Fresh Start or Head Start? Uniform Bankruptcy Exemptions and Welfare[*]

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Abstract

The 1990's witnessed a historically unprecedented number of personal bankruptcy filings. In response, Congressional debate over bankruptcy law has recently led to several proposals aimed at making it more difficult to exempt wealth in a bankruptcy. In this paper, I evaluate uniform exemption policy primarily within the context of the recent congressional proposal H.R. 975. I develop an incomplete markets general equilibrium model where secured and unsecured assets coexist and are treated differentially in a bankruptcy proceeding. I find that when exemptions are made very strict relative to current averages, filing rates and welfare fall somewhat, but when exemptions are increased, even dramatically, filing rates and welfare remain unchanged. The results are robust, and show that increases in bankruptcy exemptions beyond current state averages are largely a matter of indifference, and do not merit the heated debate they have generated.

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1. Introduction

Personal bankruptcy filings have grown rapidly over the past decade. In 1990, there were approximately 700,000 filings. By 1997, filings had nearly doubled to 1.3 million, a level that they have since averaged. The resulting losses to creditors have been estimated at over forty billion dollars annually (WEFA (1998)). Consequently, there is now an intense public debate on the desirability of comprehensive bankruptcy reform. In this debate, special emphasis has been placed on exemptions, which are the rules governing the amount of wealth that may be retained by a debtor in a bankruptcy filing.

In particular, several recent recommendations have advocated a uniform, limited, and federally mandated exemption level, the most recent of which is the Bill in Congress entitled "Bankruptcy Abuse Prevention and Consumer Protection Act of 2003" (H.R. 975). The provisions of the bill with respect to exemptions concern the "homestead" exemption, which applies to home equity, and is for most households by far the largest exemption. Currently, homestead exemptions are set by state law and are unrestricted by federal bankruptcy law. The House version of the bill seeks to place a $100,000 cap on homestead exemptions for a house purchased within two years of declaring bankruptcy. Additionally, the Bill would restrict households to exemptions established under state laws for houses purchased more than two years prior to bankruptcy. The (untitled) Senate version of this Bill seeks to override state laws by placing a nationwide $125,000 cap on homestead exemptions for all bankruptcy filers, regardless of when the house was purchased.[1] The senate proposal is aimed primarily at limiting the unlimited exemptions currently allowed in eleven states. However, while the proposal would limit exemptions in such states, it nevertheless implies increases in exemptions in fourteen states, some of them substantial.[2] Currently, exemptions vary across states, but work of Elul and Subramanian (2002) suggests that the cost of interstate moves to exploit higher exemptions is prohibitive for most. Therefore, the uniform exemption proposal will result in a large increase in the number of U.S. households with easy access to high exemptions.[3]

Exemption "reform" has been a divisive legislative issue for several years. In 1997, a

[1] Uniform exemptions also have constitutional roots. Article 1, Section 8 of the U.S. Constitution guarantees the federal government's ability to determine nationwide bankruptcy law. Existing variation in state exemption laws have led to attacks on the law as "...lacking the uniformity required by the Constitution." (James B. Haines Jr., quoted in Warren and Jacoby [1997]).

[2] Including populous states such as Michigan, Pennsylvania, New Jersey, and Virginia.

[3] Consider the following advice from a small-business advice website:

"...When the homestead exemption is unlimited, or the amount of the exemption exceeds the value of the home, consider paying off the mortgages on the property.

Where the value of the home exceeds the exemption amount, consider the opposite strategy; that is, *encumbering the home with an additional commercial mortgage* (emphasis mine) ".

nine-member panel known as the National Bankruptcy Review Commission (NBRC) made recommendations to increase exemptions and eliminates states' rights to force households to use more restrictive state exemptions. These recommendations proved contentious, and survived only by a 5-4 margin. In a forceful reply to the majority opinion, dissenting Commission members (Jones and Shepard [1997]) argued that it was "...highly likely that these liberal exemptions [would] translate into the filing of more Chapter 7 liquidation cases". Secondly, the dissenters argued that the NBRC proposal gave "...debtors a head start, not a fresh start" by enabling "...many Americans to escape their contractual obligations while maintaining levels of wealth that the vast majority of Americans do not enjoy."[4]

In this paper I ask three questions. First, will dramatic changes in exemptions, such as the ones proposed by Congress, the Senate, and others, cause an equally dramatic change in bankruptcy rates, interest rates and consumer debt, as some have argued? Second, with respect to distributive effects, will high uniform exemptions give debtors a "head start" or just a "fresh start"? Third, from a normative perspective, what are the welfare consequences of uniform exemption law? To address these questions, I develop a dynamic general equilibrium model with incomplete insurance markets, secured and unsecured credit, and liquidity constraints. Most importantly, I incorporate a well defined bankruptcy law that distinguishes between secured and unsecured debt. I calibrate the model to the filing behavior of U.S. homeowners, and then study the effects of uniform exemptions.

The results are striking. When exemptions are varied from extremely lax to extremely strict levels, bankruptcy incidence and unsecured interest rates respond only minimally. More importantly, in the benchmark case, the welfare effects from varying exemptions are modest, at consistently less than $2 per household annually in steady state. The results presented here are robust, and indicate that moving to a uniform federal exemption as high as $100,000 would have negligible consequences. In particular, allowing equity to be 100% exempt in all states will not change outcomes. The conclusion that filing rates will not rise with exemptions also receives empirical confirmation.[5] The results show also that Sen. Herbert Kohl's 2001 amendment to Senate bill S.420, aimed at closing the "mansion loophole", whereby some high-profile debtors have succeeded in retaining large properties though exemptions, will not lower welfare. Lowering exemptions across all states to near

[4]The NBRC also cites a Justice Department memorandum to it stating that it would favor "...more modest exemption levels" in a June 18, 1997 letter to NBRC Commission Chairman Brady Williamson from Francis M. Allegra, Deputy Associate Attorney General. The Justice Department made it known that it was "concerned that the asset levels tentatively adopted by the Commission are too high in light of the historical purposes of allowing property to be claimed as exempt".

[5]See for example, Apilado, Dauten, and Smith (1978), Ellis (1998), Peterson and Aoki (1984), Pomykala (1997), Shiers and Williamson (1987). However, Fay Hurst, and White (2002) find that the financial benefit (driven by exemptions) to filing does matter.

zero lowers filing rates, but also lowers welfare. With respect to a "fresh start" or a "head start", bankruptcy in the model does not reward increases in unsecured debt holdings with higher expected utility, nor does it result in filers who retain large levels of wealth. Thus, despite the heated debate over excessively lax exemption policy, it appears that it is very strict exemptions which hurt welfare.

The model suggests that despite the incentives created by exemptions for households to borrow while saving, most do not. Instead, households are shown to systematically and rationally pledge their equity in return for cheaper secured credit. It turns out that, even when calibrated only to mean exemption levels, both the implied cost of bankruptcy, in terms of future borrowing constraints and other costs, and the spread between unsecured and secured borrowing rates, are large enough to nullify the perverse incentive effects of large exemptions. Lastly, the results also suggest that the observed invariance of filing rates to state level variation in exemptions does not imply or require significant supply-side responses. Indeed, the failure of the literature to clearly document supply-side effects may simply be because exemptions do not significantly change equilibrium household decision rules, and hence should not alter lender behavior.[6] The results of the paper are also robust to both to income shock persistence and to the cost of bankruptcy assumed.

A principal motivation for this paper is the well-documented ability of households to smooth consumption effectively in incomplete-market settings without bankruptcy (e.g. Huggett (1993), Krusell and Smith (1998)). This result immediately leads one to suspect that any large "free lunch" provided by exemptions will be thoroughly exploited. Surprisingly, this has not happened. I demonstrate here that a simple model of secured and unsecured borrowing with bankruptcy and exogenous credit limits is consistent with the observed insensitivity of bankruptcy and interest rates to exemptions. This paper is therefore complementary to the work of White (1998) who finds strikingly that up to 15% of U.S. households would benefit financially from filing for bankruptcy, when only about 1% do. Furthermore, any wealth retained in bankruptcy will enhance subsequent consumption smoothing, especially if households find borrowing after bankruptcy difficult, as observation strongly suggests they do.[7] Interestingly, I find that even when the model is calibrated only to match the aggregate bankruptcy filing rate under the average state exemptions, households are nearly always unwilling to hold assets and unsecured debts together even when exemptions are pushed to nearly double the current average.[8] That is, in precisely an environment where they might

[6] Gropp, Scholz, and White [hencefoth Gropp et. al. (1997)] find some evidence that high exemptions lead to tighter credit standards for households with low asset holdings. However, they do not separate secured from unsecured debt, and assume that households can transform one into the other at low cost.

[7] See Musto (2002).

[8] The results are robust to measurement error in bankruptcy costs as well, as calibrating the model to the strictest state exemptions, for example, would have biased the model toward the finding that behavior was

distort decisions substantially, exemptions are found to be of only limited importance in influencing bankruptcy rates, prices, and household portfolios.

With respect to the existing literature on bankruptcy in incomplete-markets models, it is useful to first compare the environment developed here with the model of bankruptcy "means-tests" studied in Athreya (2002). For simplicity, Athreya (2002) collapsed all assets into a single net-worth measure, and did not allow for non-trivial debt portfolios. It was found in that paper that income based means-tests for bankruptcy did not substantially alter equilibrium prices, quantities, or welfare. However, as discussed above, it is just such an environment that has the potential for exemptions to matter for household portfolios and welfare. Furthermore, the analysis of exemptions clearly requires allowing trade in multiple assets whereby households have the option of holding debt and equity simultaneously. The main contribution of this paper is, to my knowledge, to provide the first study of exemptions in a quantitative incomplete-markets model where secured and unsecured debt coexist but are treated differently in bankruptcy.

Existing dynamic general equilibrium analysis of exemptions is limited, but is growing quickly. This paper is most closely related to Li and Sarte (2002), who study bankruptcy exemptions in a model with capital and unsecured debt, and find that stricter exemptions may actually lead to higher bankruptcy rates and lower capital accumulation, as households have incentives to borrow rather than save in order to derive benefits from bankruptcy. This paper also follows and extends work originating in the general equilibrium models of bankruptcy of Dubey, Geanakoplos, and Shubik (2001), (henceforth Dubey, et al [2001]), Zame (1993), Zha (2001), and is related to ongoing work of Chatterjee, Corbae, Nakajima, Rios-Rull (2002) (henceforth Chatterjee et al [2002]), Lehnert and Maki (2000), Li and Sarte (2002), Livshits, MacGee and Tertilt (2002) [henceforth Livshits et al. (2002)], and Pavan (2003). Chatterjee et al (2002) evaluate bankruptcy law in a small open-economy model of unsecured debt, and find a welfare improving role for means-testing of bankruptcy filers. Livshits et al. (2002) contrast bankruptcy codes in the U.S. and Europe in a small open-economy, life-cycle setting, and find a welfare improving role for bankruptcy in the presence of large "expense shocks", such as health crises.[9]A key distinction between the work presented here, and that of Athreya (2002), Chatterjee et al (2002) and Livshits et al (2002), is that the focus here is exclusively on bankruptcy exemptions with multiple assets, rather than on policies aimed at toughening or eliminating bankruptcy in a single-asset setting.[10]

insensitive to exemptions.

[9]The results derived in the present paper lend support for partial equilibrium approaches, such as that of both Chatterjee et al. (2002), and Livshits et al. (2002), at least for the study of exemptions, as risk free rates on deposits vary little with exemptions.

[10]Note that the elimination of exemptions altogether does not in any way prevent bankruptcy, as it only prevents the retaining of wealth by filers.

2. The Model

2.1. Preferences

The environment consists of a continuum of households with CRRA preferences:[11]

$$E_0 \sum_{t=0}^{\infty} \beta^t \frac{c_t^{1-\alpha} - 1}{1-\alpha} \tag{2.1}$$

2.2. Equity

In this paper, I will focus primarily on the behavior of homeowners. Homes are typically the largest asset held by households, and homestead equity exemptions are almost always the largest exemptions offered to households. Bankruptcy exemptions may therefore affect the decisions of homeowners in important ways.[12] The value of a house is normalized to $|\underline{a}^s|$ units of the single perishable consumption good, and will provide the collateral for the secured debt that households may take on. The labeling of this asset as a "house" is mainly heuristic, and $|\underline{a}^s|$ should therefore be thought of as an aggregate measure of collateralizable wealth. Total household equity is then defined in the standard way, as the difference between the value of all collateralizable wealth and the value of debt held against it.

2.3. Financial Intermediaries

As argued by Dubey, et al. (2001), Evans and Schmalensee (1999), and Lapuerta and Myers (1997), the unsecured credit market is well characterized by anonymous, competitive trading. Anonymity emerges principally because credit card issuers, and even mortgage lenders, typically cannot track borrower earnings over time. Imperfect knowledge of the earnings process will in turn limit the informational content of credit history for any particular household's behavior. Sullivan, Warren, and Westbrook (2000) report that many credit card lenders do not even collect age, employment, and income data at the time of solicitation. Nonetheless, these lenders can and do still price default risk by holding a large, diversified loan portfolio of credit card contracts characterized by fixed interest rates and credit limits. I therefore employ an intermediary who takes deposits from large numbers of agents and makes secured

[11] The assumption of infinite lives will not be important for welfare considerations. Beyond the standard arguments (e.g., altruism, absence of annuities etc.), recent work specific to bankruptcy by Gross and Souleles (1998) argues that "risk-composition", a measure which adjusts for, among other things, changing account age distributions, only accounts for a small amount of the observed rapid rise in bankruptcies and its persistently high levels over the past five years.

[12] Although they can be large, exemptions are by themselves extremely unlikely to affect the decision to own a home, making the assumption of exogenous homeownership a useful approximation.

and unsecured loans to large numbers of agents.[13] This intermediation is assumed to be costly, with a proportional transactions cost in intermediation, denoted τ.

2.4. Secured and Unsecured Loans

The restriction of attention to credit contracts with fixed interest rates that ensure zero-profits, given average repayment rates within a pool of borrowers, helps simplify the model, while preserving the essential feature that default gets paid for with higher interest rates. This is the route taken in Dubey et al. (2001), Athreya (2002), Repetto (1998), and Li (2001). Very recently, Chatterjee et al. (2002) and Livshits et al. (2002) extend existing work by allowing lenders to condition on more information than allowed here.[14]

The competitive, fixed rate contracts used here are also consistent with the empirical work of Ausubel (1991), Calem and Mester (1997), and Raskovich and Froeb (1992), who find evidence for stickiness of unsecured credit card interest rates. Work by Mester (1994), Brito and Hartley (1995), and Evans and Schmalensee (1999), goes on to demonstrate that sticky and high interest rate behavior is nevertheless consistent with competition. These authors, along with ongoing work of Ausubel (1999), also show that when information about default risk is not costlessly observable, adverse selection can constrain the use of interest rates to manage credit card risk.[15] By contrast, secured debt in the model is risk-free for the lender, and is therefore invariant to a borrower's net-worth.

2.5. Endowments, Assets and Credit Limits

Agents receive random endowments of a single perishable good each period. These endowments are assumed to take on two values, y_h and y_l, where $y_h > y_l$. Endowments follow a Markov process that is serially dependent over time and independent across agents. There is no aggregate risk. The transition function on endowment realizations is given by $\theta_{hh} \equiv P(y_{t+1} = y_h | y_t = y_h)$, and $\theta_{ll} \equiv P(y_{t+1} = y_l | y_t = y_l)$.

Agents are allowed to trade in three assets: secured credit, unsecured credit, and risk-free savings. Secured debt denoted $a^s \leq 0$, is debt that agents cannot default on in a bankruptcy proceeding. Secured debt represents the sum of all mortgage debt and home equity loans held by a household, and is offered at interest rate R^s. Unsecured debt, denoted $a^u \leq 0$,

[13] This can be thought of as a central credit authority with whom agents hold balances, as in Huggett (1993), or a risk-free claim on consumption goods.

[14] The former solve for optimal contracts in a single-asset, small open-economy, infinite-horizon setting with i.i.d. shocks, while the latter do so in a single-asset, small open-economy life-cycle setting with serially dependent shocks.

[15] It is also well known that under asymmetric information, loan contracts may display fixed interest rates with credit rationing, as posited here.

may be wholly discharged in a bankruptcy proceeding, provided no equity must be applied towards it. Unsecured debt represents credit card debt and other non-collateralized loans, and carries an interest rate of R^u. Agents may also save in a risk-free asset, denoted $a^d \geq 0$, and will receive interest payments at gross deposit rates of R^d.

Households face fixed credit limits in both secured and unsecured markets, of $\underline{a}^s < 0$, and $\underline{a}^u < 0$, respectively. The assumption that secured credit limits do not respond to exemptions is justified theoretically, as changes in exemptions should not affect secured lending.[16] With respect to unsecured credit, the fixed cost of bankruptcy penalties implies that for reasonable parameters, bankruptcy will occur only for debt levels near the credit limit. Therefore, the amounts discharged in bankruptcy may be interpreted as approximate credit limits for households and used to parameterize the household's unsecured credit line. To this end, the ratio of median debt discharged in a bankruptcy to median income has remained close to one-half median income over the past decade, even as filings have more than doubled over the past decade, suggesting that fixed limits are a useful approximation.

2.6. Bankruptcy

Bankruptcy, as modeled here, removes unsecured debt in exchange for non-exempt assets, imposes a bankruptcy cost on the household, after which the period ends. Therefore analogous to the "Fresh Start" provisions under Chapter 7 of the Bankruptcy Code. This is a form of bankruptcy which constitutes over 70% of all filings, and approximately 90% of all debt in default.

In the model studied here, there are four types of costs associated with bankruptcy. First, and of primary interest here, is the cost of giving up all non-exempt assets. Second, bankruptcy in a credit history can make subsequent borrowing much more difficult. Third, there are explicit costs such as legal fees and time costs of court dates. Fourth, "stigma" appears to be a relevant cost (see Dubey, et al. [2001]), Fay, Hurst, and White [1996], Gross and Souleles [2000]).

Bankruptcy provides insurance but beyond exemptions, bankruptcy costs are "deadweight" in nature. The use of such penalties arises in part because it is often difficult to seize wealth, most obviously because nearly all filers have negative worth. Furthermore, penalties such as wage garnishing allow resource transfers but act as a tax on labor effort, and perhaps because of this have been severely restricted by law in many states (see Baird [2001]).

The penalties for bankruptcy, given their deadweight nature, can most tractably be

[16] Empirically, recent work of Berkowitz and Hynes (1999) demonstrates the insensitivity of mortgage lending to exemptions.

represented as reducing the utility of a household that files. This is the approach taken in both Zame (1993) and Dubey et al. (2001). Additionally, because the marginal response of consumption, welfare and interest rates to changes in exemptions may vary with the filing rate, I require that the model include all relevant costs of bankruptcy beyond those explicitly related to exemptions. However, the precise composition of these various costs is not necessary for understanding how changes in exemptions affect outcomes. Let λ denote all non exemption related costs of bankruptcy. I calibrate this parameter to match observed bankruptcy filing rates among homeowners under current exemptions. It should be made clear that the notion of costs used here includes all the above penalties for bankruptcies. In particular, as it is true that households do face at least temporary difficulty in borrowing following a bankruptcy, the parameter λ implicitly includes the imputed utility cost of being shut out of credit markets.[17],[18] In this way, credit markets effectively keep track of history in a way that does not require credit status to be retained as a state variable.

2.7. Exemptions

Exemptions are rules governing the maximum amount of wealth that may be retained by a bankruptcy filer. Any wealth above the exemption must be surrendered and used to satisfy unsecured creditors. Exemptions in this model have two effects on borrowers. First, they may provide risk-sharing benefits by keeping the consumption of agents smooth when shocks occur. Second, exemptions can damage risk-sharing and consumption smoothing, to the extent that they increase interest rates and fees. Lenders of unsecured credit in turn stand to lose in two ways from higher exemptions. First, conditional upon default, unsecured lenders may lose more in environments with high exemptions than low exemptions. Second, bankruptcy rates may increase with exemptions, thus increasing losses. Let $\overline{e} > 0$ denote the exemption level, such that any equity above $\overline{e}$ is seized and used to repay unsecured creditors. Let e denote the pre-bankruptcy equity position of the household and $|a^u|$ the pre-bankruptcy value of unsecured debt. The term $(e-\overline{e})$ is therefore "excess" equity, which must be applied to paying off unsecured debt in bankruptcy. Equation 2.2 below summarizes the post-bankruptcy equity position $e^b \geq 0$, as a function of pre-bankruptcy asset holdings.

[17] The approach taken here is also similar to Livshits et al. (2002), who employ costs of bankruptcy, and do not explicitly model exclusion from credit markets.

[18] It is found however, in a related environment (Athreya [2002]), that in order to match the data, penalties that are ex-ante restricted to *only* exclusion from credit markets imply penalty periods in excess of twenty-five years under reasonable parameterizations of preferences, market incompleteness, and idiosyncratic risk. This is not sensible as, among other things, bankruptcy disappears entirely from one's credit record after ten years. This indicates that the other costs above play an important role.

$$e^b = \begin{cases} e \text{ if } e < \overline{e} \text{ and} \\ \overline{e} \text{ if } e > \overline{e} \end{cases} \tag{2.2}$$

Secured debt after bankruptcy, denoted a^{sb} is therefore given as:

$$a^{sb} = \begin{cases} a^s \text{ if } e < \overline{e} \text{ and} \\ a^s - (e - \overline{e}) \text{ if } e > \overline{e} \text{ and } (e - \overline{e}) < |a^u| \\ a^s - |a^u| \text{ if } e > \overline{e} \text{ and } (e - \overline{e}) \geq |a^u| \end{cases} \tag{2.3}$$

The first line of 2.3 applies to cases where a debtor has equity below the exemption level and so will not surrender any equity or repay any of his unsecured debts. This is the case where the benefits of Chapter 7 bankruptcy exemptions are maximized. It is precisely this aspect of Chapter 7 that leads many to the view that exemptions discourage asset holding and encourage credit card debts. The second line of 2.3 refers to the case when a debtor has enough equity to transfer some, but not all, of his unsecured debts to secured debts. The unsecured creditor receives the equity in excess of the exemption. Therefore, the household's secured debt after bankruptcy will increase by the amount of excess equity, but his unsecured creditors will not be fully repaid. The third line in 2.3 covers the case where an debtor's equity exceeds the exemption by more than his unsecured debts. In this case, a debtor will be required to transform all his unsecured debt into secured debts, leaving him with secured debts that increase by the amount of his unsecured debt, while his unsecured creditors are fully repaid. Chapter 7 bankruptcy is not useful for households in this category.

2.8. The Recursive Formulation

At the beginning of a period, an agent is assumed to know his current period income, y, his secured debt a^s, his unsecured debt a^u, and savings, if any, a^d. With this information, he must compare the utility of remaining solvent, and being forced to at least service his debts, with the utility from declaring bankruptcy. Under bankruptcy, the agent is relieved of his obligation to repay unsecured debt if his equity is below the bankruptcy exemption threshold. If his equity is above the exemption limit $\overline{e}$, he will lose all equity in excess of this limit, as specified in equation 2.2. The controls for this problem are next period's secured and unsecured asset positions, $a^{s\prime}$ and $a^{u\prime}$ respectively, and savings $a^{d\prime}$, subject to the constraints that apply if an agent stays solvent or files for bankruptcy.

I focus on steady states and therefore drop time subscripts and use primes to denote all variables one-period ahead. Equation 2.4 yields the value of entering a period with assets a^s, a^u and a^d. In each period, the agent chooses whether to remain solvent or file for bankruptcy. The value of remaining solvent, denoted $V^S(a^s, a^u, a^d, y)$, is given in Equation 2.5, followed by the set of budget, bankruptcy, and feasibility constraints for those choosing not to file for bankruptcy. These are given by 2.6 and 2.7. The value of filing for bankruptcy is given in Equation 2.8 by $V^B(a^s, a^u, a^d, y)$, whereby an agent pays the cost λ, has their equity adjusted according to the exemption function 2.2, and chooses controls subject to the set of constraints given in 2.9 and 2.10. In the period following bankruptcy, agents are once again given the option to default, and therefore realize the discounted value $\beta V(a^{s\prime}, a^{u\prime}, a^{d\prime}, y')$ in both cases. This formulation is expressed below.

$$V(a^s, a^u, a^d, y) = \max[V^S(a^s, a^u, a^d, y), V^B(a^s, a^u, a^d, y)] \tag{2.4}$$

where

$$V^S(a^s, a^u, a^d, y) = \max_{(a^s_{t+1}, a^u_{t+1})} \{u(c_t) + \beta EV(a^{s\prime}, a^{u\prime}, a^{d\prime}, y')\} \tag{2.5}$$

$$c + \frac{a^{s\prime}}{R^s} + \frac{a^{u\prime}}{R^u} + \frac{a^{d\prime}}{R^d} \leq y + a^s + a^u + a^d \tag{2.6}$$

$$a^u \in [\underline{a}^u, 0], a^s \in [\underline{a}^s, 0], a^d \in [0, \infty) \forall t \tag{2.7}$$

and

$$V^B(a^s, a^u, a^d, y) = \max_{(a^s_{t+1}, a^u_{t+1})} \{u(c_t) - \lambda + \beta EV(a^{s\prime}, a^{u\prime}, a^{d\prime}, y')\} \tag{2.8}$$

$$c + \frac{a^{s\prime}}{R^s} + \frac{a^{u\prime}}{R^u} + \frac{a^{d\prime}}{R^d} \leq y + a^{sb} \tag{2.9}$$

$$a^u \in [\underline{a}^u, 0], a^s \in [\underline{a}^s, 0], a^d \in [0, \infty) \forall t \tag{2.10}$$

2.9. Equilibrium

I employ the standard stationary recursive competitive equilibrium of Huggett (1993), Aiyagari (1994) and others. Given a stationary distribution μ of households over (appropriate subsets) of the state space, equilibrium requires meeting three conditions.[19] First, the decisions of agents, taking interest rates and bankruptcy law as given, are optimal. Second,

[19] The stationary distribution arises as follows. Let X denote the state space for households. Let χ_B be the Borel σ-algebra on X. The individual agent's decision rule for asset holdings and bankruptcy, along with the stochastic process of endowments, induce a transition function for the joint path of assets, bankruptcy, and income. This transition function will, under fairly general conditions, imply a unique limiting distribution (CDF) μ on assets, income, and the fraction of bankrupt agents. This distribution is stationary, and therefore satisfies $\mu(Z) = \int_X Q(x, Z) d\mu$ for $\forall\ Z \in \chi_B$.

markets must clear, and third, the intermediary must make zero profits in each type of credit. The first condition is automatically satisfied when decisions derive from the Bellman equation (2.3). I turn now to market clearing.

2.9.1. Market Clearing

Given μ, let marginal densities of asset holdings be denoted $d\mu_s$, $d\mu_u$, and $d\mu_d$ for secured and unsecured credit, and savings deposits respectively. Because this is an endowment economy with one perishable good, the securities in the model merely represent a mechanism to redistribute random endowments ex-post. Therefore, all securities are in zero net-supply.

$$\int a^s d\mu_s + \int a^u d\mu_u + \int a^d d\mu_d = 0 \tag{2.11}$$

2.9.2. Zero Profits

I require that the intermediary make zero profits in both the secured and unsecured credit markets. Because it is risk free, secured debt must only differ from the deposit rate by the cost of intermediation τ. That is, $R^s = R^d + \tau$. For unsecured debt, first denote by x, an arbitrary state vector $\{a^s, a^u, a^d, y, CS\}$ contained in the state space X. Let $X_{pos} = \{x \in X | a > 0\}$ be the subset of the state space X, containing agents who hold positive asset balances, let $X^u_{neg} = \{x \in X | a^u < 0\}$ denote those with unsecured debts, and let $X^s_{neg} = \{x \in X | a^s < 0\}$ denote those with secured debts. In stationary equilibrium, the time-invariant mass of agents has total unsecured borrowing $\int_{X_{neg}} a^u(x) d\mu$ and secured borrowing $\int_{X_{neg}} a^s(x) d\mu$. The total revenue for the intermediary will therefore be $(R^u - \tau)(|\int_{X_{neg}} a(x) d\mu|) + (R^s - \tau)\,(|\int_{X^s_{neg}} a^s(x) d\mu|)$, where τ is the per-unit cost of intermediation, plus any recovery of equity above the exemption they make, $\int_{X|e>\overline{e}} a^s(x) d\mu$. The total cost of funds for the intermediary is total savings multiplied by the gross deposit interest rate, $R^d \int_{X_{pos}} a(x) d\mu$. Let $\pi(x)$ to be the probability that an agent in state x will default. Total losses from bankruptcy are therefore $(R^u - \tau)|\int_X a(x)\pi(x) d\mu|$. Subtracting costs from revenues leads to:

$$\begin{aligned} &(R^u - \tau)(|\int_{X^u_{neg}} a^u(x) d\mu|) + (R^s - \tau)(|\int_{X^s_{neg}} a^s(x) d\mu|) + \int_{X|e>\overline{e}} a^s(x) d\mu \\ &\ldots - (R^u - \tau)(|\int_{X_{neg}} a^u(x)\pi(x) d\mu|) - R^d \int_{X_{pos}} a(x) d\mu = 0. \end{aligned} \tag{2.12}$$

The first line of equation 2.12 is total revenue, and the second line is total costs. Specifically, the first two terms represent revenues from solvent agents, the third term represents recoveries of "excess equity" (i.e. equity above the exemption) from bankrupt agents, the fourth term represents losses of unsecured credit, and the fifth term, the cost of funds. Given the preceding, let the aggregate default rate be given by $\Pi \equiv \int_X \pi(x) d\mu$. I next define a welfare criterion.

2.10. Welfare

The welfare criterion used here is simply the expected discounted sum of utilities evaluated under the equilibrium stochastic process for consumption.[20] It is ex-ante expected utility. The welfare function also weights all agents equally. It is denoted by W and is given below.

$$W = \int V(x) d\mu \tag{2.13}$$

With this criterion, I use a welfare measure that answers the following question. What constant proportional increment/decrement to consumption at each date under the benchmark exemption law would yield the same expected lifetime utility as the consumption allocation under a proposed exemption policy? Let W^B denote welfare in the economy under benchmark exemptions, let W^p denote welfare under a proposed exemption policy, and let ϕ denote the increment/decrement to consumption at each date.

Given this definition, it is easily shown that for $\alpha > 1$:

$$\phi = \left(\frac{W^p + \frac{1}{(1-\alpha)(1-\beta)}}{W^B + \frac{1}{(1-\alpha)(1-\beta)}} \right)^{\frac{1}{1-\alpha}} - 1 \tag{2.14}$$

2.11. Parameterization

There are nine parameters in the model that I fix ex-ante.

Table 1: Parameterization of the Model

Parameter	Baseline
α	3
β	0.96
τ	0.034
$\overline{e}$	1.14
y_h	1.25
y_l	0.75
$\theta_{hh} = \theta_{ll}$	0.75
$\underline{a}^s$	-2.0
$\underline{a}^u$	-0.5

(2.15)

[20] This criterion is used by Aiyagari and McGrattan(1998).

The first two parameters, α, and β, represent risk-aversion and discounting, respectively. Their values are standard for this class of models, and I follows Huggett (1993), and Aiyagari (1994). The third parameter, τ, is the transactions cost on secured and unsecured borrowing, and is parametrized according to the evidence in Evans and Schmalensee (1998). These authors argue that among credit card issuers, costs of servicing accounts are roughly 5.3% of total costs, but is partially offset by interchange revenues of 1.9%, implying a net transactions cost of 3.4%. Information-intensive mortgage and home equity lending is unlikely to be cheaper, and I therefore set τ =0.034.[21]

The exemption level, $\overline{e}$, is the defining statutory restriction on Chapter 7 Bankruptcy filers.[22] The single largest exemption available to filers is nearly always the Homestead Exemption. This provision protects some or all of an individual's home equity from seizure by creditors, even when they have substantial uncollateralized debts. Other exemptions include personal property, equity in automobiles, and exemptions for the "tools-of-trade". While there are federal guidelines governing exemptions, states were initially given the option to opt out of these rules and impose their own. After 1978, when the federal law went into effect, all but eleven states "opted-out" of these federal regulations. However, although almost all states opted out, the exemption provisions they chose varied enormously. For example, the current federal homestead exemption is \$16,150, while the state exemption varies from \$2,000 dollars in South Carolina, to essentially unlimited in Texas and Florida.[23] In the baseline version of the model, I set $\overline{e}$ to correspond to the 1996 average for total state exemptions of approximately \$58,000 (see Grant [2000]). In 1997, mean nominal income per household member was \$19,241 and mean nominal household income was \$50,411.[24] This implies that the baseline exemption $\overline{e}$ be set at approximately 1.14.[25]

The income process $\widetilde{y} \in \{y_l, y_h\}$ and the associated transition probabilities, $\theta_{hh} = \theta_{ll}$, follow Heaton and Lucas (1997), who normalize mean (and median) household income at one unit and approximate an autoregressive process for labor income estimated from PSID

[21] Evans and Schmalensee (1998), p.249.

[22] The other restrictions involve the number of years for which one cannot re-file (6 years), and how long bankruptcy can remain on one's credit record (10 years). Virtually all other penalties are issued by either by credit markets (borrowing restrictions, and high interest rates), or through social sanctions and other "stigma" effects.

[23] No exemptions are truly unlimited however. In states with unlimited exemptions, there are typically restrictions on who may qualify. In Arkansas, for example, only those with a homestead smaller than 1/4 acre may qualify.

[24] Source: Federal Reserve Board of Governors: http://www.bog.frb.fed.us/releases/h15data.

[25] The Senate's proposal, as it seeks to eliminate "opt-out", and allows a range for state exemptions, does not ultimately produce truly uniform nationwide exemptions. However, to study the effects of uniform exemptions, I study outcomes that obtain from varying the *maximum* allowable state exemption with "no-opt-out".

data with a two-state Markov chain. They set $\theta_{hh} = \theta_{ll} = 0.75$, with y_l=0.75, and y_h=1.25. This process implies a coefficient of variation of 0.25, which is roughly the midpoint of the range documented by Aiyagari (1994) and is consistent with work by Abowd and Card (1987, 1989), and recent work of Quadrini (1999).

The final two parameters $\underline{a}^s$, and $\underline{a}^u$ are the credit limits on secured and unsecured credit respectively. As discussed in the introduction, exemptions have not been found to have first-order effects on credit supply, which suggests that fixed limits on secured credit are a reasonable approximation (see, e.g., Berkowitz and Hynes[1999], Grant [2000]). In 1997, the median price of existing housing was approximately $120,000, slightly greater than twice annual mean household income.[26] This imposes a natural limit on secured credit at 2.0 units. The limit on unsecured credit is set at 0.5 units and is guided by observing the level of median credit card debt discharged in bankruptcy, which has remained roughly stable at 50% of median household income (see Sullivan et al (2000), and Bermant and Flynn (1999)). This implies a total credit limit of 2.5 units, and is in accordance with the (1991) mean debt-income ratio of 2.5, found by Sullivan et al. (2000).[27]

2.12. Benchmark Parameters and Data

The shocks hitting households in the model are to be interpreted as income shocks arising from the labor market outcomes of job loss, overtime, displacement etc. I do not explicitly model other shocks affecting households such as catastrophic medical shocks or law suits. The latter are in the nature of "expense shocks", and are studied in some detail by Livshits et al. (2002). Instead, I focus here on debt and equity positions arising from consumption smoothing behavior in the face of non-catastrophic events. Empirically, Chakravarty and Rhee (1999) find that approximately 33% of total filings occur amongst households who have recently experienced catastrophic health events and lawsuits.[28] The overall filing rate among U.S. households has averaged nearly 1% for the period 1990-1998, of which roughly 70% have been Chapter 7 filings. The ex-catastrophe filing rate for Chapter 7 bankruptcies is then 0.47%. However, homeowners, who are approximately two-thirds of U.S. households, imply that the relevant target for the benchmark model is Π=0.30%.[29]

The total filing rate Π is the only parameter which will be calibrated within the model. I do not calibrate interest rates, but rather determine them in equilibrium. Nevertheless,

[26] U.S. Dept.of Housing and Urban Development at: http://www.huduser.org/periodicals/ushmc/spring97 /histdata.html

[27] The limits used here are similar to limits imposed in DenHaan (1997), who uses a limit of 2.0 in a model with the same income process and transition probabililties used here.

[28] See also Domowitz and Sartain (1999).

[29] I also find that the results are robust to the bankruptcy target. For example, even when the target rate for bankruptcy is nearly quadrupled, the effects of exemptions still remain small.

a useful check on the model's implications is whether the endogenously generated interest rates from the model are similar to their empirical counterparts. I measure all rates from the first quarter of 1995 through the fourth quarter of 2001, as no significant bankruptcy legislation has passed during this period.

First, the interest rate on unsecured debt, R^u represents the cost of drawing on a credit line offered at a fixed interest rate, that also comes with a default option in the spirit of Chapter 7 bankruptcy. The natural counterpart in the data is therefore a credit card interest rate. The mean ex-post real (adjusted by CPI inflation) credit card rate, as measured by the Federal Reserve over the period 1995-2001, is 13.4%.[30] Second, the analog to the secured debt of the model is a home equity line of credit (HELOC). The mean ex-post real HELOC interest rate in the period 1995-2001 is measured to be 6.2%. Third, the model's net deposit rate R^d is analogous to the rate available on short-maturity risk-free assets, such as the average ex-post real 3-month T-bill rate. Adjusted for CPI inflation, the mean risk-free T-bill rate in this period is 2.6%.[31] [32]Last, as documented above, the ratio of median debt discharged in a bankruptcy to median household income was roughly 0.5, and is denoted "med(D_{bk})/med(I)". Table 2 below summarizes the preceding.

[30]Source: http://www.federalreserve.gov/boarddocs/RptCongress/creditcard/1999/Default.htm CPI Source: http://www.stls.frb.org/fred/data/cpi.html

[31]3-Month T-Bill Rate Source: http://www.stls.frb.org/fred/data/irates/tb3ms

2.6% is also the approximate rate for the entire post WWII period.

[32]Alternatively, one might use money market rates. However, as savings are perfectly risk-free in the model, I compare the rates to t-bills. Similarly, Livshits et al (2002) use the prime lending rate, which ranges from 2-4%.

Table 2: The Data

Π	$R^u - 1$	$R^s - 1$	$R^d - 1$	med(D_{bk})/med(I)
0.30%	13.4%	6.2%	2.6%	0.5

3. Results

The results tell a simple but striking story. Exemptions do not matter substantially for prices, bankruptcy rates, distribution, and welfare. Exemptions below the current state average have only minor effects on both bankruptcy incidence and welfare, while exemptions above the mean have no effect. The results also cast doubt on the bleak scenario painted by the opponents of the current Bankruptcy reform bill H.R. 975. The belief that a high uniform exemption level would result in households walking away from debt while retaining wealth levels far above average is not borne out in equilibrium. Additionally, the cap suggested in Sen. Kohl's proposed amendment (to Senate bill S.420) will not affect welfare. In fact, the results suggest that an optimal uniform Federal exemption may simply be the current average state exemption. This occurs as model implies that the cost of filing, using nationwide average filing rates, is high. Furthermore, while unconditional default rates are not high, the likelihood of bankruptcy, given unsecured borrowing, implies a substantial premium on such unsecured credit. These costs, in turn give households incentives to first exhaust all available secured debt, and only then turn to holding large levels of unsecured debt. Thus, exemptions will not matter, and bankruptcy will be essentially invariant to exemptions.[33] The results in Table 3 also suggest that the model provides an accurate account for the invariance of filing rates to exemptions, even if credit supply were to remain unchanged.

I turn now to specific experiments and their outcomes. First, the benchmark case is given in the second row of Table 3, where the bankruptcy exemption is set at the state mean of \$58,000, which corresponds to 1.14 units of consumption. The non-exemption cost of bankruptcy λ, is set at 1.05 units to match observed homeowner bankruptcy incidence. Equilibrium consumption in the low-income state (the only state in which agents default) for a household with the median amount of debt for bankruptcy filers is 0.57 units. From this baseline, $\lambda = 1.05$ is equivalent to a one-period reduction of 0.115 units of consumption. In 1997 dollar terms, this implies a per-household member penalty equivalent to \$2,200.

The main results, shown in Table 3 in Appendix A, reveal that the model does well in capturing both interest rate facts and also the median level of debt relative to median

[33] As noted earlier, the need for individuals to save to deal with contingencies is certainly more costly than first-best insurance, and may have led to bankruptcy procedures. In contrast, see Jackson (2001) and Baird (2001) for motivations of bankruptcy that depend on consumer irrationalilty and time-inconsistent preferences.

household income discharged in bankruptcy. In the top row, I present current U.S. data, and in the second row, results from the model under the current average state exemption. The results that the benchmark case accurately captures the data is particularly encouraging, as the model was only calibrated to match the aggregate filing rate. As exemptions are tightened from 1.14 to 0.01 units, or, in current dollars, from \$58,000 to \$500, filing rates fall non-trivially from 0.30% to 0.19%. This represents a decline of approximately 100,000 filings annually. However, the tight exemption seems to hinder consumption smoothing only slightly. In particular, consumption volatility, denoted C.V.-C, and shown in Table 4, rises from 0.806 under benchmark exemptions ($\overline{e} = 1.14$), to 0.811 when $\overline{e}$=0.01. In turn, steady-state welfare falls marginally on the order of \$2 per household annually. When exemptions are increased to $\overline{e}$=0.10, steady-state welfare losses relative to the benchmark are only 50 cents per-household annually. The reduction in consumption volatility obtaining from an increase in exemptions is the only noticeable evidence that exemptions affect risk-sharing in equilibrium.

In terms of the levels of debt discharged in bankruptcy, in Table 3 we see that median debt discharged in a bankruptcy rises only slightly as exemptions become more stringent. In the benchmark case, where $\overline{e}$=1.14, Med(D_{bk}/I) is 0.476, or roughly \$24,000. When exemptions are severely tightened to $\overline{e}$ =0.01, median debt discharged per bankruptcy falls slightly to 0.471, approximately \$23,700 dollars per filing. The main feature of the results is the fact that there are only very minor fluctuations in the level of debt discharged in bankruptcy even though exemptions vary dramatically. The intuition for these small variations is as follows. For very strict exemptions, households will have to hold very low equity levels in order to avoid surrendering equity in a bankruptcy. However, holding such low equity will make them more willing, all else equal, to hold unsecured debt, as the effective cost of bankruptcy, inclusive of the cost of giving up equity, has fallen. This leads to marginally higher debt levels at the time of filing. Conversely, as exemptions become more relaxed, households may keep more equity while holding a given level of unsecured debt without affecting the cost of bankruptcy they face. As shocks hit such households, they may be more willing at the margin to file for bankruptcy, leading to both a higher filing rate, as well as slightly lower debt levels at the time of filing. As exemptions rise further, however, the ability of households to shelter wealth in bankruptcy is further improved. Therefore, households do not need to be concerned about keeping their bankruptcy option "in the money". In turn, households may be marginally more willing to hold unsecured debt for a given equity level, consistent with the miniscule rise in debt discharged.

I next document the impact of exemptions on consumption smoothing and asset holding behavior. These results are documented in Table 4. The central finding is that of an absence of any effect of exemptions on the variability in secured and unsecured debt holdings. Note first that cross-sectional measures, such as Gini coefficients and coefficients of variation, coincide with long-run measures for a given household. In all cases studied here, the coefficient of variation of secured debt is 1.39. Consumption equality, as measured by the Gini coefficient, denoted "Gini-C" in Table 4, does rise marginally from 0.0461 when $\overline{e}$=1.14, to 0.0465 when $\overline{e}$=0.01. The Gini coefficients on assets, denoted "Gini-a^s" and "Gini-a^u", show that a significant level of asset trade takes place in order to smooth consumption. Beyond this, the wealth distribution changes little with exemptions, and is therefore not described in further detail.[34] In the model, 2.5% of all households have negative net worth, compared with 7.4% found by Repetto (1998) using PSID data. Of those households in bankruptcy, 100% had negative net worth, broadly consistent with Sullivan et al. (1989) who found that 84% of households in bankruptcy had negative net worth.

3.1. Decision Rules

The underlying decision rules used by households are helpful for understanding what drives the main result that exemptions do not matter very much for outcomes. The central feature shared by Figures 1a and 1b is that the point at which the value of bankruptcy exceeds that of solvency is not highly sensitive to the exemption level.[35] This is true both when secured debt is maximized, as well as when unsecured debt is maximized.

In Figure 1a, I display the case where unsecured debt is maximized at $\underline{a}^u$ and study the role of exemptions in altering the impact of secured debt on the bankruptcy decision. When $\overline{e}$=0.01, the highest equity level for which bankruptcy is optimal is seen to be approximately 0.05 units (a secured debt level of (-2+0.05)=-1.95 units). As the exemption level rises, households with maximal unsecured debt will consider filing for bankruptcy at successively higher levels of equity. For example, when $\overline{e}$=1.14, the highest equity level for which bankruptcy is optimal is 0.41 units (a secured debt level of -1.59 units). However, even this threshold is far below the exemption. When exemptions are increased further to 2.0, the decision rule remains unchanged. In this case, the highest equity level for which bankruptcy is optimal is still 0.41 units. Thus, households do not consider the exemption level pivotal, and exhaust far too much equity to surrender any in a bankruptcy.

In Figure 1b, I reverse the experiment of Figure 1a, fix secured debt at it's maximal level of $\underline{a}^s$, and study the role of exemptions in altering the impact of unsecured debt on the bankruptcy decision. Figure 1b illustrates how insensitive to exemptions are the critical values for unsecured debt, whereby households switch from solvency to bankruptcy. In this setting, unsecured lenders need not pay careful attention to exemptions when pricing credit

[34] Details are available from the author on request.

[35] Throughout the figures, I focus on the low- income state. Bankruptcy turns out never to be optimal in the high-income case, which is consistent with the data.

card accounts.

Having used the value function to show that exemptions do not alter decisions substantially, in Figures 1c, 1d, and 1e, I display optimal decision rules for households with low income under benchmark exemptions.[36] One obvious feature is that for a large set of secured and unsecured debt levels, households quickly eliminate debt and hold zero assets.[37] In Figure 1c, we see that secured debt is used by households only when savings is low. If, for example, secured debt were to be at its limit of -2.0, and the household also had positive savings of 3.0 units, the decision rule for secured debt implies a rapid repayment, all the way to roughly -0.6, within a single period. Figure 1d shows that savings in this case falls immediately to zero. That is, households will typically not hold positive savings and debt simultaneously, even though the exemption does give them incentives to do so. Also, note in Figure 1d that unsecured debt is repaid rapidly as well, with unsecured debt being immediately eliminated for equity levels greater than 1.8. With respect to bankruptcy, we see in Figure 1d that the level of unsecured debt chosen rises as current household debt rises, but when unsecured and secured debt are both close to the limit, bankruptcy becomes optimal, and unsecured debt falls. This is more easily seen in Figure 1e, where, holding secured debt fixed at its limit of $\underline{a}^s$, bankruptcy eventually becomes optimal, and unsecured debt is discharged.

I turn now to the role of the bankruptcy cost λ, on outcomes. In Table 5a, I reduce the cost of bankruptcy to the level where filings are nearly quadrupled to 1.11%, corresponding to the filing rate that includes both homeowners and renters, as well as some with large legal expenses. In Tables 3 and 5a, we see that as bankruptcy rates rise, the interest rate on unsecured debt rises as well, from 13.4% when $\overline{e}$=1.14 and λ = 1.05, to 14.5%, when $\overline{e}$=1.14 and λ = 0.086. As the cost of bankruptcy falls, households are more willing to borrow on unsecured markets than before. As a result, in order to clear the credit market, a higher rate must be offered for savings, which is why the deposit rate rises relative to the λ = 1.05 case. Given the higher cost of funds, financial intermediaries must raise rates on loans. Beyond the increase in levels, the spread between loan and deposit rates grows as a larger fraction files for bankruptcy in the lower bankruptcy cost regime. The effect of lowering exemptions is also stronger in this case than in the benchmark, with filing rates falling from 1.11% when $\overline{e}$=1.14 to 0.54% when $\overline{e}$=0.01. However, filing rates do not respond to increases in the exemption beyond $\overline{e}$=1.14 , demonstrating again that exemptions above current the average are unlikely to increase filing rates. Consumption smoothing is easier

[36]The decision rule for high-income households is very similar, execept that there is no bankruptcy. For brevity, decision rules for all the values of exemptions are not presented here but are available from the author on request.

[37]This feature will be presented in more detail in Figures 3, 4, and 5.

with lower bankruptcy costs. Under $\overline{e}$=1.14, both the coefficient of variation of consumption and the consumption Gini coefficient fall appreciably. The former falls from 0.0804 to 0.747, while the latter falls from 0.0461 to 0.0424 as λ is lowered from 1.05 to 0.86. To achieve this increase in smoothing, households use unsecured debt more than under benchmark bankruptcy costs. In Table 5b, we see that the coefficient of variation on unsecured debt rises, while that for secured debt remains fixed. The welfare loss from stricter exemptions when λ is reduced arises as consumption smoothing does worsen. However, these losses are still negligible. The relatively larger response to exemption under low bankruptcy costs arises because more households are near the margin for bankruptcy, implying that a change in exemption is binding for a non-zero measure of households. With respect to the threshold filing levels, when λ is reduced, households with zero equity consider filing as soon as their income becomes low and their unsecured debt hits -0.40 units.[38] This is a slightly lower level of debt than the threshold of -0.47 units when $\lambda = 1.05$.

In Table 5c, note that welfare rises only slightly as bankruptcy costs are lowered, even as bankruptcy rates rise substantially. This finding implies that changes in bankruptcy costs that are restricted to be consistent with observations on aggregate filing rates, do not alter welfare significantly, even if filing rates are altered non-trivially. Thus, the results are not driven by artificially high costs of bankruptcy and so would obtain even if bankruptcy costs were substantially overestimated.

The fact that the default option is not very useful implies that households will typically be unwilling to pay the finance costs associated with unsecured credit until they first exhaust secured credit, thus rendering exemptions unimportant. In Figures 1a and 1b, we observed households willing to consider bankruptcy when they simultaneously held maximal unsecured debt and positive equity levels (e.g., when $\overline{e}$=1.14). However, households will rarely find themselves in this situation in equilibrium. This is seen most clearly in Figure 2, where I display the difference between the value of solvency and the value of bankruptcy under benchmark exemptions, when the income shock is low, i.e., $y = y_l$. As is seen, this surface falls below zero (where bankruptcy is optimal) only for low income levels along with very low equity levels and very high unsecured debt levels.

The decision rules studied in Figures 1c-e, are confirmed in Figure 3, where we see that households only rarely borrow on the unsecured market, and in Figure 4, we see that the vast majority of borrowing takes place in the secured credit market. However, the low level of activity in the unsecured credit market is offset by the fact that, conditional on borrowing in this market, bankruptcy is frequent. In Figure 5, we see that conditional on borrowing in the unsecured credit market, a large mass point is associated with a maximal level of credit card debt. From the decision rules shown earlier, we know that such unsecured debt levels

[38] For brevity, the analogs of Figures 1a,b, and c are not reproduced here.

also occur only when secured credit has been exhausted. These households will therefore default as soon as a low income shock hits them. This implies a substantial equilibrium premium for unsecured loans.

The preceding findings are confirmed empirically. With respect to net worth, Sullivan et al. (1989, 2000) found that debtors who could generate revenues by selling assets were a tiny fraction of the Chapter 7 population. In their 1989 study, over 90% of debtors in bankruptcy had no home equity with which to repay unsecured creditors (p.204). However, those who did have assets were nearly always from Texas, a state with an unlimited homestead exemption.[39] [40] Berkowitz and Hynes (1999) find similarly that the "...vast majority of households do not maximize the theoretical exemption". With respect to income at the time of filing, Sullivan et al. (1989, 2000) find that bankrupt households on average had negative net worth, and had incomes that were approximately two-thirds of nationwide average income.[41] Bermant and Flynn (1999) and Repetto (1998) report similar findings. Sullivan et al. (1989, 2000) also note that unexpected temporary drops in income were consistently cited by filers as the cause of their bankruptcy. I now turn to the issue of whether bankruptcy provides an excessive advantage to households that use it.

3.2. Head Start or Fresh Start?

There are two tangible dimensions along which to answer the question of whether bankruptcy provides a "Fresh Start" or a "Head Start". First, will many households "...escape their contractual obligations while maintaining levels of wealth that the vast majority of Americans do not enjoy"? Second, for a given equity position, do households benefit merely by increasing their holdings of unsecured debt, even when they are unlikely to repay? The answer to both these questions turns out to be "no". Thus, while exemptions do not affect average welfare much, they *do not* appear to provide households with a "head start". The preceding finding holds true for all exemption levels, income shock processes, and bankruptcy costs used here. I turn now to some details.

With respect to whether households do emerge from bankruptcy with high levels of wealth when exemptions allow them to, we see in Table 6 that the average equity position of

[39] Their findings led Sullivan et al. (1989) to state that "We conclude that selling a debtor's assets is unlikely to yield more than trivial repayments for most creditors." (p. 209).

[40] With respect to equity holdings, an interesting feature of credit scoring models is the use of cardholder age. The data show (see again Sullivan et al. [1989]) bankrupt households are on average younger than their non-bankrupt counterparts. The model suggests why age may be a relevent characteristic. Young households may be less likely to have accumulated high levels of home equity, and may therefore find Chapter 7 more attractive for any given level of unsecured debt.

[41] Interestingly, when bankruptcy costs were lowered to λ=0.86, households were willing to file even when they had high income, but only in the state where they had zero equity and maximal unsecured debt.

households in bankruptcy is between $1,000 and $2,520 in all cases. Thus, high exemptions will simply not result in households walking away from unsecured debt with their wealth intact. This result is consistent with the arguments of the previous section. The result is also noteworthy because it indicates that the invariance of exemptions on both filing rates and equity held at the time of filing obtains even in a setting where the supply of unsecured and secured credit do not respond to completely offset increased exemptions.[42]

A natural way to address the question of whether increased unsecured debt makes households better off is to check directly if the value function of the household is increasing in unsecured debt. Figure 6 displays the value function $V(a^s, a^u, a^d, y = y_l)$ under benchmark exemptions. As is easily seen, this function is strictly decreasing in unsecured debt and clearly increasing the the level of equity as well. In conclusion, bankruptcy is chosen by those with large debts, low equity, and low income, and even large exemptions do not appear to give debtors a "head start" along either of the dimensions explored here.[43]

It is useful to place the finding of a non-negative welfare role for bankruptcy exemptions in the context of recent results of Athreya (2002) and Chatterjee et al. (2002) which find that bankruptcy as a whole should be made stricter by way of means tests. In Athreya (2002) there is a single unsecured asset whose price falls substantially with bankruptcy law. In turn, households lower precautionary savings as borrowing becomes less costly. This markedly raises the interest rate on savings, further aiding smoothing. In Chatterjee et al. (2002), tightening bankruptcy law both reduces borrowing rates on the single unsecured debt instrument, and extends credit substantially. In the present model, there are two distinct assets, with unsecured credit being a smaller part of a household's overall credit line. Thus, given the alternatives, it turns out that households find exemptions relatively unimportant and would, in any event, be able to hold low enough equity to avoid surrendering any in bankruptcy without great welfare loss. That said, however, eliminating bankruptcy as a whole, would in this model, likely produce substantial gains in welfare as unsecured rates fell and deposit rates rose. The main message of this paper is that the *marginal* benefits of strict exemptions, given all other existing bankruptcy provisions, are minor.

3.3. Robustness

Throughout the preceding analysis, a steady-state perspective was maintained, and any welfare costs associated with transitions between steady states was ignored. However, I now demonstrate indirectly that such an omission is unlikely to be important for welfare. To do this, I ask the following. How would an individual with a given level of assets feel if he were placed suddenly into a new economy with different exemption law where prices had

[42] However, Berkowitz and Hynes (1999) find little evidence that such supply changes are significant.
[43] This feature is robust to the exemption level.

already adjusted to their new steady-state levels? To answer this, let μ^*_{bench}, denote the stationary steady-state distribution of the state vector, denoting current income and debts, under benchmark exemptions. Let V_{policy} denote the value function associated with the proposed policy, given the steady-state equilibrium interest rates that would obtain under the proposal. Given the stationary benchmark distribution μ^*_{bench}, the ex-ante expected utility from suddenly applying a new policy with its associated equilibrium decision rules (which reflect equilibrium prices obtaining under the proposed policy) to an individual with a given fixed level of assets is $W^{policy}_{fixed} = \int V_{policy}(x)d\mu^*_{bench}$. As before, let W^B denote welfare under the baseline policy. I define welfare gains or losses as before, using the definition of equivalent variation given in equation 2.14. That is, let the amount required to keep agents indifferent between the benchmark and proposed policy be denoted ϕ_μ, defined below.

$$\phi_\mu = \left(\frac{W^{policy}_{fixed} + \frac{1}{(1-\alpha)(1-\beta)}}{W^B + \frac{1}{(1-\alpha)(1-\beta)}} \right)^{\frac{1}{1-\alpha}} - 1 \tag{3.1}$$

If this measure is small, it indicates that even abrupt changes in exemption law generate only minor welfare changes. Indeed, this turns out to be the case, as seen in the first two rows of Table 5. If exemptions were to fall suddenly from 1.14 to 0.01 units, the bankruptcy rate would fall substantially to 0.06%, while welfare would fall by roughly $1.30 per household annually. Similarly, when exemptions are tightened from the benchmark to 0.05 units, bankruptcy rates fall to 0.22%, but in this case the welfare loss is zero. In both these cases, households were holding levels of equity that would have allowed them to file for bankruptcy under benchmark exemptions, but not under the strict policies. In the bottom two rows of Table 5, I perform the reverse experiment. Namely, I ask what happens when exemptions are initially very strict, but are then relaxed to allow for extremely high exemptions. In this case, the effect on filing rates is the opposite of the previous experiment and rises to 0.27% from 0.19% both when $\overline{e}$ is increased from 0.01 to 1.80, and when $\overline{e}$ rises to 2.00. In these cases, welfare rises slightly, by 93 cents per household annually.

I now return to the question of how the use of fixed-interest rates contracts affect the results. First, as discussed earlier, for unsecured lenders, there are strict limitations on the types of information that loan and interest rate decisions can be made contingent on. Credit scoring models used by almost all major unsecured lenders are not allowed to incorporate age, address, race, employment, and income information, other than self-reported income at the time of application. Beyond these restrictions, the lack of symmetric information generates a serious adverse selection problem. Ausubel (1999) reports that as an empirical matter, "inferior [credit card] offers generate inferior customers", thereby limiting the use of "risk-based" pricing.[44] Secondly, if risk-based pricing did ultimately entail increased interest rates

[44] Ausubel (1999) also describes in detail the procedured by which cards are issued, whereby very large scale

for those with falling net worth, this would preserve the results reported here, as households face additional incentives to exhaust secured credit before turning to unsecured credit, all else equal, rendering exemptions even less relevant than they are here. In terms of welfare, bankruptcy is valuable as an insurance product to the extent that it allows a transfer to take place from unsecured borrowers who repay their debts with interest to those who do not. If interest rates are personalized and rise as net worth falls, the state-contingent transfer associated with bankruptcy is undone as the price of loans rises exactly when households most need them to smooth consumption. Thus, the very small welfare losses reported here an are likely an *upper* bound on the welfare effects of exemptions.[45]

Sensitivity analysis was also conducted with risk aversion, transactions costs, and also with higher targets for the benchmark bankruptcy rate than the strict target employed in the benchmark. None of these alternative parameterizations changed the central result that change exemptions do not affect equilibrium outcomes significantly. In particular, as shown earlier, the results were not altered when the model was calibrated to a much higher filing rate than observed. With respect to income risk and the ex-ante homogeneity imposed in the model, the income process used here is that of Heaton and Lucas (1997), using PSID data, and is representative of the entire population. The subset of the U.S. population who are homeowners are likely, on average, more homogenous than the U.S. population at large, and face even less risk than implied by the process used here.[46],[47]

4. Conclusions

In this paper I developed a dynamic, stochastic, incomplete market general equilibrium model with well-defined rules for default. I used the model to study the consumption, interest rate, and welfare consequences of bankruptcy exemptions. The principal finding of this paper is that very strict bankruptcy exemptions may be able to influence bankruptcy incidence, interest rates, and welfare modestly. However, even large increases in exemptions beyond the current statewide average will not affect outcomes. The costs and benefits for the preferences studied here are bounded above by $2 per household annually. The model

mailings (600,000-850,000 per offer) are sent to groups which appear similar. Within this group, accounts are priced similarly to cover average default rates, just as modeled here.

[45] Also, as a quantitative matter, for a single asset model of bankruptcy without catastrophic shocks, the unconditional contracts used in Athreya (2002) turn out to deliver similar results to that of Livshits et al. (2003), who allow lenders to condition on assets, age, and income.

[46] The fact that HELOC rates are typically lower than mortgage or auto rates may reflect this.

[47] While it would be of interest to consider a setting with substantial ex-ante heterogeneity, I leave this for future work. For clarity, one goal of this paper was to remain as close to a standard incomplete-market setting as possible, with the added condition that default be allowed on unsecured credit.

suggests that despite the incentives created by exemptions for households to borrow while saving, most do not. Instead, households are shown to systematically and rationally pledge their equity in return for cheaper secured credit. It turns out that, even when calibrated only to mean exemption levels, both the implied cost of bankruptcy, in terms of future borrowing constraints and other costs, and the spread between unsecured and secured borrowing rates, are large enough to nullify the perverse incentive effects of large exemptions. The preceding conclusions are further strengthened as they emerge from a model that is robust and able to closely match several key credit market facts under current bankruptcy law.

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Appendix A: Tables and Figures

Table 3: Filing Rates, Interest Rates, and Welfare

Exemption, $\overline{e}$	Π	$R^u - 1$	$R^s - 1$	$R^d - 1$	med(D_{bk})/med(I)	Welf.($)=$\phi\overline{Y}$
U.S. Data	**0.30%**	**13.4%**	**6.19%**	**2.58%**	**0.5 ($25,000)**	-
0.01	0.19%	13.6%	5.27%	1.87%	0.476 ($24,000)	-$2.00
0.05	0.24%	13.5%	5.27%	1.87%	0.465 ($23,400)	-$0.52
0.10	0.24%	13.5%	5.27%	1.87%	0.464 ($23,400)	$0.00
0.30	0.30%	13.4%	5.26%	1.86%	0.472 ($23,800)	$0.00
0.60	0.30%	13.4%	5.26%	1.86%	0.471 ($23,700)	$0.00
1.14* (State Avg.)	**0.30%**	**13.4%**	**5.26%**	**1.86%**	**0.471** ($23,700)	**$0.00**
1.50	0.30%	13.4%	5.26%	1.86%	0.471 ($23,700)	$0.00
1.80	0.30%	13.4%	5.26%	1.86%	0.471 ($23,700)	$0.00
2.00 NBRC, Kohl	**0.30%**	**13.4%**	**5.26%**	**1.86%**	**0.471** ($23,700)	**$0.00**

Table 4: Volatilities and Distribution

Exemption, $\overline{e}$	C.V.-C	C.V.-a^s	Gini-C	Gini-a^s	Gini-a^u
0.01	0.0811	1.39	0.0465	0.665	0.732
0.05	0.0806	1.39	0.0462	0.665	0.732
0.10	0.0807	1.39	0.0463	0.666	0.732
0.30	0.0804	1.39	0.0461	0.665	0.732
0.60	0.0804	1.39	0.0461	0.665	0.732
1.14* (State Avg.)	**0.0804**	**1.39**	**0.0461**	**0.665**	**0.732**
1.50	0.0804	1.39	0.0461	0.665	0.732
1.80	0.0804	1.39	0.0461	0.665	0.732
2.00 NBRC, Kohl	**0.0804**	**1.39**	**0.0461**	**0.665**	**0.732**

Table 5a: Filing Rates, Interest Rates, and Welfare (Low Bk. Costs)

Exemption, $\overline{e}$	Π	$R^u - 1$	$R^s - 1$	$R^d - 1$	Welf.($)=$\phi\overline{Y}$
U.S. Data	**0.30%**	**13.4%**	**6.19%**	**2.58%**	-
0.01	0.54%	14.7%	5.43%	2.03%	-$10.59
0.15	0.68%	14.5%	5.41%	2.01%	-$10.59
0.30	0.72%	14.5%	5.46%	2.07%	-$23.69
1.14* (State Avg.)	**1.11%**	**14.5%**	**5.30%**	**1.90%**	$0.00
1.50	1.11%	14.5%	5.30%	1.90%	$0.00
2.00 NBRC, Kohl	**1.11%**	**14.5%**	**5.30%**	**1.90%**	**$0.00**

Table 5b: Volatilities and Distribution (Low Bk. Costs)

Exemption, $\overline{e}$	C.V.-C	C.V.-a^s	Gini-C	Gini-a^s	Gini-a^u
0.01	0.0769	1.39	0.0427	0.664	0.743
0.15	0.0757	1.38	0.0432	0.664	0.749
0.30	0.0751	1.38	0.0427	0.664	0.750
1.14* (State Avg.)	**0.0747**	**1.34**	**0.0424**	**0.652**	**0.777**
1.50	0.0747	1.34	0.0424	0.652	0.777
2.00 NBRC, Kohl	**0.0747**	**1.34**	**0.0424**	**0.652**	**0.777**

Table 5c: Bankruptcy Costs and Welfare

λ	Π	W	Welf.($)=$\phi\overline{Y}$
1.05	0.30%	-0.9158	-
0.90	0.81%	-0.9130	$5.04
0.86	1.11%	-0.8894	$50.41

Table 6: Debt and Equity Before and After Bankruptcy

Exemption, $\overline{e}$	Time	Unsecured Debt	Equity
0.01	Pd. Of BK	\$24,000	\$1000
—	Pd. After BK	\$5,550	\$1512
0.30	Pd. Of BK	\$23,800	\$2520
—	Pd. After BK	\$3530	\$1000
1.14	Pd. Of BK	\$23,700	\$2520
—	Pd. After BK	\$3530	\$1000
1.80	Pd. Of BK	\$23,700	\$2520
—	Pd. After BK	\$3530	\$1000
2.00	Pd. Of BK	\$23,700	\$2520
—	Pd. After BK	\$3530	\$1000

Table 7: Fixed Assets

$\overline{e}_{pre}$	$\overline{e}_{post}$	Π	Welf.(\$)=$\phi_{\mu^*}\overline{Y}$
1.14	0.01	0.06%	-\$1.30
1.14	0.05	0.22%	\$0.00
0.01	1.80	0.27%	\$0.93
0.01	2.00	0.27%	\$0.93

Figure 1a: The Level of Secured Debt That Makes Bankruptcy Optimal As Exemptions Change [Unsecured Debt=−0.5]

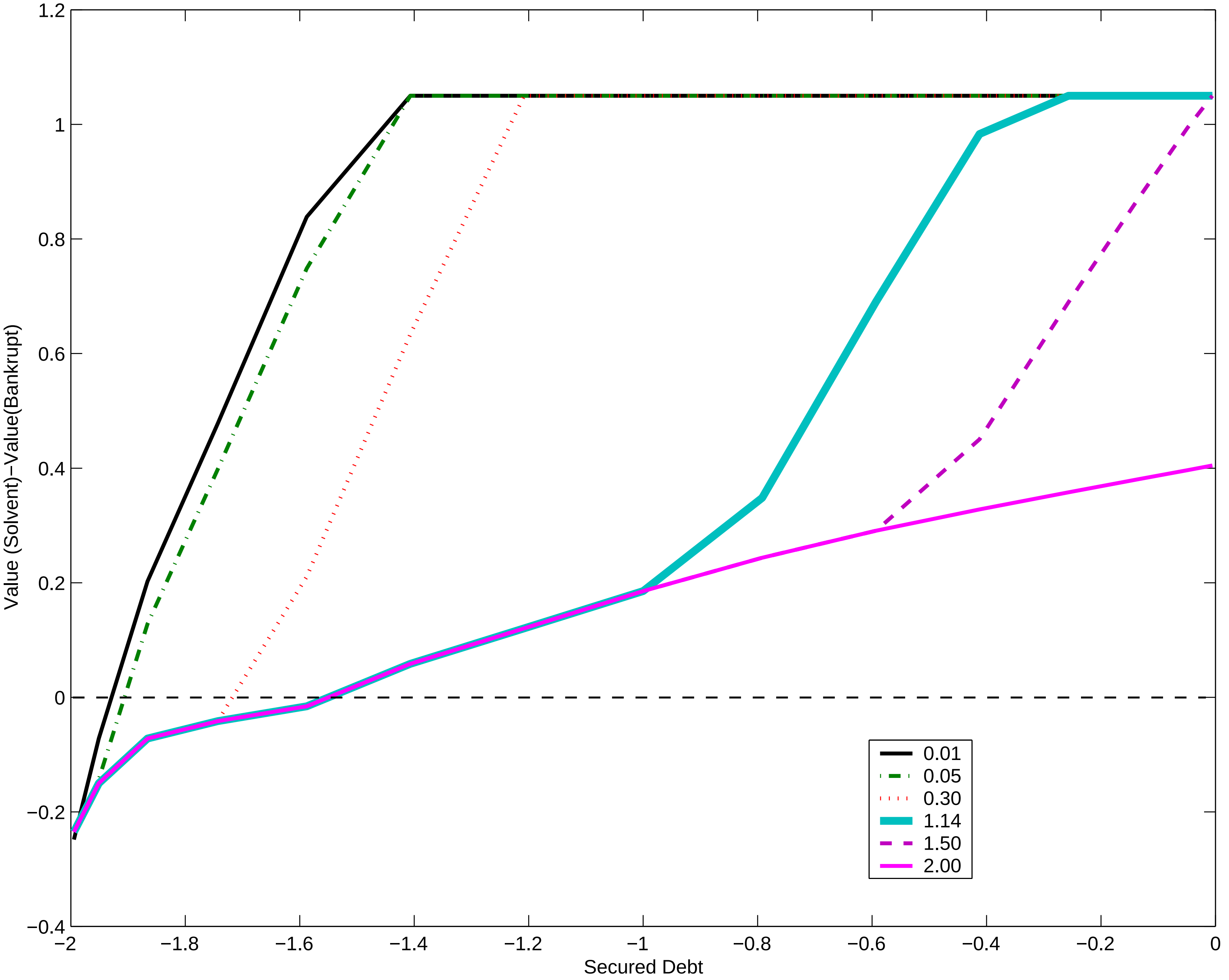


Figure 1b: The Level of Unsecured Debt That Makes Bankruptcy Optimal as Exemptions Change [Secured Debt=−2.0]

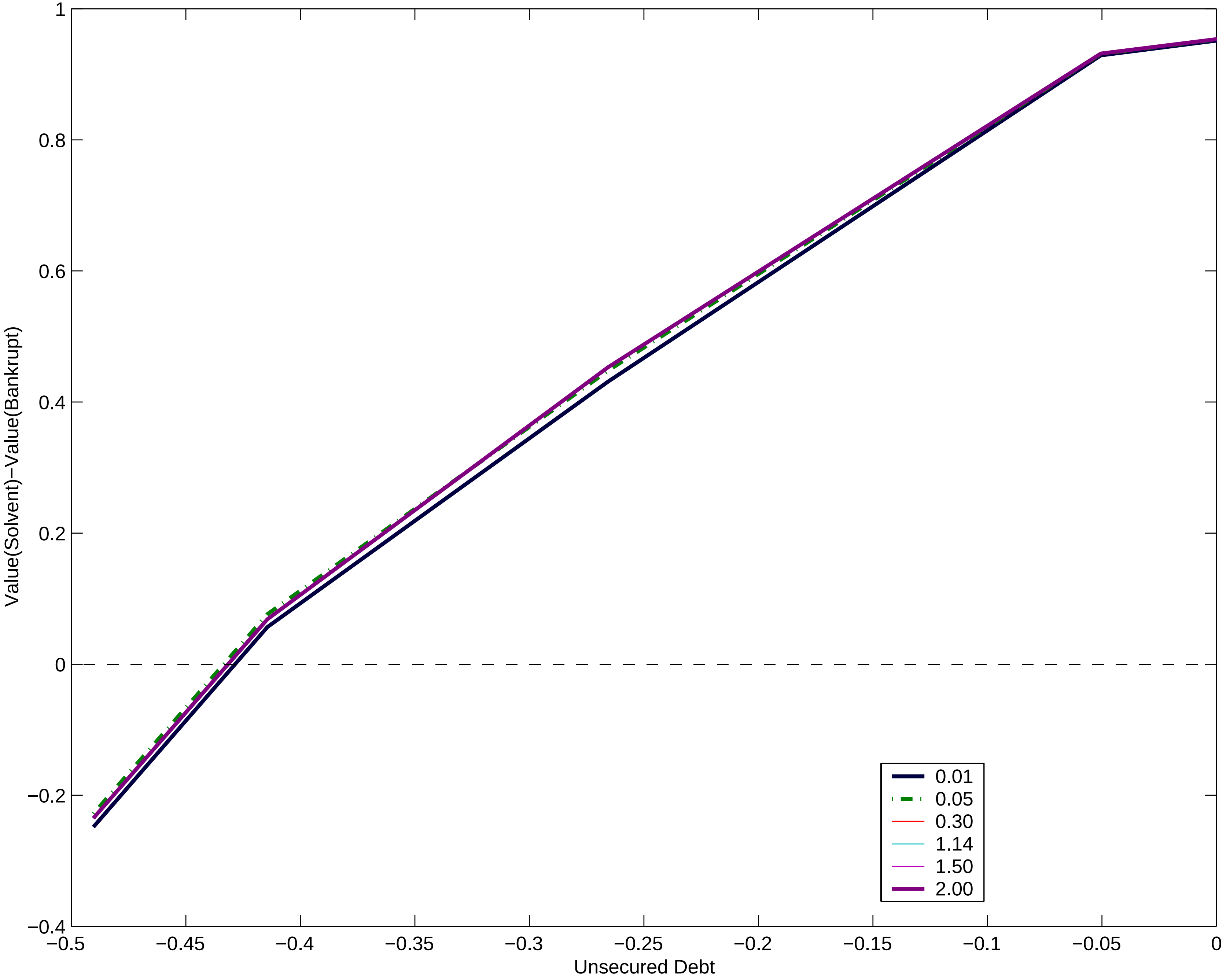


Figure 1c: The Decision Rule for Sec. Debt [Benchmark Exemptions]

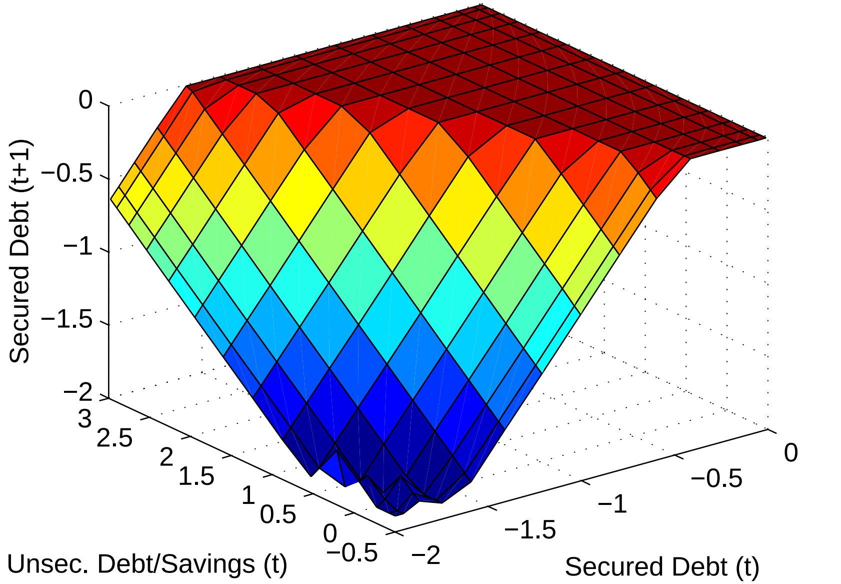


Figure 1d: The Decision Rule for Unsec. Debt/Savings [Benchmark Exemptions]

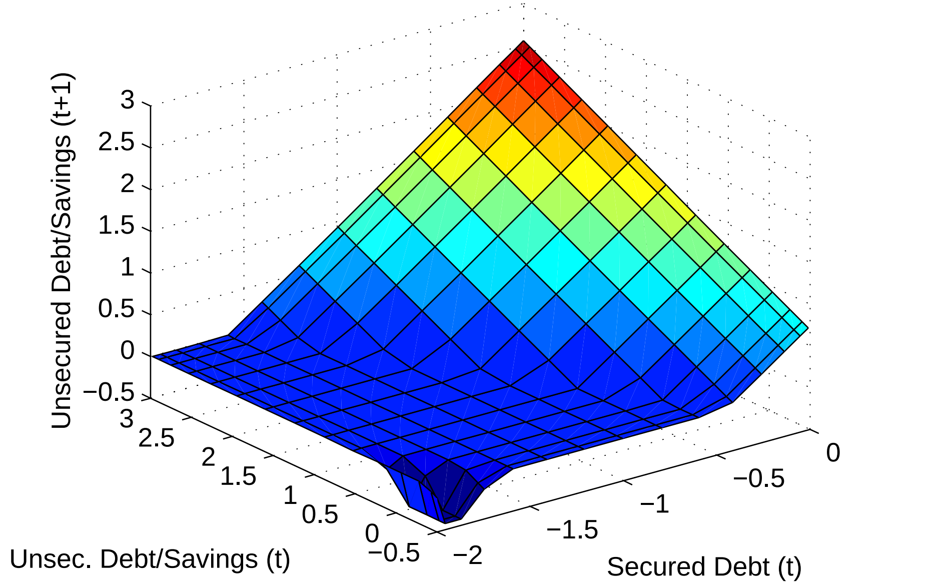


Figure 1e: The Decision Rule for Unsec. Debt when Sec. Debt is at Max

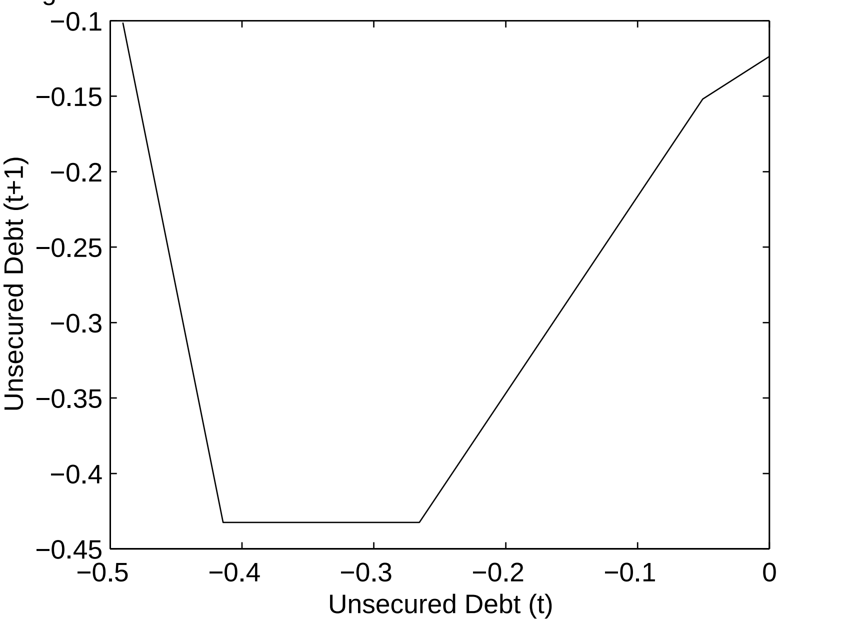


Figure 2: When Bankruptcy is Optimal

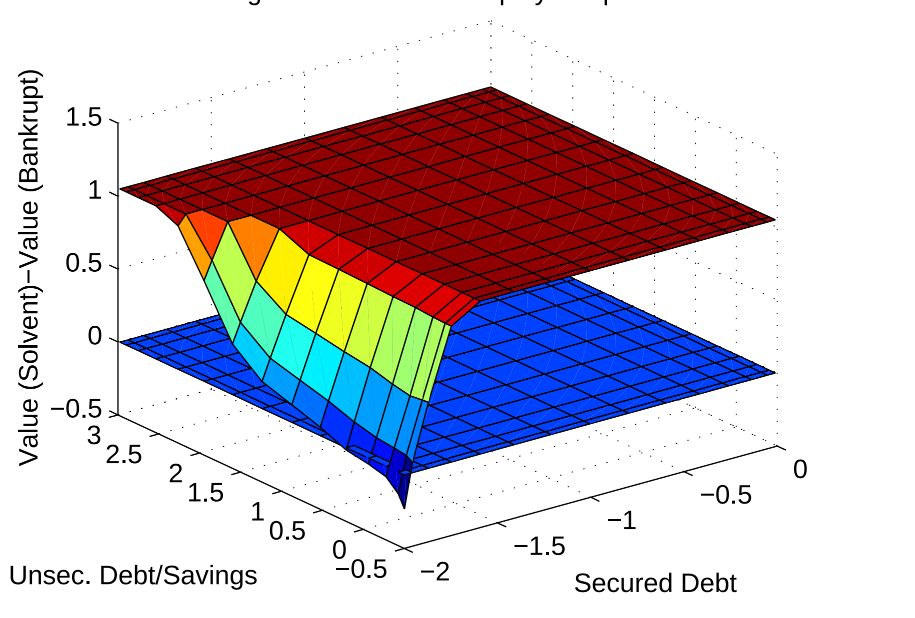


Figure 3: Unsec. Debt, Savings [Benchmark Exemptions]

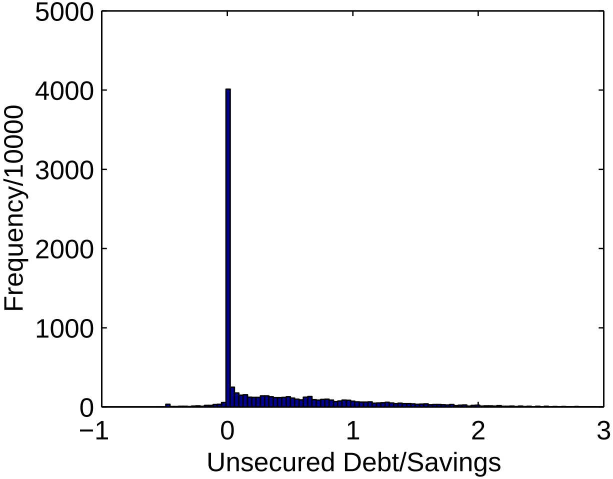


Figure 4: Sec. Debt, Unsec. Debt, and Savings [Benchmark Exemptions]

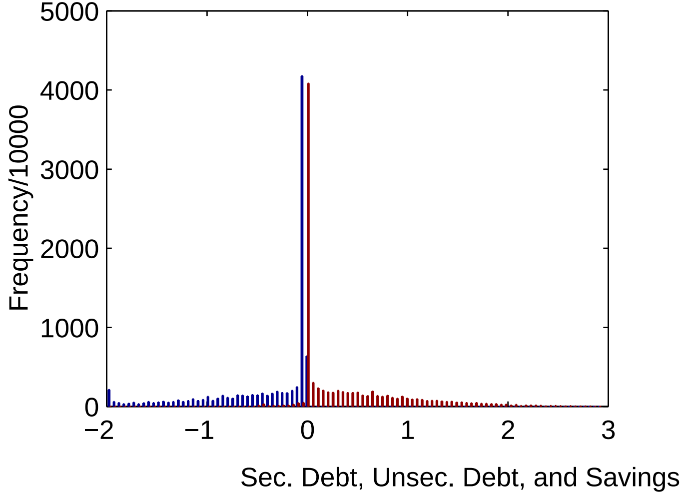


Figure 5: Unsecured Debt [Benchmark Exemptions]

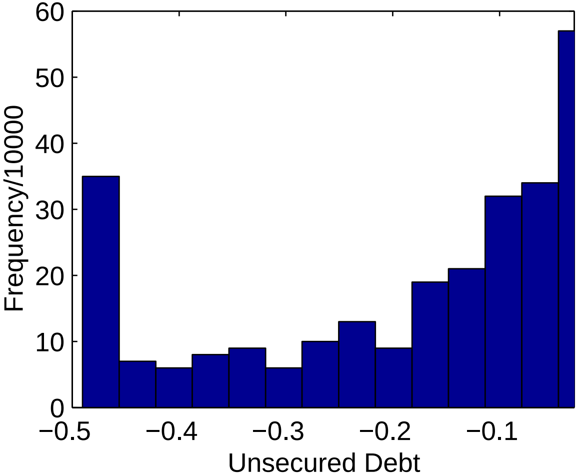
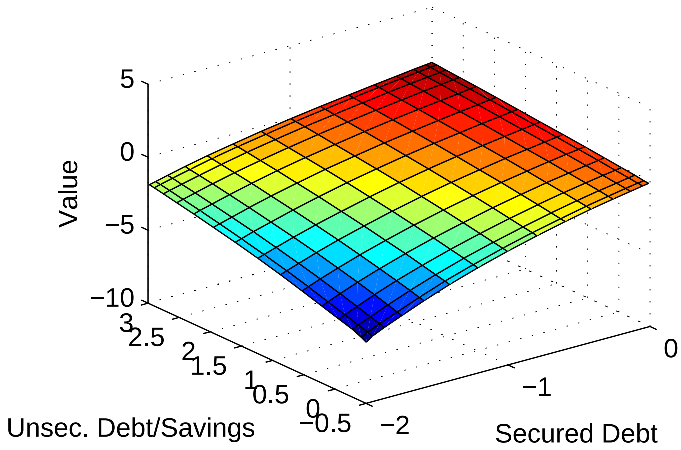


Figure 6: The Value Function is Increasing



Appendix B: Computation of Equilibria

The dynamic programming problem for the individual agent is a function of four state variables, three of which (a^s, a^u, and a^d), are continuous. This makes the problem difficult to solve precisely using standard discretized state-space methods, which are generally either inefficient or impractical for such large problems. I therefore employ smooth approximation methods to obtain the value function and related policy function. In particular, to solve the agent's problem in Equations(2.3)-(2.13), I use Algorithm 6.4 in Judd (1998), which employs tensor-product Chebyshev regression to approximate the value function, in conjunction with Algorithm 12.5 in Judd (1998), which is essentially a method of successive approximations. I am able to approximate the value function with the first seven Chebyshev polynomials and 225 nodes, where each asset is evaluated at fifteen grid points. An issue that arises here is that the presence of the "max" operator in the values function will induce a change in the concavity of the value functions. However, for the current problem, the point at which the concavity changes is endogenous, and is not known a priori. Therefore, spline methods that would place a node at such a point of change in concavity are not easily applicable. However, Chebyshev polynomials appear to provide a reasonable approximation as the size of the coefficients of successively higher degrees fall rapidly, as Judd (1998) demonstrates they should when approximating smooth functions. With the value function computed, I simulate a long sequence of income shocks, and compute the associated policy functions at each date. I then compute the mean of asset holdings and profits made by the intermediary in each sector. If these are profits are nonzero, I reset the interest rate on unsecured loans R^u by bisection, and recompute the value function with these new interest rates and generate a new series of asset holdings. Once zero profits are achieved, I check for market clearing, and depending on excess demand, I reset the interest rate on deposits, R^d, also by bisection, then recompute the agent's problem and iterate to find zero profits. I repeat this until I am able to simultaneously clear markets and generate zero profits.[48]

[48] Some details: For the computations, we define two value functions, each a function of both secured and unsecured assets, but conditional on the value for current income. For the monte carlo simulation, I generate a sequence 10,000 periods long, and then throw out the first 1,000 observations to avoid the effects of the "burn-in" period.