Credit Exclusion in Quantitative Models of Bankruptcy: Does It Matter?

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Why is there unsecured lending? Given that borrowers *seem* to have essentially no obvious incentive to repay under the generous provisions afforded them by U.S. consumer bankruptcy law, why would anyone make an unsecured loan? One answer is that borrowers are actually providing a more intangible form of collateral, such as their reputation or "good name." Such an answer is problematic, however. In particular, can households *credibly* bind themselves to agreements to which they may later have little interest in keeping? What about lenders? In particular, notice that lenders themselves have no incentive to act "punitively" after a bankruptcy filing. This is because if there are gains from renewed trade, any lender that "renegotiates" with borrowers will profit. In other words, in a competitive setting, the only reasonable changes in credit terms are those warranted by a change in assessing the likelihood of repayment.

Perhaps the most natural representation of the destruction of a reputational form of capital in unsecured loan markets is the reduction in the "credit score" that typically follows a bankruptcy filing. Thus, if neither borrowers nor lenders can credibly promise to forgo mutually beneficial transactions after a default, there would seem to be little hope for unsecured credit. And yet, a great deal of such credit exists, in an amount that currently exceeds $1 trillion!

The thorny issues raised above have, in large measure, been avoided by quantitatively oriented researchers. Instead, they typically assume that a penalty for default is exclusion from future borrowing, at least temporarily.

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However, for such analysis, the effects of exclusion on borrowing and lending depend on the precise specification of the income paths facing households. To understand why, assume first, as economists since Friedman (1957) have, that households use credit markets to "smooth" consumption. That is, they wish to shield consumption from changes in income. Smoothing occurs both in response to predicted changes in income as well as to unforeseen ones. The value of credit markets, in turn, depends on what households ask of them. Notably, if income risk is large and extremely persistent, or permanent, the household has little choice but to reduce consumption when hit with a negative shock. In such a case, the value of access to the credit markets may be quite low. If, instead, shocks are small or primarily transitory, borrowing will be an effective bulwark. It is the latter case in which the assumption of exclusion following bankruptcy would have the most bite. Thus, both households facing large and possibly infrequent shocks, as well as those facing small but frequent shocks may find the inability to borrow quite painful. Because the quantitative role of exclusion following bankruptcy may depend on the precise specification of income risks faced by households, the relevant question is: In recent quantitative models of bankruptcy, what role does credit exclusion play?

The two central contributions of this article are to (1) take a first step in evaluating the commonly used (but rarely justified) assumption in recent models of unsecured household borrowing of credit that defaulting borrowers get exiled and (2) quantitatively examine the role of exclusion in affecting the sharp rise of both debt and bankruptcy observed in the 1990s. We consider a simple model of consumer borrowing and lending developed in Athreya (2002, 2004). This model shares enough with other recent work to be useful in gleaning insights about exclusion. We organize our results around three experiments. In the first two, we investigate the extent to which reductions in exclusion-related penalties matter for post-bankruptcy asset accumulation under a variety of income processes. In the third experiment, we ask whether these changes generate outcomes consistent with recent observations on aggregates, such as the bankruptcy rate and debt discharged in bankruptcy.

Specifically, we proceed in two steps. First, we simulate counterfactual exclusionary periods precisely to understand the extent to which exclusion matters. Second, we link the length of credit exclusion to the level of competition in the unsecured lending market. The experiments performed in the first step will inform us as to the inherent "plausibility" of exclusion as a credible phenomenon. That is, if exclusion is found to be a "binding" constraint, then households value borrowing and would, in the absence of other constraints, be able to renegotiate loans with lenders. It has been observed that a high level of competition in the unsecured credit market makes purely punitive exclusion increasingly unlikely. This trend stems from a reduction in search and switching costs for households. We employ the intuition that while punitive

exclusion may be sustainable with a few lenders, it will not be with a large number of them.

Our central findings are twofold. First, we find that exclusion from credit markets alone seems insufficient to explain current repayment rates on unsecured debt. Second, we observe that a reduction in exclusion-related penalties for bankruptcy arising from technological changes in the 1990s is consistent with both growth in debt and personal bankruptcy.

One consideration that we address is the reason for borrowing. In particular, the nature of income shocks determines not only the usefulness of borrowing, but also the misery inflicted by exclusion. Consider an example in which a household faces minimal and transitory uncertainty nearly all of the time, but is nonetheless prone to prolonged spells of relatively low income. In such a world, the household may choose to borrow and may hold substantial debt at the time that the "long-term" shock occurs. In this situation, the household may not value highly the option to borrow, simply because the shock is expected to last a long time, thereby altering the present value of future earnings nontrivially. In this setting, the household will not care greatly that it will be excluded if it defaults. More troubling is that we may not be able to easily disentangle a reduced need to borrow after bankruptcy from a willful imposition of exclusion by creditors. Both causes have similar symptoms.

What Is Exclusion?

The sanctions assumed in recent work range from infinitely long periods of autarky for defaulters to relatively short periods where only borrowing is prohibited and saving is allowed. The former penalties have been used extensively to evaluate the best possible risk-sharing arrangements that are sustainable given a party's ability to walk away from contracts at any time. In these settings, default does not occur in equilibrium. These studies dismiss the issue of whether the penalties are credible. However, for their purposes, permanent autarky may be appropriate as a harsh punishment that allows for a bound of sorts on risk sharing under limited commitment. By contrast, when attempting to capture costs of default in the U.S. credit market, exclusion appears less plausible because of the coexistence of finite penalties and default.

Purely temporary exclusion has been an attractive modeling device for recent quantitative work, such as Athreya (2002, 2004) and Chatterjee et al. (2005) on unsecured consumer debt, and Yue (2005), Aguiar and Gopinath (2005), and Sapriza and Cuadra (2005) on sovereign debt. Nonetheless, such exclusion is not easily supported and deserves more justification than has been provided. In particular, a key problem is that in choosing to punish default ex post by exclusion, lenders and borrowers forgo opportunities for mutually beneficial trade that exist after default. In other words, once default has taken place, "bygones should be bygones"; the parties should recontract

and move on. However, the possibility of recontracting itself undermines the initial obligation of the borrower to commit to repay. Unless the lender can somehow credibly threaten to cut off the borrower from *all creditors*, the problem is not easily circumvented.

One case where exclusion may be plausible occurs when a single, or small number of, creditors may be able to coordinate to sustain ex post exclusion as a credible threat. Furthermore, it is possible, even with a large number of creditors and an infinite horizon, to construct systems of beliefs among market participants such that exclusion becomes sensible *ex post*. These belief systems are, however, not immune to criticism. In the subsequent section, we discuss an example where assumptions regarding these beliefs rationalize, at one level, the presence of unsecured debt. Nevertheless, the lack of discipline imposed on "off-equilibrium" beliefs can make ex post exclusion inefficient.

There is a good deal at stake in understanding the nature of penalties for default on unsecured debt. From an efficiency standpoint, limits to commitment, along with private information, are the prime suspects in the limited risk sharing we observe in the world around us. Moreover, since exclusion does not involve transfers of resources across parties, these penalties are socially wasteful ex post. Thus, unless offset by their ability to sustain better risk sharing, deadweight penalties should be regarded with concern. From a distributional standpoint, there is perhaps even more at stake; it is reasonable to suspect that the income-poorest are often the young, who, in turn, are wealth-poor. Therefore, the inability to commit to repayment affects this subgroup most profoundly, while leaving untouched those who may post collateral such as home equity.

Recent Changes in the Unsecured Credit Market

Our interest in the potential implication of changes in the competitiveness of the unsecured credit market is derived from the seminal studies of Ausubel (1991) and Calem and Mester (1995). These studies confirmed the popular view of many that, in the late 1980s and early 1990s, the U.S. market for unsecured credit was an imperfectly competitive marketplace in which rational lenders systematically earned supernormal profits. We now examine some well-publicized changes in the structure of unsecured lending and assess its role in driving the even more well-publicized increases in household debt and bankruptcy. We divide our focus into two broad periods: the 1980s and the 1990s to the present.

The 1980s

The most important article in this relatively large body of literature might be that of Ausubel (1991), who argues on empirical grounds that as of the late

1980s, returns in unsecured credit markets were highly supernormal. Moreover, and more intriguing, was that the market seemed to offer a near textbook case of perfect competition. In particular, Ausubel documents that there were in excess of 4,000 lenders and that free entry seemed possible. In particular, Ausubel (1991) notes that the ten largest lenders accounted for only two-fifths of market share and therefore could not be said to monopolize the market. The returns to credit card lending grow even more puzzling as it is difficult to find any evidence of overt collusion or price fixing. One finding in particular has spurred substantial analysis, namely, the feature that credit card interest rates are remarkably insensitive to changes in the measured cost of funds. In conclusion, Ausubel (1991) suggests three possibilities for the observed behavior of the credit card market. First, he allows for departures from standard consumer rationality, and argues that in a setting with irrational households that systematically underestimate their own likelihood of carrying credit card balances, lenders may be able to earn supernormal profits. Second, Ausubel allows for search and switching costs to reflect several hurdles that lie in front of those wishing to switch credit cards. Lastly, Ausubel suggests that asymmetric information regarding the default risk of borrowers could make it difficult to control risk using interest rates. In particular, a fall in the rate offered by a lender might simply attract a disproportionate response from those most likely to default, and would generate only indifference from low-risk households that often did not carry balances on which they paid interest. In this setting, one might reasonably expect retail interest rates to move far less in response to changes in funding costs than when more was known about cardholders.

An important article that pursues the conjectures of Ausubel (1991) in explaining credit card interest-rate stickiness is that of Calem and Mester (1994). These authors conclude that all three aspects of Ausubel's reasoning receive empirical support when data from individual consumers (from the Survey of Consumer Finances) is used. Notably, Calem and Mester do find a significant role for the effect of both search and switching costs. One of the costs they note that is that while borrowers provide real-time information on their financial situation through their repayment behavior, credit bureau data in the 1980s was not updated as frequently. In turn, while lenders had measures of the risk posed by their own cardholders, this risk was only partially revealed, as it did not reveal the behavior of the same individual with respect to other accounts, nor the risk posed by new account holders. More subtly, as noted by Calem and Mester (1995), high switch costs can independently limit the value of search, leading again to stickiness in interest rates.

The 1990s to the Present

The preceding work deals with a period immediately prior to a noticeable change in technology for intermediation. As documented by Furletti (2003),

FDIC (2004), and Edelberg (2003), the use of large-scale credit scoring and intensive data mining led to large changes in the growth of information available to lenders. In turn, search costs fell. Notably, to the extent that search could be initiated by either buyer or seller, a major change in the 1990s was the growth of massive preapproved, direct-mail solicitation. Figure 1 (all figures appear at the end of this article) shows that even a casual viewing of the data makes clear that an important "regime change" occurred in the early 1990s. To the extent that technological advances mitigated adverse selection, price-based completion grew more attractive. Indeed, Furletti (2003) and Edelberg (2003) argue that these changes paved the way for much more detailed pricing strategies according to cardholder risk.[1] Perhaps the most interesting aspect about the 1990s was the growth of debt and bankruptcy to unprecedented levels.

The facts documented above for the 1990s can be expected to result in a reduction or elimination of exclusion. Moreover, these changes may be expected to first generate a transitional period during which repayment rates on credit contracts issued prior to the early 1990s did not reflect the intensifying competition. Additionally, in the longer run, we might expect a "supply side" response leading to a repricing of terms to accommodate this new reality. The first period might well be associated with increased borrowing and default, while in the longer run, the repricing of the riskier loans might led to a fall in default rates (all else equal). Once again, the preceding experiment is only partially a natural one because of the simultaneous change in the technology of credit intermediation. Athreya (2004) explores the effects of a fall in transactions costs on borrowing and default and finds that it accounted well for the period between 1991 and 1997. In this article, we abstract from technological advances and focus exclusively on the aggregate consequences of reductions in credit exclusion for debt, bankruptcy, and credit supply.

The article is organized as follows. In Section 1, we document some recent empirical evidence on the consequences of bankruptcy. We also briefly present a theoretical model and some quantitative theory to review the standard approach to incorporating credibility of ex post punishment and use of assets for consumption smoothing. Section 2 presents a simple model and evidence from counterfactual experiments to examine the extent to which household behavior is dictated by exclusion and income. In Section 3, we extend the model to address the effects of exclusion on the aggregate unsecured credit market. Section 4 concludes.

[1] See Athreya (2004) for an account of these changes and the implication they have for indebtedness and default.

1. BACKGROUND EMPIRICAL EVIDENCE AND THEORY

Consequences of Bankruptcy: Empirical Evidence

Several recent articles have gathered empirical evidence that argues that bankruptcy blights a credit score. Stavins (2000) finds that having been turned down for credit makes one substantially more likely to have filed for bankruptcy in the past. Relatedly, and perhaps as a consequence, bankruptcy filers are less likely to hold at least one credit card if they have filed for bankruptcy in the past. These two observations are suggestive, but they do not have an unambiguous interpretation of forcible "exclusion" from credit markets. Ideally, what one would like to know is the probability of rejection given a past bankruptcy. Instead, what we know from Stavins (2000) is the probability of having filed a bankruptcy given that one is rejected for credit. The second observation is perhaps more informative, as the absence of a credit card means that households have foregone the potential transactions-related benefits of convenience associated with credit cards. On the other hand, the growth of debit cards allows for access to the payment network of Visa, Mastercard, and others without the need for a credit card. Moreover, the quantitative differences between those with a prior bankruptcy and those without are not so large. In particular, Stavins (2000) finds that the mean number of credit cards held by those with a past bankruptcy was 2.91, while it was 3.58 for those without a bankruptcy. This also calls into question the extent to which bankruptcy filers are truly "excluded." Among the strongest findings in Stavins (2000) is that a past bankruptcy was predictive of future delinquency. This suggests that something systematic characterizes bankruptcy filers that warrants differentially strict treatment, such as more frequent rejections in credit application. Once again, the data do not speak with one voice, because the interest rates faced by those having filed averaged only one percentage point more than those who had not. Thus, conditional on obtaining an unsecured credit card loan, past bankruptcy filers appear not to be paying a great premium.

In the United States, credit bureaus are important institutions that aggregate debt and repayment data across consumers and over time. In the scoring models most commonly used, such as Fair Isaac & Co. (FICO), the leading issuer of credit scores, repayment history is a major determinant of score. In turn, scores are interpreted by lenders as measures of risk, implying that the drop in credit score triggered by bankruptcy leads to at least temporary repricing and possibly exclusion from unsecured borrowing.

In addition to Stavins, another important reference in the literature on post-bankruptcy credit extension is that of Musto (2004), who exploits a natural experiment created by laws limiting the length of time a bankruptcy may be retained on a credit record to ten years. The main finding of the latter is that for more "creditworthy" households, the removal of a past bankruptcy

from a credit record has an immediate and economically significant effect on household indebtedness. When those with high and medium credit ratings were studied, as measured by FICO, the average credit lines jumped in the tenth year from $2,810 to $4,578.

Lastly, Fisher, Filer, and Lyons (2000) study a panel of households that have filed for bankruptcy, and they argue that the consumption of this group is somewhat more sensitive to income than in the period preceding the filing. This is consistent with borrowing constraints binding in the post-bankruptcy period. Furthermore, the authors find that after five years beyond the removal of the bankruptcy from a credit record, consumption ceases to be excessively sensitive to income. Again, this is consistent with bankruptcy leading to a temporary cutoff from unsecured credit markets.

Exclusion in Theory: A Simple Example

Given the observation that sovereign debt and unsecured consumer debt markets both exist, work on supporting punishments as credible threats has occupied the time and imagination of theorists for some time. A textbook example of such a system of beliefs is taken from Obstfeld and Rogoff (1995, Ch. 6, 376–77). In this example, there are a large number of a risk-averse nations facing uncertain country-specific output. However, all shocks to output are uncorrelated across countries, and there is, therefore, the possibility for complete insurance. However, it is also assumed that each nation may walk away with its current income at any time. The only penalty is a permanent exclusion from credit markets. The key question is whether such a punishment can be credible. Below is a set of beliefs and strategies that generate credibility. If country A is to be penalized by the others, (1) it must be that country A has no reputation for repayment, and (2) all other countries lose their own reputations for repayment by dealing with country A. Note that without clause (2), a country could default and then buy an insurance contract against income risk by putting up money up front, thereby removing all credit risk. With clause (2) in place, no defaulting country would dare send money to a country that agreed to insure it. This is also beneficial because it confirms the beliefs held by the nondefaulters about country A. Namely, since country A believes that any insurer B will default at the first chance, country A will default on any obligations it has to country B. In turn, country B would be optimizing by seizing any payments by country A.

What is notable about this example is not so much that punishments may be sustained, but that they depend intricately on the systems of beliefs held by market participants. Moreover, to the extent that we do not have definitive means of winnowing the sets of beliefs that are "plausible," such resolutions are somewhat troubling. There is also a more serious problem, namely that of "renegotiation." In particular, even though the threats specified above are

credible in that they remain in the interest of countries to impose ex post, they are not immune to renegotiations. We now examine a problem with the belief system discussed above. In particular, all the gains from trade that could be realized between the parties go unrealized. In the preceding example, the problem arises because even though the specification of beliefs makes it sensible for the borrower to take the threat of exclusion seriously, the actual imposition of the threat ex post is *inefficient for all parties*. This creates incentives for all parties, not just the ones that have experienced default, to create other contractual arrangements beyond those rendered unworkable given people's beliefs. As a result, one might expect that ex ante, the threat of exclusion will once again become ineffective to sustain risk sharing.

Value of Asset Markets in Quantitative Theory

To obtain an initial measure of the value of assets for smoothing, and thereby the pressure not to impose exclusion ex post, we turn now to a canonical model of savings and consumption taken from Deaton (1991). A broad lesson of this work is that temporary shocks will generally be smoothed via borrowing and savings, while persistent, or permanent, shocks will not.

To make things clearer, consider a household that maximizes the following objective:

$$E_0 \sum_{t=0}^{\infty} \beta^t \frac{c_t^{1-\kappa} - 1}{1-\kappa}.$$

In the preceding, consumption in period t is given by c_t, β is the discount factor, and κ specifies risk aversion. The latter is a key parameter governing the extent to which households borrow to keep consumption smooth in the face of shocks. The objective function is maximized subject to the constraints

$$c + \frac{a'}{1+r} \leq y + a$$

$$a' \geq 0,$$

where y denotes income from sources other than wealth, a, and r denotes the interest rate. Notice that there is a restriction that $a' \geq 0$, ruling out borrowing. However, the exercise is still instructive because our primary goal is to understand the effect of limits on the decumulation of wealth, with an exclusion from borrowing being a special case. If we now specify a simple AR(1) income process

$$y_t - \overline{y} = \varphi(y_{t-1} - \overline{y}) + \epsilon_t,$$

where

$$\epsilon_t \sim N(0, \sigma),$$

Table 1

Persistence (φ)	-0.40	0.00	0.30	0.50	0.70	0.90
1. s.d. y	10.90	10.00	10.50	11.50	14.00	22.90
2. estimated. s.d. y	10.80	10.20	10.00	11.40	13.30	27.50
3. estimated. s.d. c	4.60	5.10	6.70	7.60	10.40	25.90
ratio $\frac{\text{s.d. } c}{\text{s.d. } y}$	0.43	0.50	0.67	0.67	0.78	0.94

we obtain Table 1 from Deaton (1991).

Notice that as shocks become more persistent, households choose not to smooth shocks. The ratio of the standard deviation of consumption to that of income grows systematically with the persistence of shocks to income. The intuition here is that highly persistent negative shocks, for example, have a grave impact on lifetime income. To the extent that it is lifetime income that determines in large part the long-run average level of consumption, a large downward revision demands a reduction in average consumption. In other words, households will generally be unwilling to borrow against a greatly diminished future income just to avoid today the anticipated pain of a bad event. By contrast, a highly persistent positive shock implies a relatively large upward revision in future income prospects. In light of this, households will reduce their indebtedness or increase their savings. Lastly, take the extreme case where the shocks to income are permanent. An example of this is a "raise" in salary that also resets the "base" at which future raises are computed. In this case, the positive shock may lead to *borrowing* in anticipation of future good times. At the other extreme, if a permanent bad shock occurs, households may actually increase their savings to allow them to make the transition more smoothly to a permanently lower level of income.

The implications of this example for a world with bankruptcy are noteworthy. In particular, it matters a great deal whether one lives in a world of highly persistent income risk. If so, credit markets are not useful to households anyway, and credit exclusion is not painful. In short, the incentives to default for any given debt level are relatively large when compared to a world of less persistent income risk. On the other hand, the usefulness of bankruptcy in such a setting is less obvious. After all, little smoothing can be done via borrowing in such an environment. Ironically, exclusion may be "sustainable" in this setting simply because there is not much at stake for creditors in imposing it.

With more transitory shocks, however, the incentives to borrow for consumption smoothing are relatively large, and the threat carried by a *credible* promise of exclusion following default is meaningful. Nonetheless, ex post exclusion hurts the household precisely because it values borrowing and raises the issue of the credibility of an exclusion. Credibility is even more implausi-

ble when it is assumed to be imposed by a highly competitive industry where consumers are well aware of competitors' terms and rates.

As we will see in the following section, the presence of default makes the results above less obvious. In particular, one's willingness to smooth even temporary disturbances may depend importantly on the presence of longer-term shocks and the ability to default should such shocks occur. Conversely, even a persistent shock may be smoothed by a household that has access to a default option. In particular, bankruptcy introduces an incentive to "gamble" that is not otherwise present. In the present context, the household may gamble by borrowing more than it otherwise would just to ensure a smooth consumption path, knowing that bankruptcy is a possibility should poor incomes continue. Of course, creditors will price such risk, and in the end, households may choose not to borrow in equilibrium. Therefore, the net effect of bankruptcy on the equilibrium willingness of households to smooth shocks is not perfectly straightforward and remains a quantitative issue.

2. THE BASIC MODEL

To study the effects of exclusion and the dependence of the effects of exclusion on income risk, we now turn to the following model, taken from Athreya (2004). Let there be a large number of infinitely lived households with identical preferences given by

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

Households save in risk-free claims to consumption that mature in the next period. Savings earns an interest rate of $(1 + r^d)$. Households have the option of defaulting on debt. In each period, the household chooses whether to file for bankruptcy. Bankruptcy is kept simple and is assumed to remove all the debt of a household.

Bankruptcy generates two costs. Households must pay transactions costs associated with legal proceedings, as well as have their utility lowered by any stigma they may feel. Moreover, households are assumed to be temporarily banned from borrowing. We denote the sum of all costs that did not arise from credit exclusion by λ and the length of the average exclusionary period by γ. The preceding structure leads to the following set of value functions.[2]

At any date, households are either solvent, which we denote by S, or "borrowing constrained" while excluded because of a past bankruptcy, which we denote by BC.

[2] See Athreya (2004) for more details.

The value of being solvent, V^S, must satisfy

$$V^S(y, a) = \max[W^S(y, a), W^B(y, a)]. \tag{2}$$

The value of *repaying debt* in the current period satisfies

$$W^S(e, a) = \max\{u(c) + \beta E V^S(e', a')\} \tag{3}$$

s.t.

$$c + \frac{a'}{1 + r^l(a')} \leq y + a. \tag{4}$$

If a household files for bankruptcy, their debts are removed, and they pay the transactions costs, λ.

In the period following a bankruptcy, the household is excluded from borrowing, which means that the value, V^{BC}, from beginning in this state is

$$W^B(e, a) = \max\{u(c) - \lambda + \beta E V^{BC}(a')\} \tag{5}$$

s.t.

$$c + \frac{a'}{1 + r^d} \leq y. \tag{6}$$

The exclusion from credit markets ends each period with probability, γ, with the average restriction from borrowing lasting 1/(1-γ) periods. The value of this state is therefore

$$V^{BC}(y, a) = \max\{u(c) + \gamma\beta E V^S(y', a') + (1 - \gamma)\beta E V^{BC}(y', a') \tag{7}$$

s.t.

$$c + \frac{a'}{1 + r^d} \leq y + a. \tag{8}$$

Let the default probability for a debt of d units be denoted $\theta^{bk}(a')$. In equilibrium, economic profits must be zero. Therefore, given the cost of funds for intermediaries, $(1 + r^d + \tau)$, where τ is a transactions cost that represents recordkeeping and other operational expenses, the interest rate on loans will be restricted to

$$r^l(a') = \frac{(1 + r^d + \tau)}{(1 - \theta^{bk}(a'))} - 1. \tag{9}$$

Parameterization

With this simple model of consumer borrowing and bankruptcy, we evaluate the interplay between income persistence, the size of income shocks, the exclusionary period, and desired borrowing. We study five income processes, which differ along two dimensions: the persistence of shocks, denoted by φ, and their variance, denoted by σ^2. The first process is our benchmark, taken

Table 2

Income Process	μ	σ^2	φ
Y^B	1	0.15	0.97
Y^1	1	0.10	0.50
Y^2	1	0.10	0.99
Y^3	1	0.30	0.50
Y^4	1	0.30	0.99

from Athreya (2004). It is an AR(1) process broadly consistent with panel data on U.S. households and includes low income states that are interpretable as "unemployment." For brevity, the reader is referred to Athreya (2004) for details on the (discretized) version of this process. The key parameters of that process are the mean level of income, μ, which we fix at unity, the variance among working households, set to 0.15, and the serial correlation of income, set at 0.97. The remainder of the processes involve changes in the variability persistence of income shocks relative to the benchmark, where we *hold mean income fixed*. The processes are summarized in Table 2. One period in the model represents one quarter. The remaining parameters are given as $\kappa = 1$ (which implies logarithmic utility), $\tau = 0.0085$, $\beta = 0.9865$.

Using these processes, we simulate the income, consumption, savings, and bankruptcy decisions of a large number of households. We then evaluate household behavior immediately prior to, and following, a bankruptcy filing. Specifically, we concentrate our attention to the 10 quarters preceding and 20 quarters following a bankruptcy. We study the behavior of cross-sectional averages in each quarter of this 30-quarter window. Our goal is to evaluate the extent that exclusion from credit markets is actually a binding restriction that requires explanation. For example, if, for the benchmark income process, removing exclusion did not change post-bankruptcy debt accumulation, we would know that exclusion cannot be an important deterrent to default. By contrast, if removing exclusion did imply a substantial increase in post-bankruptcy debt, we have evidence that exclusion matters.

For the remainder of this section, we focus on Figures 2–6. These figures display the path of average quantities in the window around the date of bankruptcy, where date 0 on the x-axis is the period of the bankruptcy filing. The top panel in Figures 2–6 presents the results where no post-bankruptcy exclusion is assumed. The middle panel in Figures 2–6 contains results across the income process when exclusion is set as in Athreya (2004) to an average of four years. By contrast, in the bottom panel in Figures 2–6, we assume a lengthy exclusion of 25 years. For reasonable discount factors, exclusions of such high duration generate outcomes similar to a truly permanent exclusion.

Experiment 1: Effects of Income Risk, Given Exclusion

We begin by holding exclusion, γ, and filing costs, λ, fixed. We vary the income process in order to display the effects of income volatility and persistence on asset accumulation and decumulation before and after a bankruptcy. In the top panel of Figures 2–6, we set $\gamma = 0$ (no exclusion). When comparing the top panel across Figures 2–6, we see immediately that asset holdings are uniformly higher at all dates under processes Y^1 and Y^3, both of which display relatively low persistence, than under Y^2 or Y^4, both of which display high persistence. The intuition here is the same as presented earlier. Note first that the average income preceding a bankruptcy is falling for the population. Given the mean-reversion implicit in all the income processes under consideration, we see that on average, after a filing, incomes rise again and then level off at their long-term average. The positive income shocks that occur on average to bankruptcy filers after they file are treated as temporary under processes Y^1 and Y^3 and treated as somewhat more permanent under the other two processes. In turn, the former save some of the gains and accumulate a "buffer stock" of savings. The relationship between persistence and asset holdings is robust and survives in the middle and bottom panels of Figures 2–6 as well. However, the behavior of assets across the income process grows more similar as exclusion becomes longer lasting.

Experiment 2: Effects of Exclusion, Given Income Risk

We now turn to the experiment of central interest: the effect of varying exclusion under a fixed income process. A comparison across panels of each of Figures 2–6 shows that increased exclusion is met after bankruptcy by increased asset accumulation. Preceding a bankruptcy, asset paths are quite similar across exclusionary periods. What is perhaps more important to see is that even when exclusion is eliminated (top panel in Figures 2–6), households simply do not borrow much after bankruptcy. This is true across all four income processes considered here. It suggests that a valid interpretation of the observation is that *households are not simply excluded from borrowing; rather they do not wish to borrow after bankruptcy.*

One consideration worth mentioning is that our experiments consider the equilibrium effect of changes in exclusion. Namely, households are assumed to know, understand, and respond to the changes. In turn, note that our results focus on the behavior of those in and around a bankruptcy filing. Therefore, when exclusion becomes strict, it is possible that we observe bankruptcy only in those circumstances when ex post exclusion would be least painful, all else equal. For example, consider a world with long exclusionary periods and both transitory and long-lasting income shocks, such as the processes used here. In

such a setting, one might expect that bankruptcy becomes used predominantly when debts are large and a persistent shock strikes, rather than when a more transitory shock occurs. Our findings suggest that this effect is unimportant, as average incomes at the time of filing are very similar across Figures 2–6. In the discretized income process we employ, the income level "triggering" bankruptcy is always the state we associate with prolonged unemployment at a time when unemployment insurance benefits no longer are provided.

A second issue is that even if the circumstances at the time of filing are not affected strongly by bankruptcy, the rate at which people file may be materially altered by credit exclusion. This happens in part because debt accumulation overall may change significantly, making exclusion important as a deterrent even when it leaves the proximate "cause" (i.e., the state of the household at the time of filing) of bankruptcy unchanged. We address this issue next by evaluating the effects of exclusion on aggregate unsecured credit-market activity in terms of debt accumulation, bankruptcy rates, and loan pricing. We also provide a first look at studying a narrative that addresses recent technological changes that have reduced search and switching costs for households and have led to greater effective competition across lenders.

3. COMPETITION IN UNSECURED CREDIT MARKETS

Athreya (2004) proposes an explanation for events detailed above by modeling technological advances by reductions in transactions costs and finds that such changes produce outcomes broadly consistent with the data. In the current work, we propose a different approach. Namely, we emphasize in this article that while reductions in transactions costs are part of the story, the fact that search and switching costs in particular have fallen may resurrect the credibility problem faced by unsecured lenders. In other words, a borrower who has defaulted now has an easier time communicating his risk to prospective lenders, as better credit bureau data are available to lenders. Moreover, a borrower may more easily evaluate the quality of offers from a very wide range of solicitors both because he receives roughly five times as many offers in the late 1990s as he did in the late 1980s, and also because disclosure regulations such as the "Schumer Box" allow for easy comparisons of rates and terms. These changes, in turn, must begin to force lenders to "treat bygones as bygones." Therefore, the only remaining rationale for treating bankruptcy filers like "hot potatoes" is that they must have revealed something about themselves that makes them undesirable.

A key issue here is the following: To what extent does bankruptcy differentiate households into persistently different risk categories? Answering this question requires answering the question of "who" bankruptcy filers are. Athreya (2004) summarizes work by Sullivan, Warren, and Westbrook (1989, 2000), and others, reaching the conclusions that along many relevant dimen-

sions such as age, education, and income, bankruptcy filers appear to be "middle class" people who have gotten unlucky. While some of this poor luck was persistent, much of the immediate history preceding bankruptcy filings was not atypical. Once again, there in an inherent conflict in arguing that bankruptcy leads to credit embargoes that filers are mainstream households. After all, mainstream households would not be treated as pariahs unless they were truly different from the remainder of the population.

Experiment 3: Are Rising Indebtedness and Default Rates Consistent With Reduced Search and Switching Costs?

We now assume that the improvements in informational flows between borrowers and lenders have led to competitive behavior, especially in terms of lenders no longer being able to sustain the credit exclusion of bankruptcy filers. Athreya (2004) investigates the role of reducing the cost of intermediation itself and finds that such changes imply more indebtedness and default. In this article, we focus solely on discerning the effects of reduced credit exclusion, while fully acknowledging that both processes may (and indeed seem likely to) have occurred together. To generate the quantitative implications of such a change, we ask whether the total elimination of any means of ex post credit exclusion, whereby $\gamma = 0$, produces increases in bankruptcy and debt broadly consistent with the data since the early 1990s.

We proceed in two steps. We first allow for the removal of exclusion in a way that creditors are not fully aware of the change. This allows us to capture the *initial* effects of reductions in search costs that facilitated more switching among debtors. In particular, we study this "transitional" period by *holding the loan pricing function fixed* at its initial steady state level. We then allow for prices to adjust as lenders learn their environment and compute a new steady state equilibrium.[3] Our first finding is seen in column one of Table 3. We study the effects of setting $\gamma = 0$ under the benchmark income process.

[3] A natural criticism could be that we allow borrowers to learn about the new environment before creditors do. Note, however, that we assume that the technological change (i.e., reduced search and switching costs) was *unanticipated*. Therefore, loans made just prior to adopting the technological change turn out to be mispriced ex post.

Table 3

Income Process	Y^B=(0.97, 0.15)			Y^1=(0.5, 0.1)			Y^2=(0.995, 0.1)			Y^3=(0.5, 0.3)			Y^4=(0.995, 0.3)		
Exclusion Length	0	0.9375	0.99	0	0.9375	0.99	0	0.9375	0.99	0	0.9375	0.99	0	0.9375	0.99
Bankruptcy Rate	0.0018	0.0012	0.0010	0.0025	0.0014	0.0011	0.0023	0.0012	0.0010	0.0015	0.0009	0.0008	0.0020	0.0012	0.0009
E(a|a<0)	−0.443	−0.472	−0.505	−0.280	−0.318	−0.353	−0.227	−0.356	−0.380	−0.417	−0.453	−0.483	−0.332	−0.303	−0.195
Consumption Coefficient of Variation	0.142	0.142	0.140	0.084	0.077	0.075	0.123	0.121	0.120	0.104	0.101	0.100	0.296	0.295	0.294
Fraction Borrowing	0.369	0.344	0.324	0.337	0.309	0.301	0.465	0.311	0.295	0.232	0.225	0.235	0.419	0.366	0.329
Transition Pricing		$q^{y=0.9375}$			$q^{y=0.9375}$			$q^{y=0.9375}$			$q^{y=0.9375}$			$q^{y=0.9375}$	
Bankruptcy Rate	0.0101		0.0006	0.0145		0.0006	0.0060		0.0006	0.0136		0.0006	0.0016		0.0005
E(a|a<0)	−0.505		−0.342	−0.539		−0.341	−0.496		−0.300	−0.515		−0.322	−0.348		−0.214
Consumption Coefficient of Variation	0.131		0.139	0.127		0.139	0.137		0.139	0.128		0.139	0.142		0.139
Fraction Borrowing	0.415		0.247	0.449		0.248	0.405		0.241	0.427		0.245	0.252		0.130

As in Athreya (2004), the initial steady state assumes an exclusionary period averaging 16 quarters (four years), and thereby sets $\gamma = 0.9375$, and under the benchmark income process, matches several aggregate U.S. unsecured credit and default facts. When exclusion is eliminated, the initial transition period is quite striking. Notably, the quarterly aggregate default rate rises sharply from 0.12 percent to 0.18 percent, a 50 percent increase in quarterly filing rates! The increase in filings is in part driven by the temporary mispricing of credit risk, which households use to their advantage. This is seen along both the "extensive" margin of borrowing, whereby more people borrow, and the "intensive" margin, whereby borrowers are more indebted than before. In terms of the fraction of borrowers, there is a very large 7.1 percentage point, or roughly a 20 percent increase in the fraction of households that borrow. Overall indebtedness, as measured by the conditional mean of debt among those who borrow, also grows substantially, from approximately \$3,400 in the benchmark to \$5,050 in the transition. These facts are all qualitatively consistent with the observations over the early 1990s, during which margins fell while debt and bankruptcies both grew. As lenders adjust pricing to a world in which exclusion is simply unsustainable, credit supply effectively shrinks, reducing indebtedness and default along with it. This is seen in the top block of column one in Table 3. The fraction of borrowers falls back from its transitional maximum to a lower level that is very close to the initial steady state. Conversely, to get a measure of the deterrent power of exclusion, we present results for the case where exclusion is increased so as to average 25 years. In essence, this represents nearly permanent exclusion. In this case, the previous intuition goes through in reverse, whereby borrowing and default initially fall very sharply, but then result in long-run loan terms that make borrowing attractive again, as seen in Figure 7. These features can also be seen in Figure 8. In the long run, bankruptcy nearly disappears, but borrowing increases to the point where roughly one-third (32.4 percent) of all households borrow, and when they do, they actually borrow more than under benchmark exclusion, at \$5,050. These results are largely robust across the entire set of income processes we consider, and for brevity, we refer the reader to Table 3 and Figures 9–12 for details.

4. CONCLUDING REMARKS

Our finding that the removal of ex post exclusion leads to greatly increased bankruptcy rates and indebtedness is striking. A corollary is that the other costs of bankruptcy—namely, fees, time costs, and ultimately, the shame or "stigma" felt by filers—must be very acute indeed. After all, even in the absence of exclusion, the credit market in our model continues to exist rather than collapse, even though stigma-related costs were held fixed throughout.

In other words, stigma is arguably even more important, and might be all there is, in keeping unsecured credit markets in existence.

Filing-related costs are important and worrisome, because they indicate that unless monetary policymakers act to provide repayment commitment, attitudes may be all that lie between the current setting and a setting in which the young and the wealth-poor generally cannot obtain credit. In particular, one institutional impediment to the commitment to repay is the U.S. bankruptcy code. Even after currently enacted reforms take hold, it is still unconstitutional to write contracts waiving the right to bankruptcy. At present, only the wealthy, who might post collateral, can do so. One alternative is that exemptions be stricter, as they implicitly will make much of the borrowing of even the wealth-poor collateralized. On the other hand, the benefits arising from an increase in strictness of exemptions must be weighed against the costs imposed by facing a rigid repayment schedule in an environment of nontrivial income risk.

The results presented here are simple and suggestive, but by no means definitive. Yet, they point to several directions for future research, all of which seem essential if we are to explain the rich array of unsecured credit products in a world where penalties appear nebulous and even unavailable.

Figure 1 Annual Credit Card Solicitations

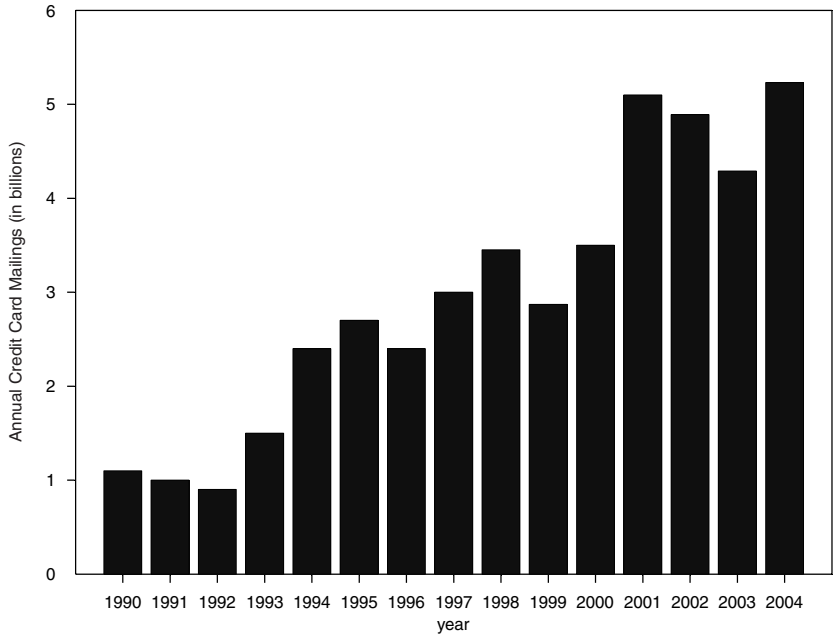


Figure 2 Mean Household Behavior Before and After Bankruptcy ($Y=Y^B$)=(0.97, 0.15)

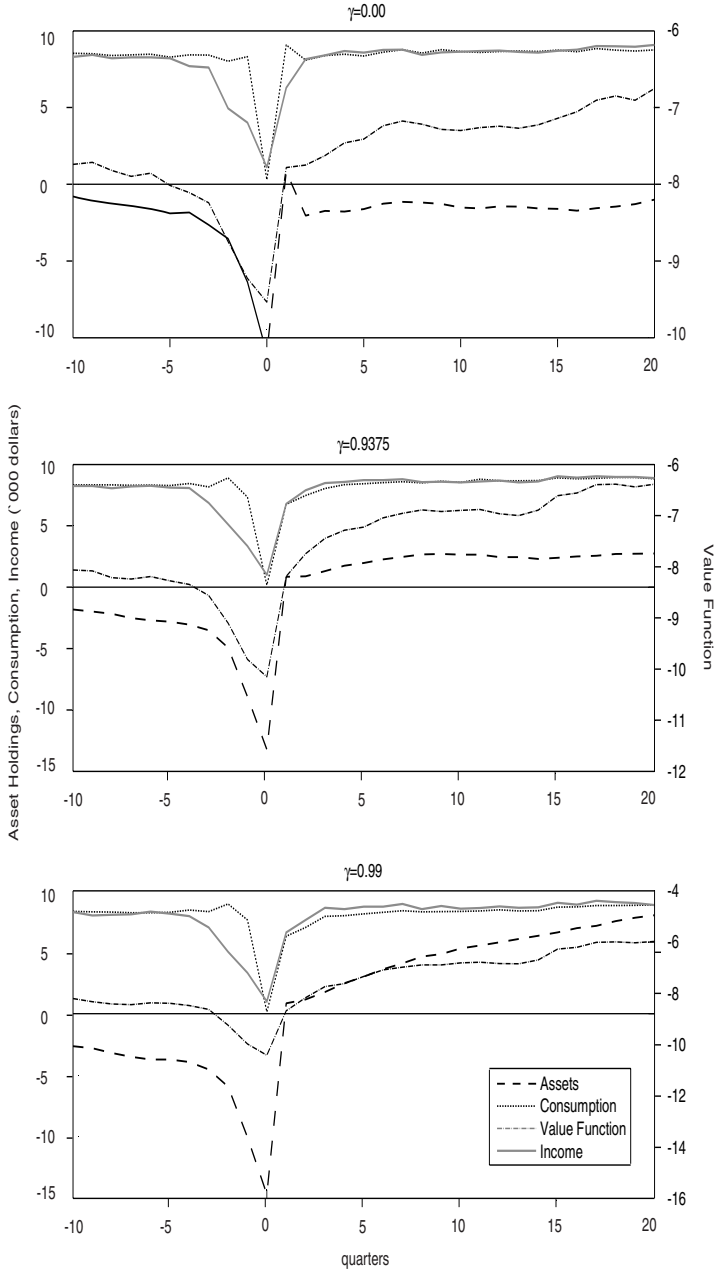


Figure 3 Mean Household Behavior Before and After Bankruptcy Y^1=(0.5, 0.1)

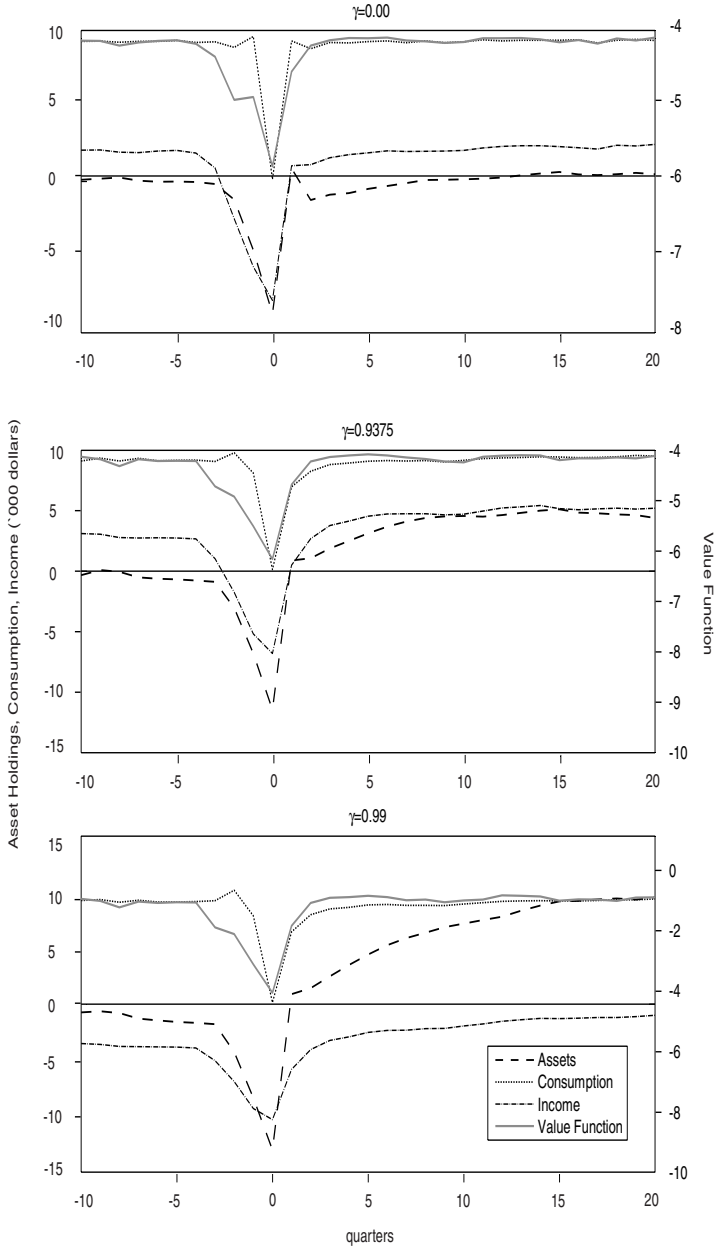


Figure 4 Mean Household Behavior Before and After Bankruptcy
Y^2=(0.995, 0.1)

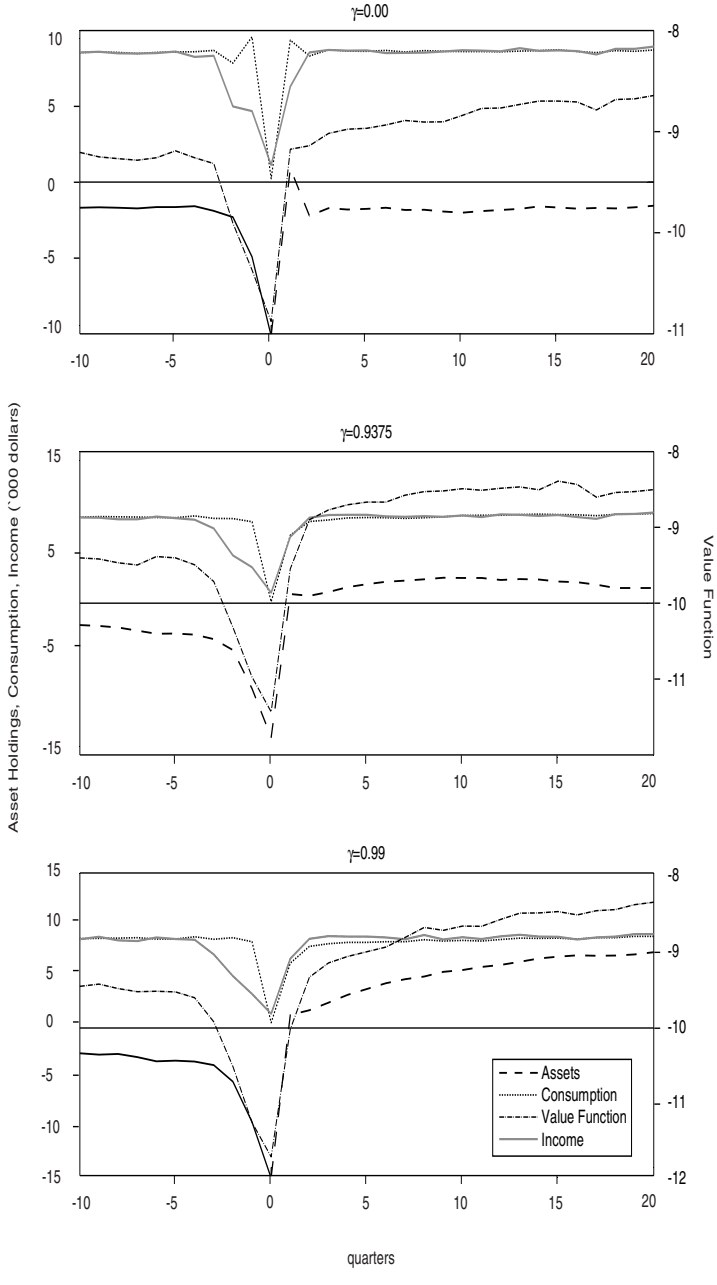


Figure 5 Mean Household Behavior Before and After Bankruptcy Y^3=(0.5, 0.3)

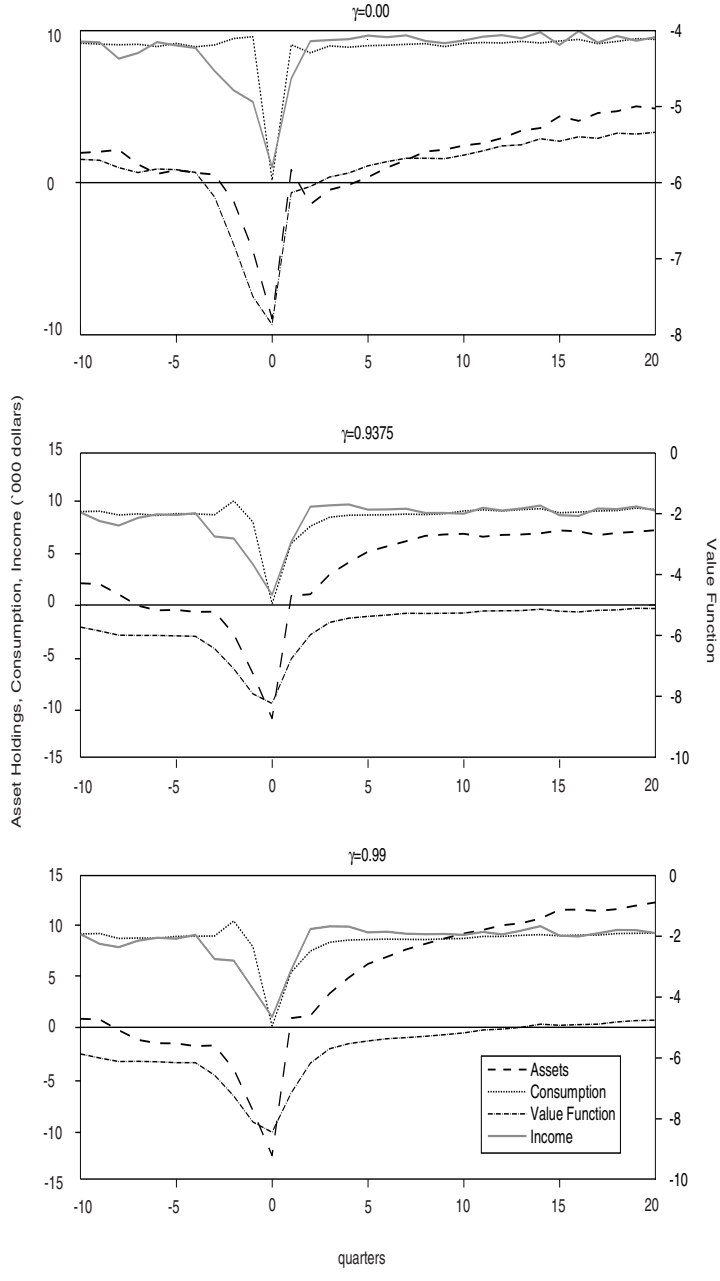


Figure 6 Mean Household Behavior Before and After Bankruptcy
Y^4=(0.995, 0.3)

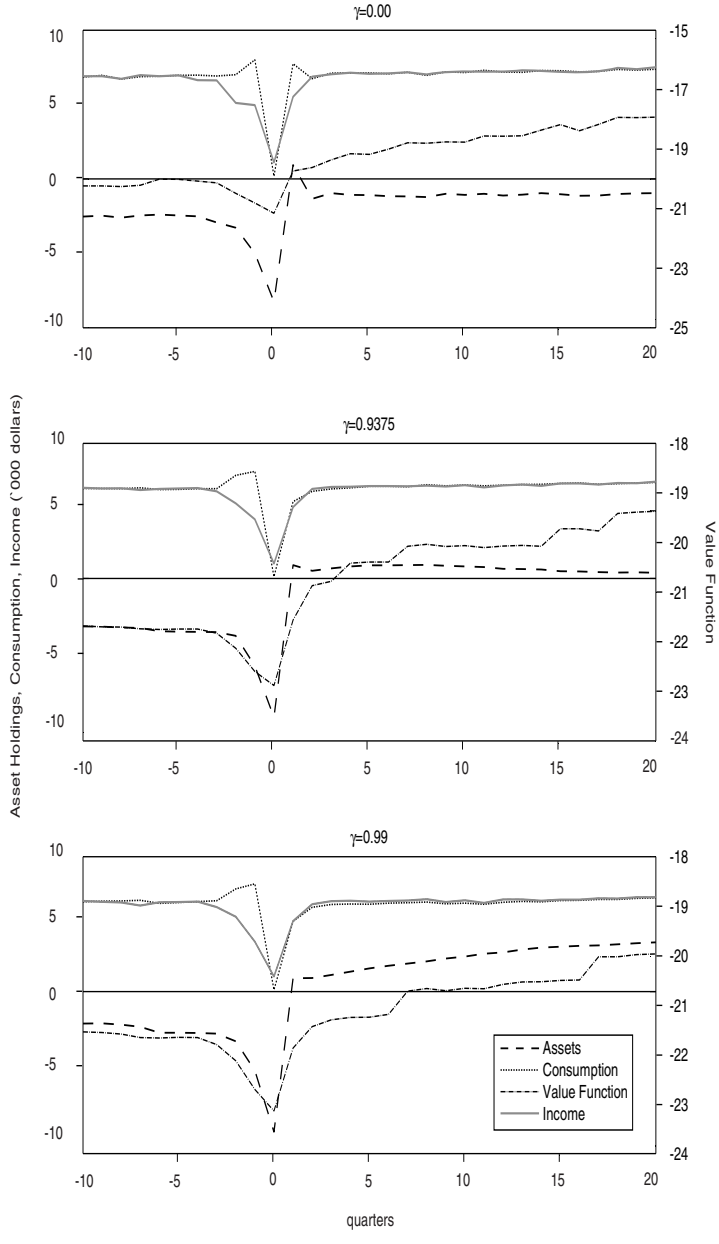


Figure 7 Loan Pricing By Income and Exclusion

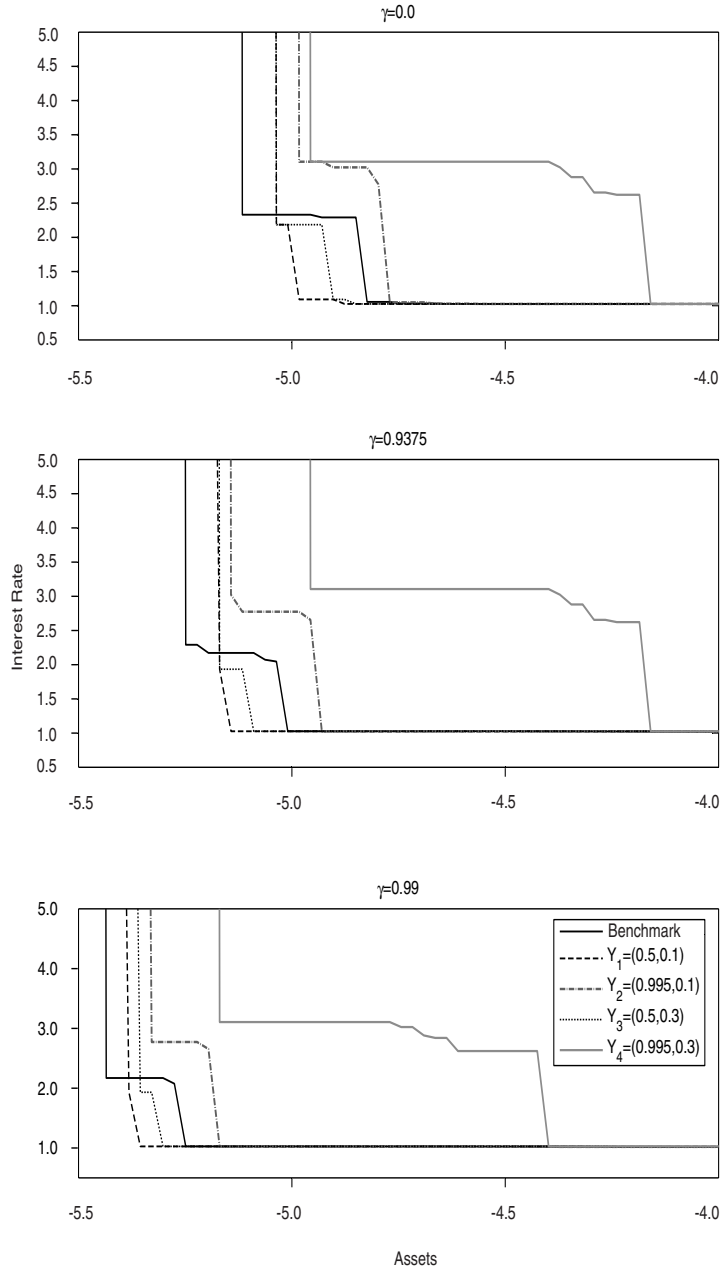


Figure 8 Transitional Effect of Change in γ with Unadjusted Pricing Income Process: $\mathbf{Y}^{\mathrm{B}}$

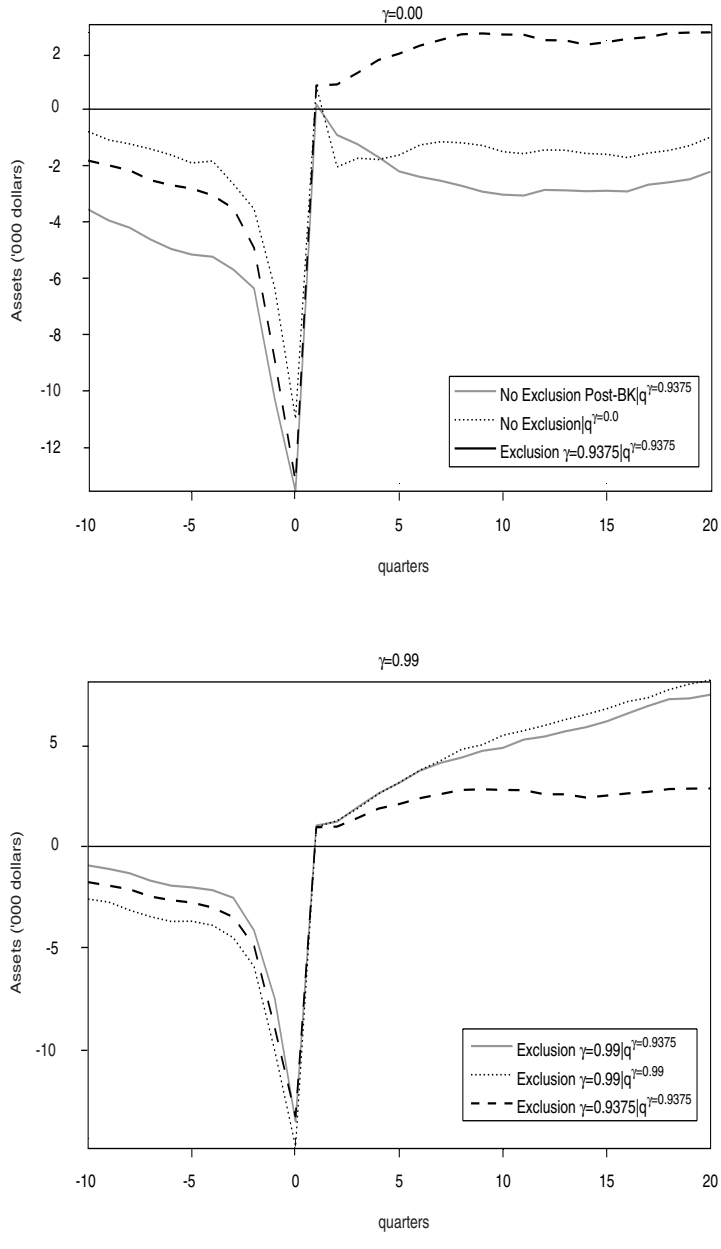


Figure 9 Transitional Effect of Change in γ with Unadjusted Pricing Income Process: Y^1

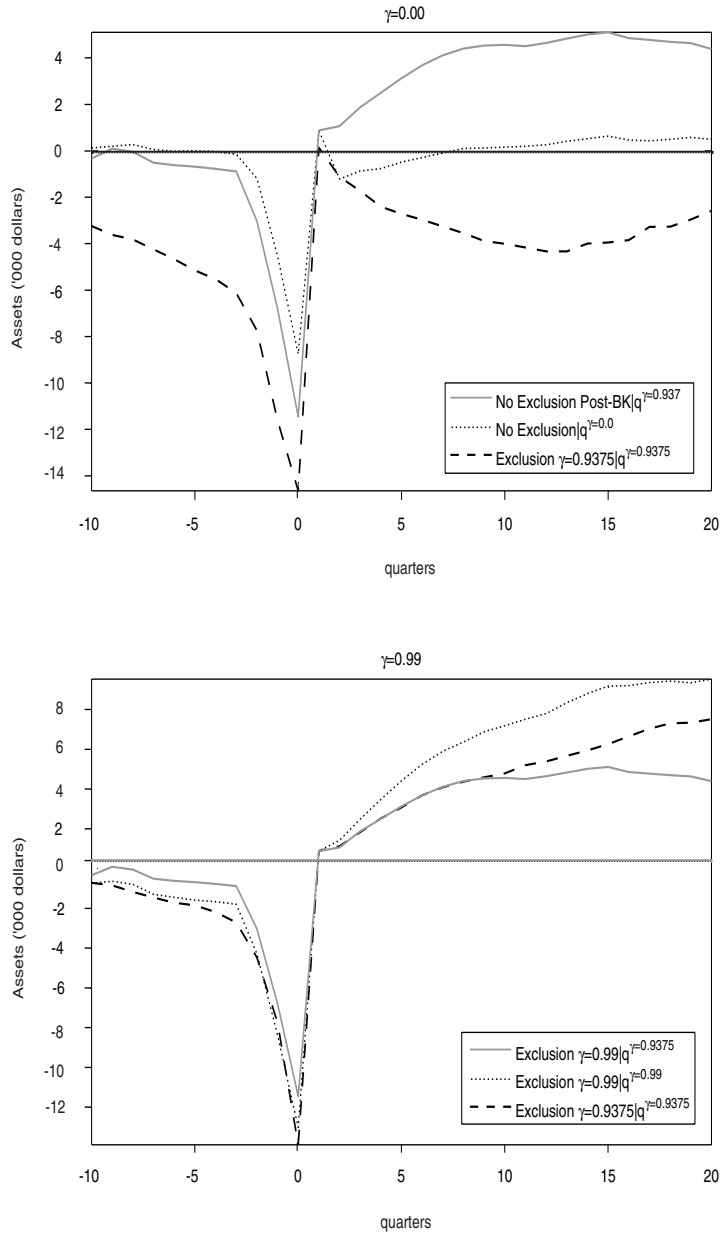


Figure 10 Transitional Effect of Change in γ with Unadjusted Pricing Income Process: Y^2

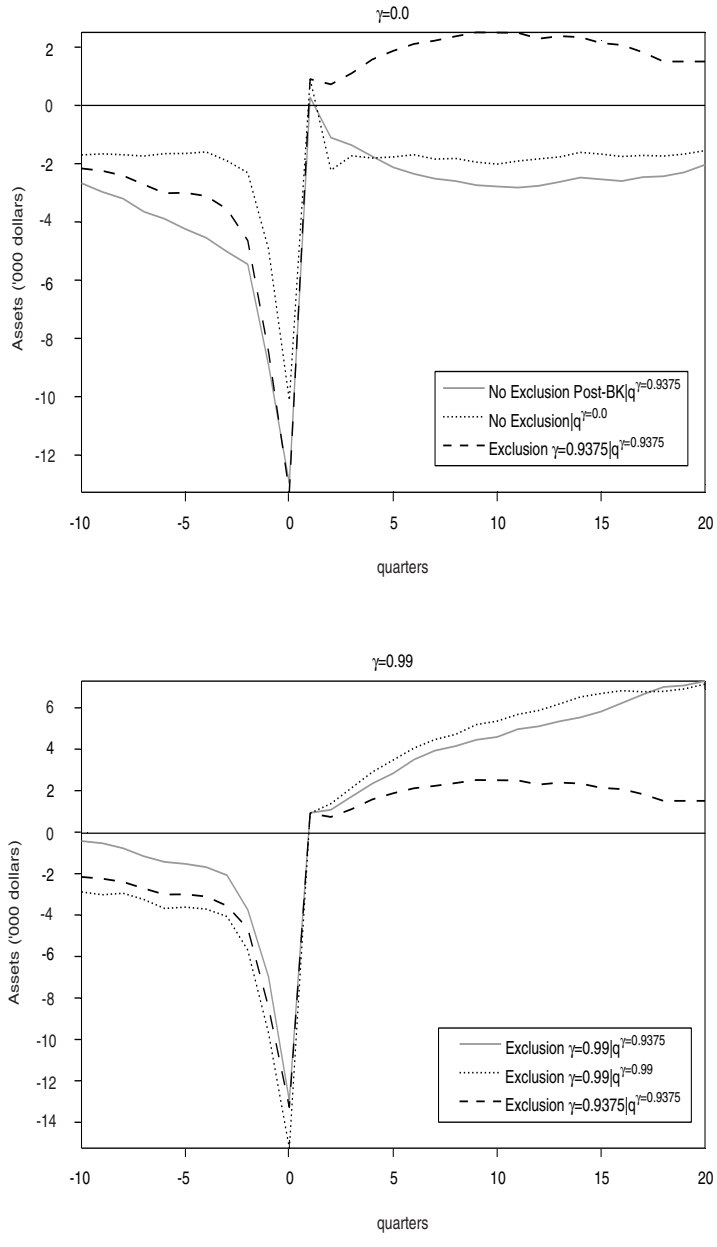


Figure 11 Transitional Effect of Change in γ with Unadjusted Pricing Income Process: Y^3

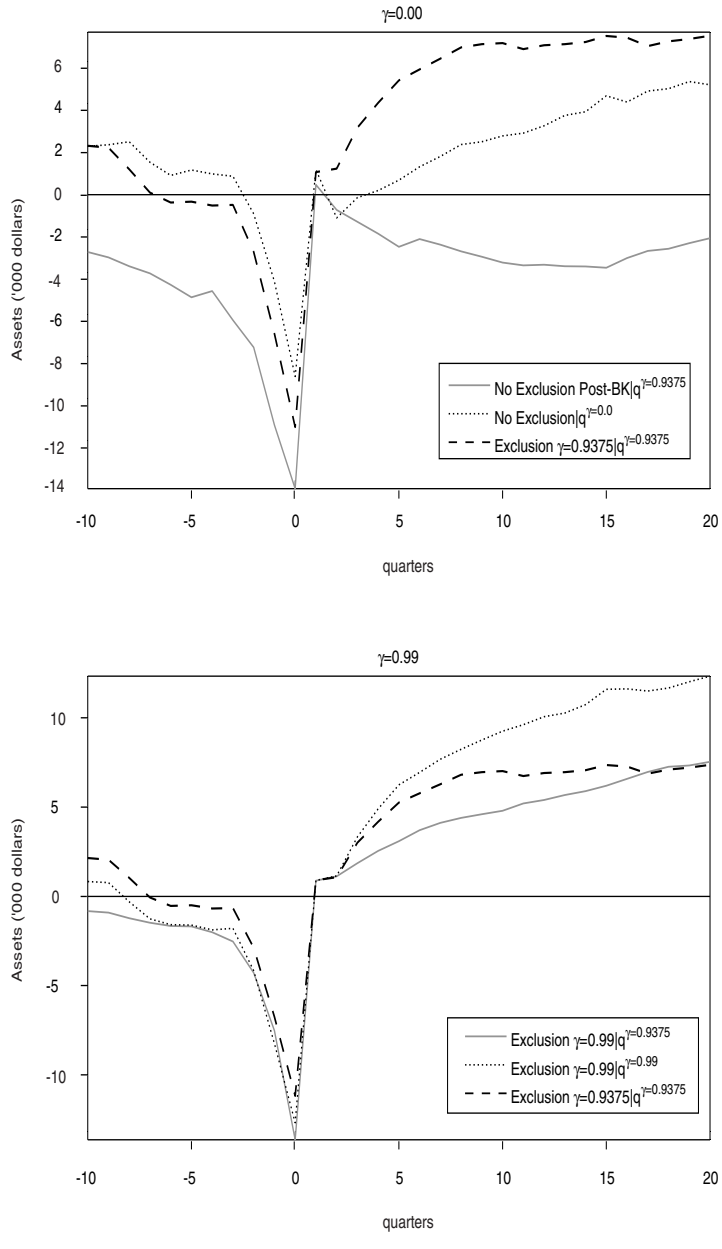
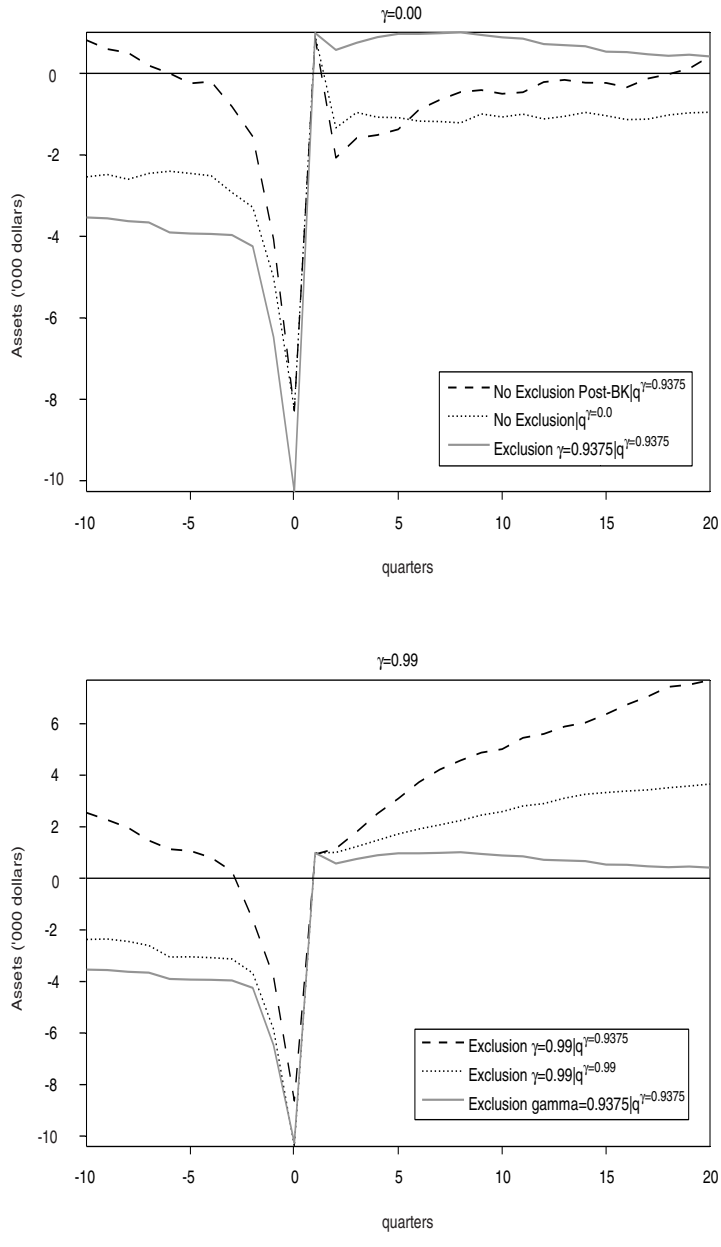


Figure 12 Transitional Effect of Change in γ with Unadjusted Pricing Income Process: Y^4



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