log utility, the expression for ϕ is:

$$\phi = \exp((1-\beta)(V^{pol} - V^{bench})) - 1. \tag{21}$$

This welfare criterion also respects distributional concerns, in the sense that welfare is the expectation of the value function, itself highly concave at low levels of wealth.

4 Parameterization

A model period is one quarter. We calibrate the following five parameters: the probability of job loss (ρ), the cost of filing for bankruptcy (λ), the discount rate (β), the effectiveness of search (ω), and the probability of receiving a long-term shock conditional on being unemployed for J or more periods (π^{ℓ}). All other parameters are exogenously fixed with direct reference to data. Table 1 reports the eight steady state targets for the model to match.

Table 2 lists all of the parameter values for the benchmark parameterization. We set both search disutility and preferences over consumption to be logarithmic.[15] The probability of job loss (ρ) is calibrated most directly to match the average unemployment rate in the U.S. during the last two decades, 5.8%. The transaction cost of intermediation (δ) reflects the difference between interest rates charged by lenders and interest rates earned on deposits. We follow Athreya (2002) (who used the estimates of Evans and Schmalensee (1999)) to get a quarterly measure of $\delta = 0.0085$. Credit limits for solvent households are endogenous in the model and turn out to be slightly higher than half of annual income, or approximately \$20,000. For simplicity, we set $\underline{A_B}$ and $\underline{A_{BC}}$ to zero.

For income risk among the employed, we use panel data estimates from the PSID (1978-1998) on continuously working households to parameterize an AR(1) income process that captures both the serial correlation and volatility of household income. We approximate the income process using a two-state Markov chain, and normalize mean income ($\overline{Y}$) to 1. If a household is employed, they experience a low or high income shock, so that $\widetilde{Y} = \{Y_l, Y_h\}$ where $Y_l < Y_h$. The conditional probability of receiving each income level is given by $P(\widetilde{Y}' = Y_l|\widetilde{Y} = Y_l) = p_{ll}$ and $P(\widetilde{Y}' = Y_h|\widetilde{Y} = Y_h) = p_{hh}$. Income in the low state (Y_l) consists of 0.85 units of output and income in the high state (Y_h) yields 1.15 units of output. The process is symmetric so that the conditional probabilities of low and high shocks (p_{ll} and p_{hh}) are 0.97.

4.1 Long-Term Shocks

To parameterize long-term income risk, we follow several recent studies on displaced workers, as well as recent estimates on the depreciation rate of human capital. With respect to the former, estimates of Jacobson, LaLonde and Sullivan (1993) place long term wage losses from displacement at approximately 30%. As Kletzer (1998) documents however, the estimates of wage loss of Jacobson et al. (1993) are larger than the estimates for the overall population of displaced workers. In particular, Kletzer (1998) reports that only 14% of displaced workers

[15] Our specification is most similar to Alvarez and Veracierto (2001), who also choose log utility over consumption, but choose linear disutility from search.

have 10 or more years of job tenure, and hence lose substantially from displacement. With respect to the latter, Keane and Wolpin (1997) estimate that annual depreciation rates for human capital arising from work interruptions are 10% for blue-collar workers, and 30% per year for white-collar workers. Lastly, Stevens (1997) also finds that while earnings fall post-displacement, the losses are not as great as measured in Jacobson et al. (1993), and estimates that wages remain approximately 9% below their pre-displacement levels six or more years after displacement. We therefore set $\mu = 0.90$, whereby the long-term shock results in a 10% reduction in wages.

We target the fraction of workers affected by such shocks as follows. According to Kletzer (1998), the two-year displacement rate was 4% in 1992-93. Given the twenty-year displacement period and uniform age distribution assumed by Rogerson and Schindler (2002), the long-run stock of workers who have experienced a displacement is then 40%. Using the estimate of Kletzer (1998) that long-tenure workers are 14% of the pool of displaced workers, the fraction we target is 5.6%. We calibrate the likelihood of receiving long-term income shocks conditional on being unemployed in part to match this stock of workers, and set $\pi^{\ell} = 0.05$. Lastly, following Rogerson and Schindler (2002), we assume that the displacement lasts an average of twenty years, or eighty quarters, and therefore choose η =0.0125.

For robustness, we analyze the sensitivity of our results to changes in μ. In particular, we evaluate the implications of both a 30% reduction in wages ($\mu = 0.70$), as well as the elimination of all long-term risk. Quantitatively, we find that accounting for long-term risk is important in assessing the costs of bankruptcy. Nonetheless, our qualitative finding that bankruptcy impedes public insurance turns out to be robust to the precise specification of the long-term shock.

4.2 Search

To parametrically represent the probability of re-employment, we employ the function $\pi^e(n, \omega) = \min(1, \frac{n}{1-\omega})$ where $\omega > 0$ is an index of search effectiveness. Therefore, higher search effort (n) improves job prospects linearly, which is increasing in ω. We calibrate ω in the benchmark so that the model replicates two summary statistics for unemployment duration (from Wang and Williamson (2002)): that approximately 69.8% of unemployed workers remain unemployed for 13 weeks or less while 15.5% remain unemployed for 14-26 weeks.

To capture the observed limits on the duration of UI benefits of two quarters, we assume that if households are unemployed for two or more consecutive periods, the likelihood of getting disqualified from UI is one. Thus, $\pi_k^{dq} = 1$ for $k > 2$. During the first two quarters of an unemployment spell, however, this function is not degenerate. In the first period of unemployment, we assume no households are disqualified from UI, so that $\pi_1^{dq}(n, \nu) = 0$.

Qualification for UI in the second period of a spell depends on search effort in the previous period. We assume that $\pi_2^{dq}(n) = min[1, \nu(1-n)]$ where $\nu \geq 0$. In the benchmark case, we assume $\nu = 1$ for simplicity, but consider alternate values of ν in the experiments.

4.3 Public Insurance

The generosity of public insurance policies are dictated by the parameters θ and $Y_{\min}$. The replacement ratio for unemployment insurance (θ) is set to 0.50, as is standard (see, e.g. Wang and Williamson (2002)). The floor on income, $Y_{\min}$, consists of cash assistance beyond UI, including welfare payments. Because long-term shocks in our model are meant to capture shocks to human capital arising from market forces, an appropriate measure of the relevant long-term replacement rate is that applying to programs such as TANF (Temporary Assistance to Needy Families). As a bound, we note that these programs offer much lower replacement rates than programs to overcome physical disabilities. For example, Autor and Duggan (2003) measure replacement rates for disability insurance at approximately 40%, while Fisher (2003) finds that average monthly household transfers through the AFDC program (the predecessor to TANF) were $376 in 1994. This implies an annual payment of approximately $4,500, or roughly 11% of median household income. This estimate is also consistent with that of Martin (1996), who finds that the average replacement rate for unemployment and other related welfare benefits for households beyond their second year of unemployment to be 8%. Therefore, we assume that households who no longer qualify for UI receive a publicly funded transfer that replaces 10% of pre-displacement mean income, or $0.1\overline{Y}$. For robustness, we will also consider different values of θ and $Y_{\min}$.

4.4 Bankruptcy

There are two parameters in the model related to the cost of filing for bankruptcy: ψ governs credit market exclusion and λ dictates the out-of-pocket costs of bankruptcy arising from legal fees, court costs, etc. We target an average length of post-bankruptcy exclusion of 4 years (16 quarters), following Athreya (2002). Thus, ψ must be set to 0.9375. The out-of-pocket cost λ is calibrated to help match bankruptcy filings as defined below.

Total non-business bankruptcy filings have been stable in the past several years at roughly 1.5 million filings annually. Of these, roughly 70% are Chapter 7 bankruptcies. In the data, roughly 20% of filings involve large medical expense shocks. Debts emerging from large health-related events such as hospitalization are not well captured in a model of voluntary borrowing, but are better dealt with as shocks to "expenses".[16] We therefore omit these

[16] See Livshits et al. (2003).

cases when calibrating our model's filing rate.

Given the preceding selection process, the target annual filing rate is 0.84%, or 0.21% per quarter. Our calibration yields a value for λ of 2.3 utils, or approximately $1,860.[17] We set the annual discount rate (β) to 0.9853, in line with standard values in the literature (for example, Cooley and Prescott (1995)). The discount rate is calibrated in the benchmark economy to match the ratio of debt discharged in bankruptcy to unsecured debt, which is approximately 4.8% per year, or 1.2% per quarter (as reported in Sullivan et al. (2000)).

Our calibration matches two other facts. First, the ratio of unsecured debt to income, if proxied by the ratio of revolving debt to personal disposable income, is approximately 9.6% in the data, and 10% in the benchmark model.[18] Second, the median household filing for bankruptcy discharges $19,000 in our model, close to $18,321 estimated for 1997 data in Sullivan et al. (2000).

5 Results

The results are organized as follows. In Section 5.1, we study equilibrium allocations under current U.S. bankruptcy provisions, and contrast them with allocations obtained when bankruptcy is eliminated. In the latter case, the model collapses to one of purely risk-free loans, such as Huggett (1993). In Section 5.2, we consider the consequences of public insurance provision, under current U.S. bankruptcy law. Lastly, Section 5.3 addresses the question of how, and to what extent, U.S. policymakers can usefully coordinate personal bankruptcy and public insurance.

Before evaluating the results, it is important to document the sources of welfare gains and losses in our model. The policy experiments we study each have a direct effect on the constraints faced by individual households, and an indirect effect on constraints that

[17] Let $x = \{CS, a, y\}$ be any value for the state vector, and let y_{med} be the median value of earnings among those filing for bankruptcy. The expected discounted utility from filing for bankruptcy is:

$$W^B(y_{med}, a) = \max\{u(c) - \lambda + \beta EV(BC, e', a')\} \tag{22}$$

s.t

$$c + \frac{a'}{1 + r^d} \leq y_{med} \tag{23}$$

s.t.

$$a' \geq A_{BC} \tag{24}$$

We solve for the *reduction in income* $\triangle y$ such that optimizing under the remaining income $y^* \equiv y_{med} - \triangle y$, yields a utility loss of λ units. This is the consumption value of the penalty to a representative member of the group who receives it. For our benchmark, this value is approximately 0.186 units, or $1860.

[18] Revolving debt was $625 billion in 2000, relative to a disposable personal income of $6,500 billion.

arise from equilibrium conditions. For example, any policy allowing either more generous bankruptcy, or more generous public insurance has a direct effect of insuring the household that is *unambiguously* positive. However, at the aggregate level, the changes to household incentives are reflected in prices, which may accentuate, or undo, any gains at the individual level. These price effects in our model arise from an "interest rate" effect and a "tax rate" effect. The interest rate effect measures the extent to which policy changes the equilibrium interest rate on loans, and thereby changes the limits and costs of borrowing. The tax rate effect measures the change in average consumption due to changes in the tax rate, the change to the return to searching, as well as any smoothing benefits of proportional taxes. Lastly, because bankruptcy occurs in equilibrium, the administrative costs of bankruptcy also account for a portion of the welfare gains and losses, as they are "transactions" costs that are deadweight in nature.

5.1 Bankruptcy

At the individual level, the possibility of bankruptcy has three major consequences. First, perhaps most importantly, we find that bankruptcy "inverts" the relationship between wealth and search effort. In Figure 2, we display outcomes, with and without bankruptcy, for search effort and borrowing behavior across households that are a) unemployed for more than 1 quarter ('u'), and b) newly unemployed (i.e. for less than 1 quarter, 'unew'). In a standard model, without default, search effort falls with wealth (e.g. Wang and Williamson (2002)), as seen in the first row of Figure 2. When bankruptcy is allowed, however, this is completely reversed. Search effort under current bankruptcy law decreases as wealth falls. That is, households for whom bankruptcy is likely (i.e., those with negative net wealth) search less than wealthier households. However, for the very poorest households, borrowing costs increase by enough to lead households to increase search effort.

The second main implication of default for household behavior is that the sharpest reductions in search effort are always associated with the sharpest increases in borrowing. This is also seen in Figure 2 (row 3). Unsecured credit is therefore clearly encouraged at the expense of search, and this behavior is most pronounced among low wealth unemployed households. That is, bankruptcy distorts search effort the most for households in which default is most likely.

The third implication of bankruptcy is that, in addition to discouraging search and encouraging borrowing, search incentives created by the possibility of skill loss (i.e., receiving a long-term shock) are significantly muted. In Figure 2, it is clear that the availability of default is most corrosive for households who have been unemployed for more than one period, even though such households face increased risk of long-term loss to human capital.

By contrast, newly unemployed households search harder and also borrow relatively less.

The preceding household-level decision making has several notable aggregate implications. The inability to use bankruptcy as an insurance mechanism clearly motivates households to search harder. The increase in search effort rises by enough to sharply lower unemployment, as seen in Table 3. Relative to the benchmark, the elimination of bankruptcy leads to a 4 percentage-point decrease in the fraction of unemployment spells of duration greater than two quarters, from 11.1% to 7.6% (see 'u_3' in Table 7). In turn, this leads to a nontrivial fall in the fraction of households suffering skill-loss, from 5.65% to 3.52% (i.e. 'LTS rate' in Table 7). In sum, banning state-contingent debt by eliminating bankruptcy actually turns out to be useful, as it reduces borrowing costs and lowers taxes for the large measure of employed households. Thus, both the interest rate and tax effects are positive, leading to welfare gains (relative to the benchmark economy).

It is remarkable that even though households borrow much less when bankruptcy is eliminated, they actually experience less variation in consumption compared to the benchmark. This is evident in Table 3: 'σ_c' falls from 0.172 to 0.141. Part of this derives from the reduction in the incentives to "gamble" so that search effort rises. The other part emerges from an appreciable shift away from large debt holdings ('borrow' falls).

In Figure 3, we plot the asset distributions across the bankruptcy experiments and observe that borrowing falls as the option of bankruptcy disappears. What is more striking is that the elimination of bankruptcy does not lead households to avoid hardship by accumulating large buffer stocks of wealth. In fact, holding the cost of funds fixed shows that the unconditional mean of wealth actually *fall*s ('avg. assets' in Table 6). This is precisely the sense in which the current system appears to reward households for increased risk-taking for re-employment. Households wish to smooth search effort, in principle, but the incentives created by default turn out to induce an inefficiently low level of search.[19]

Intuitively, the elimination of bankruptcy produces two competing effects on borrowing. First, relatively easy bankruptcy, all else equal, will increase the price of borrowing, hindering households' use of debt to smooth consumption when compared with a world without bankruptcy. The consumption distributions in Figure 4 show that this force is operative. Figure 2 (row 2) makes it clear that lenders offer uniformly lower rates in the world without bankruptcy. Second, because the option to default is removed, households may in the end be less willing to assume debts. In the case below, the latter effect dominates, and we find that eliminating bankruptcy is associated with a lower level of debt, conditional on borrowing, than in the benchmark.

[19] For completeness, we also considered various quintiles of the wealth distributions and compared their expected values with and without bankruptcy (under benchmark public insurance). For each group, the average welfare was higher without bankruptcy than with it.

We also consider a reduction in the cost of bankruptcy filing, by lowering λ from 2.3 in the benchmark to 1. This reduction makes the filing cost equivalent to $900. Recall that the cost of bankruptcy is an aggregate of all costs beyond credit market exclusion. Therefore, reductions in these costs are to be interpreted as arising from, most obviously, changes in the law allowing discharge of debt. Examples include the length of time elapsing between the application for bankruptcy and the extent to which debts are discharged. The results go through as above, as incentives continue to be distorted in the same manner, and underline our conclusion that increasing the generosity of the bankruptcy code should be approached with care.[20]

5.2 Public Insurance

In this section, our goal is to understand the incentive effects of changes in the public insurance system, given the self-insurance options created by current U.S. bankruptcy law. In particular, we assess the claim that improved public insurance will reduce the demand for bankruptcy protection. With respect to the UI system, we consider policies aimed at 1) changing the generosity of benefits, as measured by the UI replacement ratio (θ), and 2) extending the duration of benefits. With respect to minimal social insurance (SI), we systematically evaluate changes in the generosity of the lower bound on transfer income ($Y_{\min}$).

5.2.1 Unemployment Insurance (UI)

Replacement Ratios We first consider the effects of increasing the replacement ratio θ for all households, from 50% to 75%, while holding the length of eligibility fixed. The effects on individual decisions can be seen in Figure 5. The borrowing decision (row 3 of Figure 5), as a function of wealth, responds only marginally across replacement ratios. However, the net effect of reduced search effort outweighs these decisions, and leads, in the aggregate, to an *increase* in the bankruptcy rate from 0.85% to 0.904% (see Table 4). Lower search effort is also reflected in the unemployment rate, which rises to 5.97%. By making short-term exclusion from credit markets less painful, greater replacement ratios generate more borrowing and higher bankruptcy rates.

In particular, the preceding results suggest that generous UI has the effect of insuring those populations at the expense of those who suffer income shocks that are not covered by these programs. Because one effect of more generous insurance is to enhance the desire to

[20] Intuitively, the need to limit self-insurance in order to realize gains from public insurance is important here. See Golosov and Tsyvinski (2003), who find that implementing optimal disability insurance may involve a tax on savings. See also Kocherlakota (2004).

file for bankruptcy, all else equal, the interest rate effect makes borrowing more expensive for all households. This, of course, imposes costs disproportionately on those households whose income has fallen due to the many circumstances not covered through the narrow definitions allowed for receiving unemployment-based insurance. As the bulk of the population is not unemployed at any given time, the welfare costs of unemployment benefits are large and outweigh the benefits accruing to the small minority of unemployed households. In addition, the distortion to search effort also leads households at the margin to substitute borrowing for search effort. As a result, in such a world, more households will ultimately find bankruptcy useful. However, this appears to be, on net, relatively inefficient, as welfare typically falls with higher tax rates and public insurance. The source of the inefficiency is that bankruptcy generates deadweight costs, as it is paid for via increased interest rates, and also because it creates ex-post deadweight costs as captured in the parameters λ and ρ. In other words, generous public insurance requires high taxes, distorts search effort, and also reduces the pain from credit exclusion. These effects are large enough that they lead households to use bankruptcy with excessive frequency.

In contrast, decreases in the replacement rates of the same magnitude ($\theta = 0.25$) lowers the incentive to borrow. Table 4 shows that mean debt holdings ('borrow') fall by roughly one-fourth, as households realize that becoming unemployed will result in a short, sharp shock to their income. As a consequence, households file for bankruptcy less frequently. Unemployed households, however, are more likely to file with lower UI, consistent with the empirical findings of Fisher (2003). Specifically, the bankruptcy rate among the unemployed sharply increases from 2.93% to 3.39%. In addition, less UI motivates households to increase their search efforts, resulting in less unemployment and improvements in welfare ($\phi > 0$). An implication of the latter is, of course, that the currently observed U.S. replacement ratio generates nontrivial welfare loss relative to a stricter UI regime.

Figure 5 also compares how unemployment duration affects search effort across various wealth levels. We see that search effort falls less steeply with wealth under low replacement ratios. This is intuitive, as subsequent unemployment is less pleasant under low replacement ratios. Similarly, the willingness to borrow in order to consumption smooth is attenuated, relative to that under a high replacement ratio.

Our results for the behavior of filing rates are consistent with empirical findings of Shepard (1984), Buckley and Brinig (1996), Domowitz and Eovaldi (1993), and most recently, Fay, Hurst and White (2002). The latter do not directly evaluate the impact of social insurance on filing decisions, but do find that the household's propensity to file increases with the "financial benefit" of bankruptcy, which is precisely what increasing UI benefits does.[21]

[21]Some care should be taken in directly linking our results to that of empirical work. Our equilibrium concept is inherently a long-run one, whereby our results should be interpreted as the long-run outcome from

Extension of Benefits

A second natural dimension along which to evaluate the effects of increasing the generosity of UI is to extend the duration of benefits. Currently in the U.S., households typically receive two quarters of UI benefits. In our model, all households are therefore disqualified from UI after two periods ($\pi_k^{dq} = 1 \ \forall \ k > 2$). We study the consequences of increasing the generosity of benefits by allowing half of the formerly disqualified households to remain eligible for additional periods of UI benefits.[22] Specifically, we set $\pi_k^{dq} = 0.5 \ \forall k > 2$. In the aggregate, we see that the results in Table 4 support the view that extended UI benefits lead to a reduction in the bankruptcy rate. However, this reduction is also accompanied by an increase in the unemployment rate, the tax rate, and average consumption. With longer UI eligibility, households increase their borrowing levels by 9% but file for bankruptcy less frequently. This is consistent with the findings of Fisher (2003), and occurs because, for many agents, the likelihood of a prolonged fall in income is lower under the extended UI system. Bankruptcy rates fall non-trivially for both unemployed households and households who receive long-term income shocks.[23]

Surprisingly, despite this additional availability of public insurance, average consumption is slightly more volatile, whereby σ_c increases from 0.172 to 0.176, and welfare (ϕ) falls by 0.81%. The majority of the drop in welfare costs come directly from the tax rate effect. As in Wang and Williamson (2002) and Lentz and Tranaes (2003), we find that extending UI benefits reduces effort levels and increases the unemployment rate. Therefore, these findings imply that increased public insurance, at least in the form of extended eligibility for UI benefits, will not improve matters.

Lastly, we combine the reduction in the UI replacement ratio with an extension of UI benefits (that is, we set $\theta = 0.25$ and $\pi_k^{dq} = 0.5 \ \forall k > 2$). The results are quite similar to the case with only a reduction in UI; however, this policy has larger effects on both bankruptcy and unemployment rates. As before, borrowing is much lower than in the benchmark, and this is associated with a dramatic fall in the bankruptcy rate, especially among unemployed households. Combining low UI with extended benefits however leads to decreases in the volatility in consumption: σ_c falls to 0.169. With considering low UI and extended benefits independently, we found that σ_c increases (0.176 and 0.175, respectively). In addition, welfare gains under this policy are high (as with low UI replacement ratios alone), but the significant reductions in consumption volatility, bankruptcy rates, and unemployment are particularly noteworthy.

implementing a given policy nationwide.

[22] This is also in part to assess the effects of the current practice of extending UI benefits periodically. For example, Congress extended UI benefits in January and May of 2003.

[23] Refer to Table 6 in the Appendix.

5.2.2 Minimal Social Insurance (SI)

A second facet of public insurance is that, in the U.S., those who have been unemployed long enough to run out of UI benefits typically still qualify for some form of minimal income support. Examples of such longer-term income insurance include, but are not limited to, publicly-provided disability insurance (OASDHI) and welfare assistance (e.g. TANF). To the extent that bankruptcy is most useful to households who have been hit with a long-term shock, public insurance against such lengthy unemployment spells is likely to interact with bankruptcy in meaningful ways. In the benchmark economy, we set the replacement rate for long-term public insurance programs (SI) to 10%. We now evaluate the effect of both more and less generous social insurance programs (i.e., replacement rates of 15% and 5% of income, respectively). Results are reported in Table 5. It turns out that, like UI, generous SI also increases bankruptcy via the same channels as generous UI, the strongest aspect of which is the tendency to borrow instead of search. For brevity, we do not report the details here.

In summary, introducing bankruptcy has rather negative effects, given current U.S. public insurance. It distorts search dramatically, encourages suboptimally risky borrowing and also risk-taking among the unemployed. Bankruptcy lengthens unemployment spells, increases skill loss, and reduces credit availability. Most interestingly, and quite in contrast to the view of Sullivan et al. (2000), more generous public insurance will *increase* bankruptcy, while it is actually reductions in public insurance relative to current practice that will reduce filing rates. Furthermore, increased default crowds out the unsecured credit markets and thereby lowers welfare.

5.3 Coordinating Public Insurance Policy with Personal Bankruptcy Law

In the preceding two sections, we evaluated the effects of bankruptcy on incentives under current public insurance policy, and conversely, the effects of public insurance under current bankruptcy policy. We now address the natural question of the role of public insurance in conjunction with bankruptcy policy. That is, if a policymaker could change both public insurance and bankruptcy costs, what combination of insurance and bankruptcy law should he choose or avoid? For simplicity, we restrict attention to studying cases where bankruptcy is allowed as per the benchmark, against cases where bankruptcy is prohibited.

Consider the following four polar cases involving uniform changes in public insurance, whereby all households face the same UI replacement ratio θ and minimal income floor $\mathrm{Y}_{\min}$. We consider the welfare implications of various UI/SI combinations. Low UI is defined as $\theta = 0.25$ while high UI implies $\theta = 0.75$. Similarly, low SI is defined as $\mathrm{Y}_{\min} = 0.05\overline{Y}$ while high SI is where $Y_{\min} = 0.15\overline{Y}$. The results are given in Tables 8 and 9. For all cases, when bankruptcy is allowed, households face the benchmark bankruptcy cost ($\lambda = 2.3$).

Three features are notable. First, with uniform SI and UI, the best policy is to prohibit default, and to then lower SI and UI below their current benchmark values. Second, welfare goes up systematically when bankruptcy is removed as an option. For example, the welfare gain with low UI and SI is 0.58% (relative to the benchmark) when bankruptcy is allowed but is 0.68% when it is not (i.e. when λ is large). Under high SI and UI, the corresponding welfare change goes from -0.82% to 0.16%. Third, the damage done by allowing bankruptcy is minimized by making UI and SI very strict. Under relatively generous UI and SI, we see that welfare is much higher without bankruptcy than with it. A final implication of this experiment is that higher levels of UI and SI can only be justified when bankruptcy is disallowed. The intuition for these results remains the same as presented in the previous sections.

5.3.1 Targeted Insurance

Thus far, we considered only "uniform" public insurance policies, whereby all households are treated equally. However, despite the findings thus far, it is possible that changes in insurance aimed *exclusively* at households who experience skill loss ('LTS') are potentially beneficial, for two reasons. First, given that roughly half of all households in bankruptcy have suffered the long-term shock, it is plausible that the treatment received by such households will affect their decisions to file. Second, the group of LTS households is small, meaning that the taxes necessary to finance state-contingent transfers are relatively small. Tables 10 and 11 present outcomes for four polar levels of insurance provisions for LTS households, holding fixed insurance to all other households at their benchmark levels. Interestingly, we still find that allowing bankruptcy is detrimental, and that increased public insurance makes the availability of bankruptcy even more damaging. However, the main finding here is that, when compared with all other insurance schemes considered, the targeting of LTS households alone appears most beneficial. Most notable among these cases is that when bankruptcy is disallowed, increasing the generosity of UI to LTS households for a given SI improves welfare. Thus, both with and without bankruptcy, proposals to better insure those who have suffered long-term shocks can be supported.

5.4 The Role of Long-Term Income Risk

In order to properly measure the role of bankruptcy, an important aspect of our work was the inclusion of the long-term income risk. The role of such risk for our results can be clarified by studying four polar cases whereby bankruptcy is allowed and then removed, with and without long-term income risk. The results are presented in Table 12. The most informative feature is that the elimination of bankruptcy produces much smaller gains in the presence of long-term risk than in its absence. The gain from prohibiting bankruptcy is 0.36% of average consumption in the presence of long-term risk, but more than doubles, to 0.76%, when such risk is absent. Without long-term risk, bankruptcy rates also fall nontrivially, to 0.75% annually, making clear that the former plays an important role in the evaluation of personal bankruptcy.

Nevertheless, even with long-term risk, the incentives created by bankruptcy make the insurance provided by bankruptcy inefficient. This is seen in the fact that the two highest welfare levels both occur when bankruptcy is not allowed, and do not depend on the presence or absence of long-term risk. The increased distortions created by bankruptcy and long-term risk are also evident in the relatively larger increase in unemployment rates arising from the introduction of bankruptcy (4.63% to 6.18%) without long-term risk than with (4.45% to 5.81%). Thus, our main finding– that bankruptcy obstructs public insurance–remains robust to the specification of long-term income risk.

5.5 Robustness

The policy implications reported above are also robust to a variety of other specifications.[24] First, in constrast to the preceding, we find also that increasing the magnitude of the long-term shock (μ) so that households experience a 30% reduction in average wages (as opposed to 10% in the benchmark) generated qualitatively similar outcomes. While the overall welfare effects are larger (a more severe shock significantly reduces aggregate welfare), the policy implications discussed above still hold. The implications of the model survive changes to other parameters, including transactions costs, which we halve, to $\delta = 0.017$, and lastly, to increases in the amount of moral hazard in the model, where we set $\nu = 0.1$.

6 Conclusions

In the U.S., various public insurance programs exist to help households insure against income or employment disruptions. Credit with a personal bankruptcy option may also provide insurance. This paper analyzes the relationship between these two insurance systems and arrives at two central results. Our main finding is that the U.S. bankruptcy code impedes public insurance provision in the U.S. Second, our results for public insurance contradict the view that better insurance, by limiting drops in income, will reduce the use of bankruptcy. Personal bankruptcy creates inefficiently large reductions in search effort. These reductions

[24] For brevity, we do not include the details here, but they are available on request.

are associated with suboptimally large risk-taking with respect to re-employment risk and skill loss. Distributionally, generous unemployment insurance imposes costs disproportionately on those households whose income fluctuations are not covered by unemployment-based insurance. Therefore the welfare gains from unemployment benefits go to a relatively small group, while the costs of restricted credit access are borne by a much larger group.

References

[1] Aiyagari, S. Rao and Ellen R. McGrattan. 1998. "The Optimum Quantity of Debt." *Journal of Monetary Economics*, 42:3, pp. 447-69.

[2] Alvarez, Fernando, and Marcelo Veracierto, "Severance Payments in an Economy With Frictions", 2001, *Journal of Monetary Economics*, 47:3, pp. 477-98.

[3] Arulampalam, W, Allison Lee Booth and Mark P. Taylor 2000, "Unemployment Persistence" *Oxford Economic Papers* ; 52:24-50

[4] Autor, David H. and Mark G. Duggan. 2003. "The Rise in the Disability Rolls and the Decline in Unemployment." *Quarterly Journal of Economics*, 118:1, pp. 157-205.

[5] Athreya, Kartik B. 2002. "Welfare Implications of the Bankruptcy Reform Act of 1999." *Journal of Monetary Economics*, 49:8, pp. 1567-95.

[6] Athreya, Kartik B. 2004. "Shame As It Ever Was: Stigma and Personal Bankruptcy." *Federal Reserve Bank of Richmond Economic Quarterly*, 90:2.

[7] Attanasio, Orazio and Jose-Victor Rios-Rull. 2000. "Consumption Smoothing in Island Economies: Can Public Insurance Reduce Welfare?" *European Economic Review*, 44:7, pp. 1225 - 1258.

[8] Bermant, Gordon and Ed Flynn. 2002. "Just Recently Hired: Job Tenure Among No-asset Chapter 7 Debtors." American Bankruptcy Institute.

[9] Buckley, Frank and Margaret Brinig. 1996. "The Market for Deadbeats." *Journal of Legal Studies*, 25:1, pp. 201-232.

[10] Chatterjee, Satyajit, Dean Corbae, Makoto Nakajima, and Jose-Victor Rios-Rull. 2002. "A Quantitative Theory of Unsecured Consumer Credit with Risk of Default." Federal Reserve Bank of Philadelphia: Working Paper 02-6.

[11] Cooley, Thomas F. and Edward C. Prescott. 1995. *Frontiers of Business Cycle Research.* Princeton University Press: Princeton.

[12] Corcoran, M., and G. Duncan, 1979, "Work history, labor force attachment, and earnings differences between the races and sexes", *Journal of Human Resources*, 14(1), pp.3-20

[13] Deaton, Angus. 1991. "Saving and Liquidity Constraints." *Econometrica,* 59:5, pp. 1221-48.

[14] Domowitz, Ian and Thomas L. Eovaldi. 1993. "The Impact of the Bankruptcy Reform Act of 1978 on Consumer Bankruptcy." *Journal of Law and Economics*, 36:2, pp. 803-35.

[15] Dubey, Pradeep, John Geanakoplos, and Martin Shubik. 2003. "Default and Punishment in General Equilibrium." Cowles Foundation Discussion Paper, No. 1304RRR.

[16] Evans, David S and Richard Schmalensee. 1999. *Paying with Plastic: The Digital Revolution in Buying and Borrowing.* Cambridge, Mass.: MIT Press.

[17] Fay, Scott, Erik Hurst and Michelle White. 2002. "The Household Bankruptcy Decision." *American Economic Review*, 92:3, pp. 706-718.

[18] Fisher, Jonathan D. 2003. "The Effect of Government Unemployment Benefits, Welfare Benefits, and Other Income on Personal Bankruptcy." Bureau of Labor Statistics Manuscript.

[19] Golosov, Mikhail and Aleh Tsyvinski. 2003. "Designing Optimal Disability Insurance." Federal Reserve Bank of Minneapolis, Working Paper 628.

[20] Hansen, Gary D. and Ayse Imrohoroglu. 1992. "The Role of Unemployment Insurance in an Economy with Liquidity Constraints and Moral Hazard." *Journal of Political Economy*, 100:1, pp. 118-42.

[21] Huggett, Mark. 1993. "The Risk-Free Rate in Heterogeneous-Agent Incomplete-Insurance Economies." *Journal of Economic Dynamics and Control*, 17:5-6, pp. 953-69.

[22] Jacobson, Louis S, Robert J. LaLonde, and Daniel G Sullivan. 1993. "Earnings Losses of Displaced Workers." *American Economic Review*, 83:4, pp. 685-709.

[23] Keane, Michael, and Kenneth I. Wolpin "The Career Decisions of Young Men", *Journal of Political Economy, 105 (473-522).*

[24] Kletzer, Lori G. 1998. "Job Displacement." *Journal of Economic Perspectives*, 12:1, pp. 115-36.

[25] Kocherlakota, Narayana R. 2004. "Zero Expected Walth Taxes: A Mirrlees Approach to Optimal Taxation." Stanford University Working Paper.

[26] Krueger, Dirk and Fabrizio Perri. 2003. "Does Income Inequality Lead to Consumption Inequality? Evidence and Theory." Mimeo, NYU.

[27] Lentz, Rasmus and Torben Tranaes, "Job Search and Savings: Wealth Effects and Duration Dependence", mimeo, Boston University, November 2003.

[28] Li, Wenli and Pierre-Daniel Sarte. 2002. "The Macroeconomics of U.S. Consumer Bankruptcy Choice: Chapter 7 or Chapter 13?" Federal Reserve Bank of Richmond Working Paper #02-1.

[29] Livshits, Igor, James MacGee, and Michele Tertilt. 2003. "Consumer Bankruptcy: A Fresh Start." Federal Reserve Bank of Minneapolis, Working Paper 617.

[30] Ljungqvist, Lars and Thomas J. Sargent. 1998. "The European Unemployment Dilemma." *Journal of Political Economy*, 106:3, pp. 514-50.

[31] Martin, John. 1996. "Measures of Replacement Rates for the Purpose of International Comparisons: A Note." OECD Economic Studies No. 26:1.

[32] Musto, David. 2002. "What Happens when Information Leaves a Market? Evidence from Post-Bankruptcy Consumers." *Journal of Business*, forthcoming.

[33] Obstfeld, Maurice and Kenneth Rogoff. 1996. *Foundations of International Macroeconomics*. Cambridge, Mass. and London: MIT Press.

[34] Pissarides, Christopher A. 1992. "Loss of Skill during Unemployment and the Persistence of Employment Shocks." *Quarterly Journal of Economics*, 107:4, pp. 1371-91.

[35] Rogerson, Richard and Martin Schindler. 2002. "The Welfare Costs of Worker Displacement." *Journal of Monetary Economics*, 49:6, pp. 1213-34.

[36] Shepard, Lawrence. 1984. "Personal Failures and the Bankruptcy Reform Act of 1978." *Journal of Law and Economics*, 27:2, pp. 419-437.

[37] Stevens, Ann Huff. 1997. "Persistent Effects of Job Displacement: The Importance of Multiple Job Losses." *Journal of Labor Economics*, 15:1, pp. 165-88.

[38] Sullivan, Teresa A., Elizabeth Warren, and Jay Lawrence Westbrook. 2000. *The Fragile Middle Class: Americans in Debt.* New Haven: Yale University Press.

[39] Wang, Cheng and Stephen D. Williamson. 2002. "Moral Hazard, Optimal Unemployment Insurance, and Experience Rating." *Journal of Monetary Economics*, 49:7, pp. 1337-71.

[40] Young, Eric. 2004. "Unemployment Insurance and Capital Accumulation." Forthcoming, *Journal of Monetary Economics.*

[41] Zame, William R. 1993. "Efficiency and the Role of Default When Security Markets Are Incomplete." *American Economic Review*, 83:5, pp. 1142-64.

[42] Zha, Tao. 2001. "Bankruptcy Law, Capital Allocation, and Aggregate Effects: A Dynamic Heterogenous Agent Model with Incomplete Markets," *Annals of Economics and Finance,* v2.

7 Appendix

7.1 Flowchart

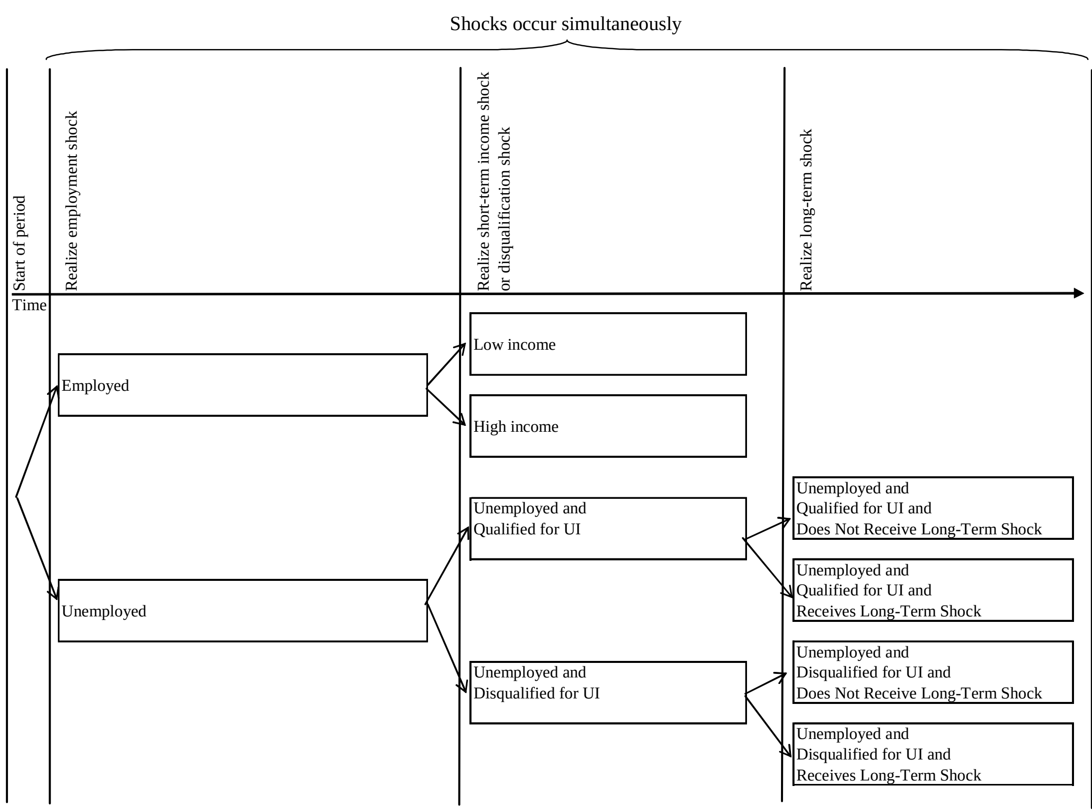


Figure 1: Sequence of Events

7.2 Labor Income By Employment and Long-Term Shock Status

Labor income y be defined as follows:

$$y = \begin{cases} \widetilde{Y} \in \{Y_l,Y_h\} \text{ if employed without long-term shock } (I_L = 0) \\ \widetilde{Y} \in \{\mu Y_l,\mu Y_h\} \text{ if employed with long-term shock } (I_L = 1) \\ \theta\overline{Y} \text{ if unemployed, qualified for UI, } (I_L = 0) \\ \theta(\mu\overline{Y}) \text{ if unemployed, qualified for UI, } (I_L = 1) \\ Y_{\min} \text{ if unemployed and disqualified from UI} \end{cases} \tag{25}$$

Employment status evolves as follows. Let I_U denote an indicator function over unemployment. If employed in the current period (i.e. $I_U = 0$), households are unemployed next period according to:

$$(I'_U|I_U = 0) = \begin{cases} 1 \text{ with prob. } \rho \\ 0 \text{ with prob. } 1-\rho \end{cases} \tag{26}$$

If unemployed in the current period, the likelihood of becoming employed in the following period depends on search effort:

$$(I'_U|I_U = 1) = \begin{cases} 1 \text{ with prob. } 1-\pi^e(n) \\ 0 \text{ with prob. } \pi^e(n) = \min(1, \frac{n}{1-\omega}) \end{cases} \tag{27}$$

For those who are currently suffering the effects of the long-term shock (i.e., $I_L = 1$), the shock evolves according to:

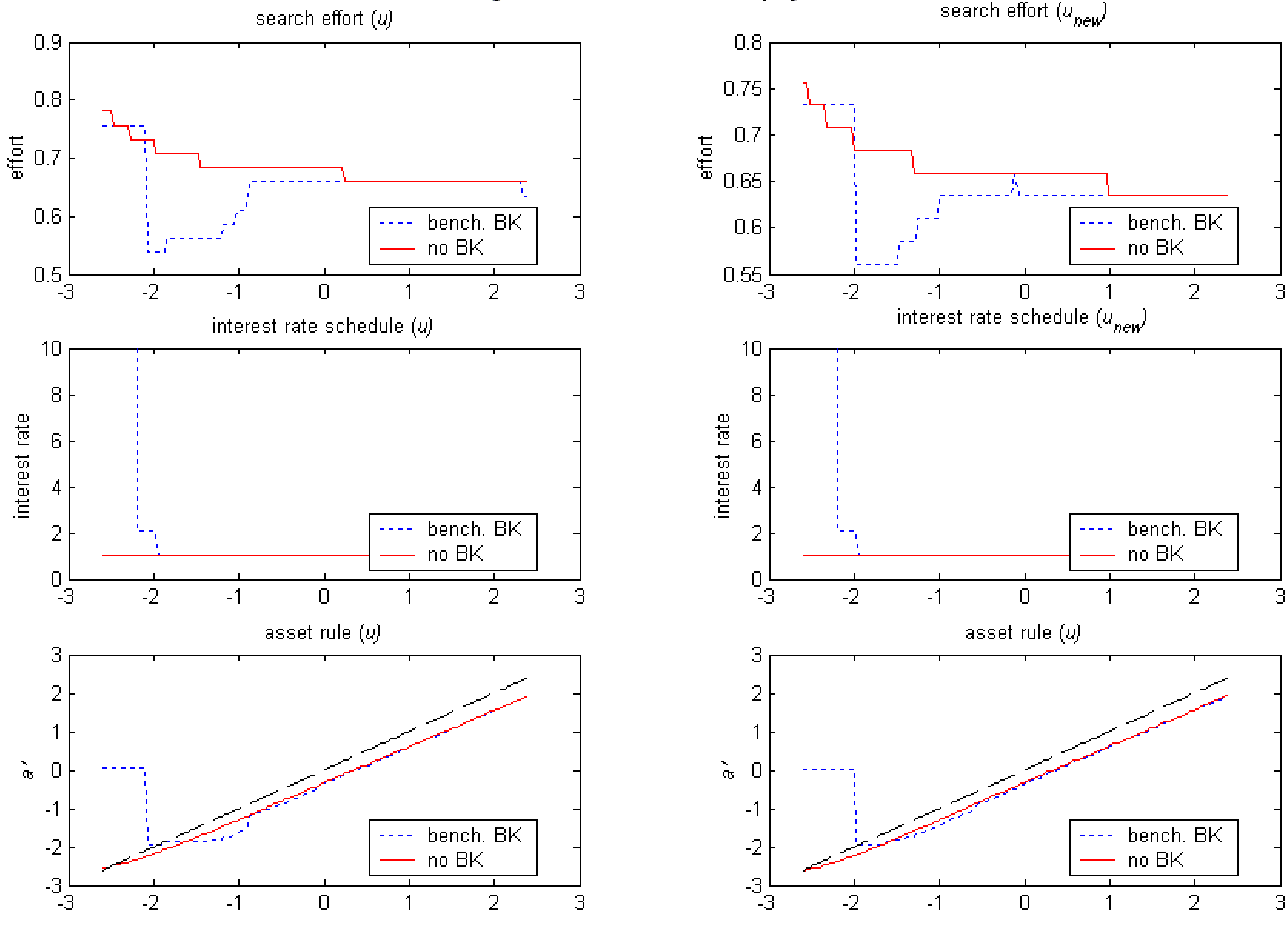
$$(I'_L|I_L = 1) = \begin{cases} 1 \text{ with prob. } 1-\eta \\ 0 \text{ with prob. } \eta \end{cases} \tag{28}$$

For those who are currently not affected by the long-term shock, the law of motion is:

$$(I'_L|I_L = 0) = \begin{cases} 0 \text{ if } I_U = 0 \\ \pi^\ell \text{ if } I_U = 1 \text{ and } I_U(t-2) = 1 \end{cases} \tag{29}$$

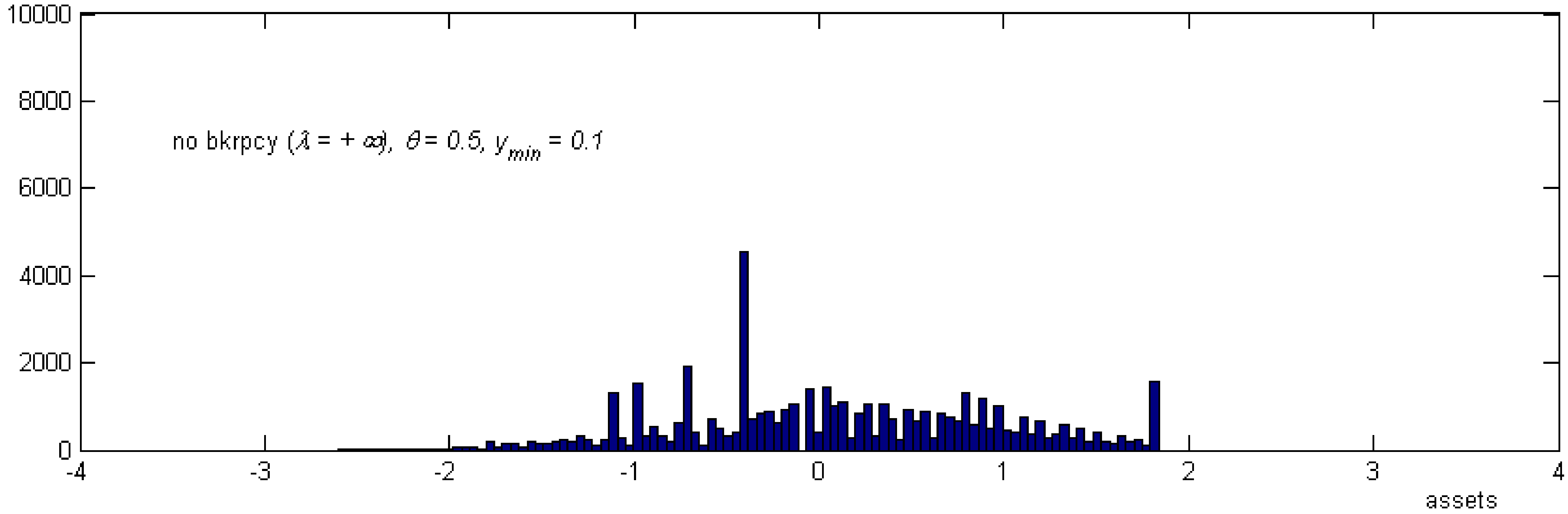
where we abuse notation slightly by using $I_U(t-2)$ to denote unemployment status two periods ago. That is, households are susceptible to the long-term shock only after experiencing two successive periods of unemployment.

Figure 2: The Effect of Bankruptcy



note: panels above represent $(\theta, y_{min}) = (0.50, 0.10)$

Figure 3: Bankruptcy and the Distribution of Assets



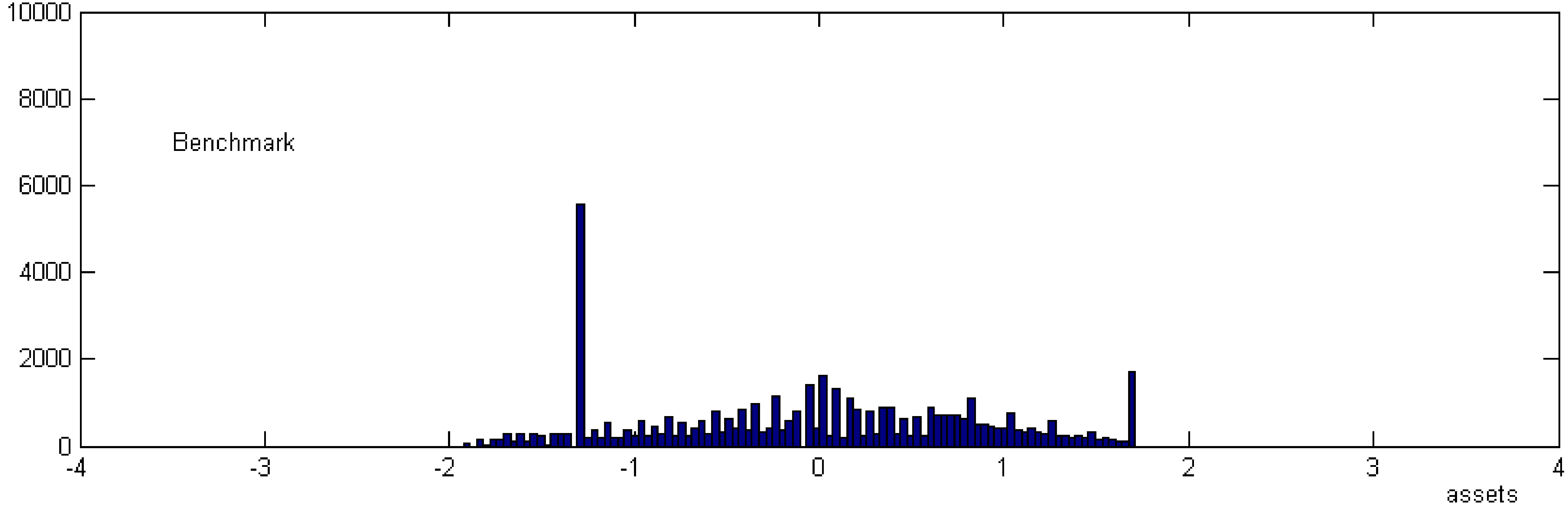


Figure 4: Bankruptcy and the Distribution of Consumption

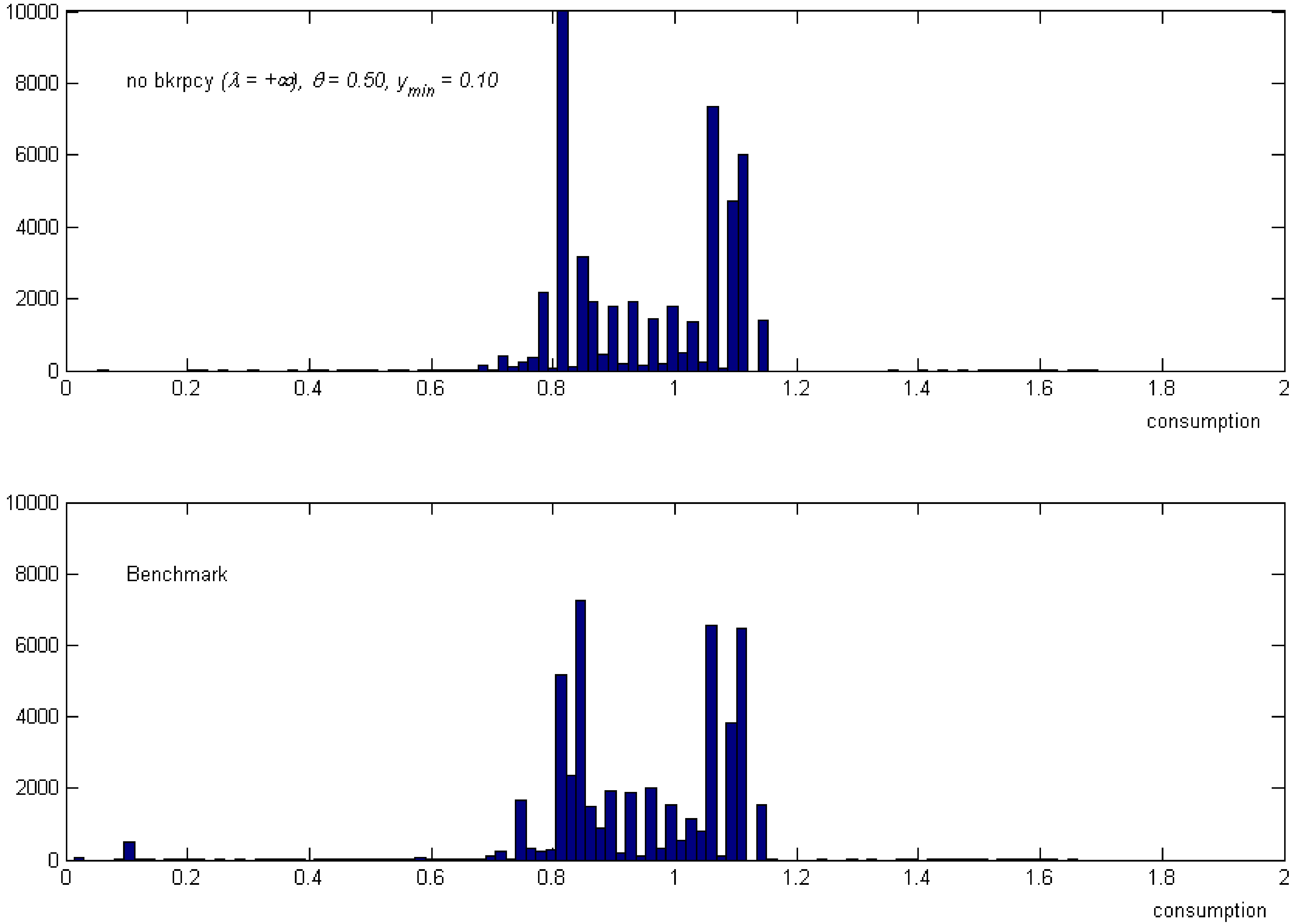
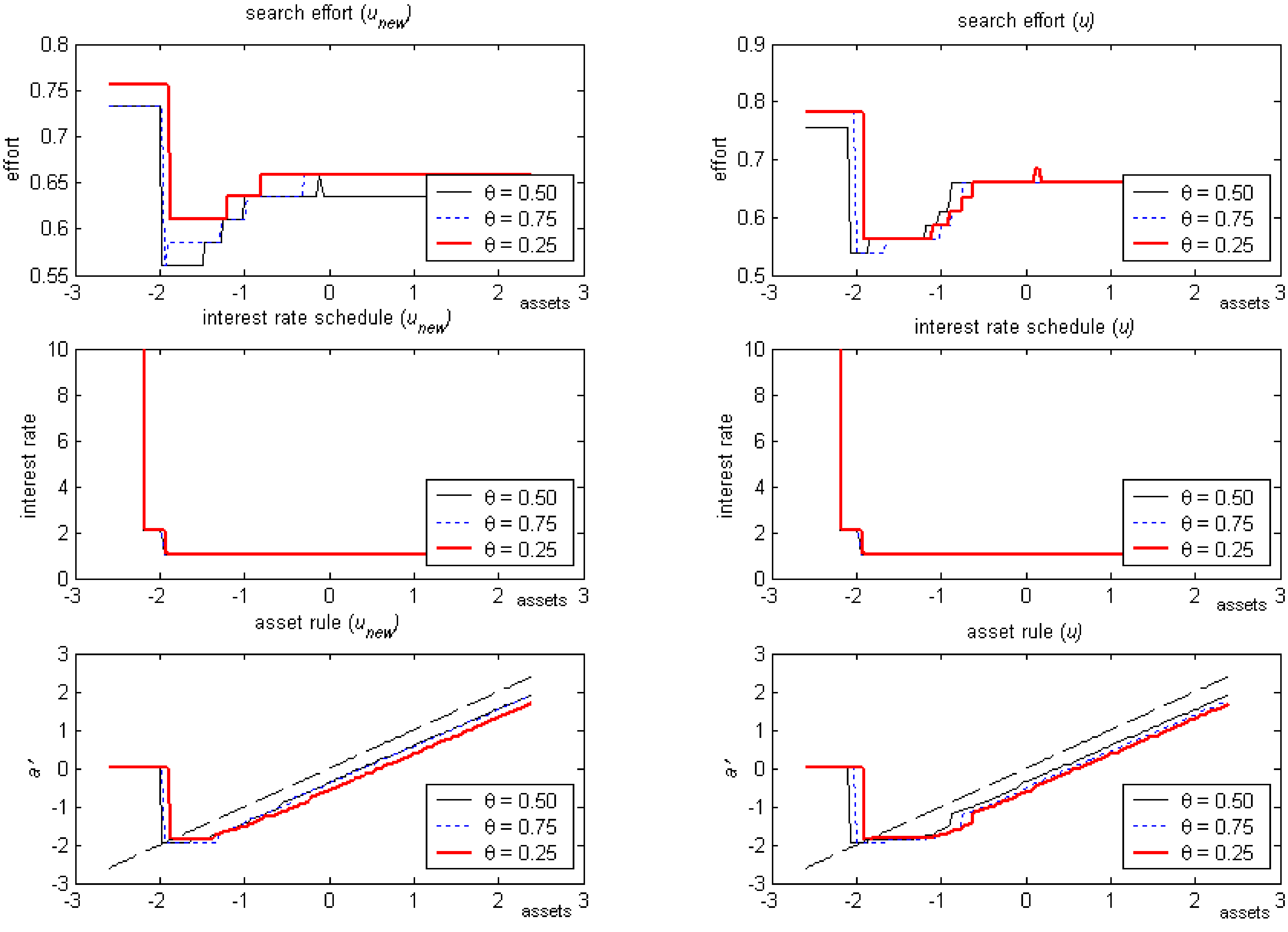


Figure 5: Effects of Changes in the UI Replacement Ratio



note: panels above represent $(\lambda, y_{min}) = (2.3, 0.10)$

Tables

Description	**Benchmark Value**	**Observed Value**
Unemployment rate	5.81%	5.80%
Quarterly bankruptcy filing rate	0.213%	0.210%
Quarterly ratio of discharged to unsecured debt	0.97%	1.20%
Unemployment durations (<13 wks, <26 wks)	68.5%, 20.5%	69.8%, 15.5%
Fraction of displaced workers	5.65%	5.60%
Ratio of unsecured debt to income	10.0%	9.60%
Loss per bankruptcy (1997$)	$18,321	$19,000

Table 1: Calibration Targets

Parameter	**Description**	**Value**
σ	Risk aversion	1.00
ρ	Probability of job loss	0.032
δ	Transaction cost of intermediation	0.0085
$\underline{A_B}$, $\underline{A_{BC}}$	Borrowing limit for borrowing constrained households	0
Y_l	Low wage shock	0.85
Y_h	High wage shock	1.15
p_{ll}	Probability of remaining low wage	0.97
p_{hh}	Probability of remaining high wage	0.97
μ	Magnitude of long-term shock	0.90
π^{ℓ}	Probability of experiencing long-term shock given unemployment	0.05
η	Probability of escaping from long-term shock state	0.0125
ω	Effectiveness of search	0.92
$\pi_k^{dq}\ \forall k > 2$	Probability of UI disqualification after 2 periods	1
ν	Search incentives	1
θ	UI replacement ratio	0.50
Y_{min}	Income from public insurance	$0.1\overline{Y}$
ψ	Average length of post-bankruptcy borrowing limit	0.9375
λ	Bankruptcy cost	2.30
β	Discount rate	0.9853

Table 2: Parameters

Experiment	Bk(%)	U(%)	ϕ (%)	τ (%)	Loss/Bk($)	Bk/U(%)	Effort	Borrow($)	σ_c	Cons
Benchmark	0.852	5.81	-	2.30	18,321	2.93%	0.643	4,028	0.172	0.945
No bankruptcy	0	4.45	0.36	2.19	N/A	N/A	0.672	3,203	0.141	0.957

Table 3: Effects of Bankruptcy

Experiment	Bk(%)	U(%)	ϕ (%)	τ (%)	Loss/Bk($)	Bk/U(%)	Effort	Borrow($)	σ_c	Cons
Benchmark	0.852	5.81	-	2.30	18,321	2.93	0.643	4,028	0.172	0.945
High UI	0.904	5.97	-0.38	3.54	18,203	2.48	0.625	4,292	0.167	0.941
Low UI	0.724	5.45	0.38	1.22	17,826	3.29	0.663	3,006	0.175	0.952
Extended UI	0.732	6.73	-0.81	3.03	17,804	2.66	0.605	4,395	0.176	0.930
Low & Ext. UI	0.469	5.28	0.33	1.30	17,804	2.22	0.661	3,140	0.169	0.950

Table 4: Effects of Unemployment Insurance

Experiment	Bk(%)	U(%)	ϕ (%)	τ (%)	Loss/Bk($)	Bk/U(%)	Effort	Borrow($)	σ_c	Cons
Benchmark	0.852	5.81	-	2.30	18,321	2.93	0.643	4,028	0.172	0.945
High SI	0.993	6.45	-0.38	2.60	18,114	3.74	0.622	4,353	0.183	0.938
Low SI	0.703	5.34	0.04	2.24	18,430	2.17	0.666	3,869	0.165	0.949

Table 5: Effects of Minimal Social Insurance

For each experiment, we calculate several other bankruptcy and labor market outcomes. For ease of exposition, we did not include these results in Section 5.

Experiment	**Bk/LTS (%)**	**NCL/ANR (%)**	**Avg. Assets**	**LTS rate (%)**
Benchmark	1.92	0.97	-0.03	5.65
No bankruptcy	0	0	-0.09	3.52
High UI	2.53	0.96	-0.12	5.46
Low UI	1.56	1.07	0.19	4.74
Extended UI	1.65	0.74	-0.10	6.77
Low & Extended UI	1.48	0.66	0.18	4.54
High SI	1.66	1.03	-0.09	5.91
Low SI	1.82	0.84	0.01	5.22

Table 6: Additional Bankruptcy Results

We also present additional unemployment durations for each experiment: the percent of unemployed households that remain unemployed one or less quarter (u_1), the percent of unemployed households that are unemployed for one to two quarters (u_2), and the percent of unemployed households that remain unemployed for more than two quarters (u_3).

Experiment	$\mathbf{u_1}$	$\mathbf{u_2}$	$\mathbf{u_3}$
Benchmark	68.5	20.3	11.1
No bankruptcy	72.5	19.9	7.6
High UI	67.5	20.9	11.6
Low UI	71.2	19.1	9.69
Extended UI	67.0	19.8	13.1
Low & Extended UI	71.3	19.9	8.8
High SI	66.8	20.6	12.5
Low SI	70.9	19.3	9.8

Table 7: Additional Labor Market Results

Experiment	**Bk(%)**	**U(%)**	ϕ **(%)**	τ **(%)**	**Loss/Bk($)**	**Bk/U(%)**	**Effort**	**Borrow($)**	σ_c	**Cons**
Low UI, Low SI	0.503	4.93	0.58	1.11	17,914	2.17	0.684	2,632	0.165	0.957
Low UI, High SI	0.952	6.17	0.11	1.40	18,226	3.86	0.641	3,294	0.187	0.944
High UI, Low SI	0.710	5.31	-0.07	3.35	17,881	2.21	0.644	3,620	0.155	0.948
High UI, High SI	1.21	7.05	-0.82	3.85	17,312	3.03	0.600	4,410	0.185	0.930

Table 8: Effects of Uniform UI/SI With Bankruptcy

Experiment	**Bk(%)**	**U(%)**	ϕ **(%)**	τ **(%)**	**Loss/Bk($)**	**Bk/U(%)**	**U/Bk(%)**	**Effort**	**Borrow($)**	σ_c	**Cons**
Low UI, Low SI	0	4.29	0.68	1.07	N/A	N/A	N/A	0.695	2,582	0.147	0.963
Low UI, High SI	0	4.36	0.63	1.11	N/A	N/A	N/A	0.682	2,805	0.148	0.961
High UI, Low SI	0	4.55	0.17	3.31	N/A	N/A	N/A	0.657	3,141	0.135	0.954
High UI, High SI	0	4.65	0.16	3.38	N/A	N/A	N/A	0.642	3,371	0.135	0.953

Table 9: Effects of Uniform UI/SI Without Bankruptcy

Experiment	**Bk(%)**	**U(%)**	ϕ **(%)**	τ **(%)**	**Loss/Bk($)**	**Bk/U(%)**	**Effort**	**Borrow($)**	σ_c	**Cons**
Low UI, Low SI	0.772	5.51	-0.19	2.30	18,170	3.25	0.656	4,305	0.173	0.945
Low UI, High SI	0.786	5.55	-0.23	2.31	18,412	3.41	0.652	4,446	0.171	0.945
High UI, Low SI	0.910	6.27	0.04	2.46	17,970	2.75	0.620	3,625	0.196	0.942
High UI, High SI	0.986	6.76	-0.18	2.65	18,075	2.98	0.612	3,697	0.204	0.937

Table 10: Effects of UI/SI for LTS Households With Bankruptcy

Experiment	**Bk(%)**	**U(%)**	ϕ **(%)**	τ **(%)**	**Loss/Bk($)**	**Bk/U(%)**	**Effort**	**Borrow($)**	σ_c	**Cons**
Low UI, Low SI	0	4.36	0.21	2.13	N/A	N/A	0.681	3,991	0.142	0.957
Low UI, High SI	0	4.36	0.20	2.14	N/A	N/A	0.681	4,008	0.142	0.957
High UI, Low SI	0	4.56	0.53	2.3	N/A	N/A	0.656	2,445	0.148	0.958
High UI, High SI	0	4.56	0.53	2.3	N/A	N/A	0.655	2,450	0.148	0.958

Table 11: Effects of UI/SI for LTS Households Without Bankruptcy

Experiment	**Bk(%)**	**U(%)**	ϕ **(%)**	τ **(%)**	**Loss/Bk($)**	**Bk/U(%)**	**Effort**	**Borrow($)**	σ_c	**Cons**
Bench. Bk, LTS	0.85	5.81	-	2.30	18,321	2.93%	0.643	4,028	0.172	0.945
No Bk, LTS	0	4.45	0.36	2.19	N/A	N/A	0.672	3,203	0.141	0.957
Bench. Bk, No LTS	0.75	6.18	0.22	2.46	19,011	3.01%	0.618	4,535	0.177	0.944
No Bk, No LTS	0	4.63	0.75	2.26	N/A	N/A	0.646	3,132	0.139	0.959

Table 12: Bankruptcy and Long-Term Income Risk