Accounting for the Rise in Consumer Bankruptcies

By Igor Livshits, James MacGee, and Michèle Tertilt*

Personal bankruptcies in the United States have increased dramatically, rising from 1.4 per thousand working age adults in 1970 to 8.5 in 2002. We use a heterogeneous agent life-cycle model with competitive lenders to evaluate several commonly offered explanations. We find that increased uncertainty (income shocks, expense uncertainty) cannot account quantitatively for the rise in bankruptcies. Instead, the rise in filings appears mainly to reflect changes in the credit market environment: a decrease in the transactions cost of lending and in the cost of bankruptcy. We also argue that the abolition of usury laws and other legal changes were unimportant.
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Over the past thirty years, there has been explosive growth in the number of consumer bankruptcy filings in the United States. Personal bankruptcies have increased from 1.4 per thousand of the working age population in 1970 to 8.5 in 2002 (see Figure 1), with virtually all of the increase occurring between 1980 and 2000. While a number of potential explanations have been proposed, few quantitative evaluations of these explanations exist. This paper aims to help fill this void.

We consider six potential explanations for the increase in consumer bankruptcies. One holds that an increase in household income risk led more households into financial trouble (John M. Barron, Gregory Elliehausen and Michael E. Staten (2000), Jacob S. Hacker (2006)). A second emphasizes the role of greater idiosyncratic expense uncertainty, due for example, to higher medical bills (Elizabeth Warren and Amelia Warren Tyagi (2003)). A third points to compositional changes in the population (e.g. the passing of the baby-boomers through the prime bankruptcy ages, and changing family structure) that may have increased the number of risky households (Teresa A. Sullivan, Elizabeth Warren

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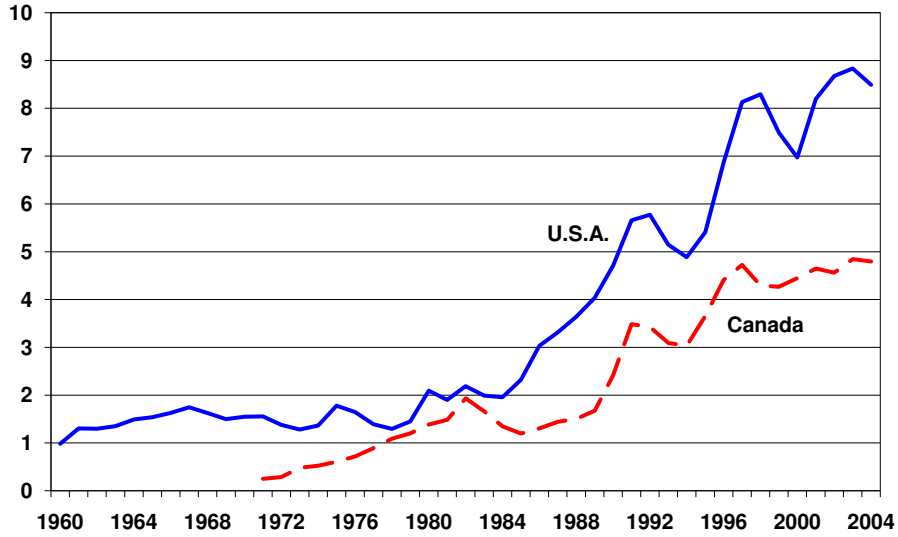

Figure 1. Consumer Bankruptcies per 1000 of 18-64 year-old.

and Jay Lawrence Westbrook (2000)). The fourth, likely the most commonly cited, explanation is that the cost of filing for bankruptcy has declined (e.g., David B. Gross and Nicholas S. Souleles (2002)). Two frequently heard versions of this explanation are that the "stigma" attached to bankrupts has weakened (Frank H. Buckley and Margaret F. Brinig (1998) and Scott Fay, Erik Hurst and Michelle J. White (2002)) and that amendments to the U.S. bankruptcy code made bankruptcy more attractive to potential filers (Lawrence Shepard (1984) and William Boyes and Roger L. Faith (1986)). Fifth, credit market innovations (such as the development and spread of credit scoring) may have lowered the cost of lending, thereby leading to more borrowing and potentially more defaults (John M. Barron and Michael E. Staten (2003), Diane Ellis (1998)). The final explanation we consider claims that the removal of interest rate ceilings, following the US Supreme Court's 1978 *Marquette* decision, eased the expansion of credit to higher-risk individuals by allowing lenders to charge higher risk premia (Ellis (1998)).

Disentangling these explanations is a challenging task since several involve legislative reforms and changes in the economic environment that took place at roughly the same time. The main tool we use to tackle this challenge is an equilibrium model of consumer

bankruptcy. The model allows us to derive quantitative implications of each proposed explanation. The premise of our approach is that any explanation of the rise in bankruptcies should be consistent not only with the rise in filings but also with three other empirical observations: the simultaneous increase in unsecured consumer debt, little change in the average real interest rate for unsecured lending, and the increase in the charge-off rate. In addition, we make a comparison with Canada as a way to check the consistency of several stories. This comparison is relevant because Canada experienced a similar rise in filings during the 1980s and early 1990s, but did not undertake the same legislative reforms as did the U.S.

The model we use is based on the competitive theory of equilibrium default introduced by Jonathan Eaton and Mark Gersovitz (1981) and, in the context of consumer bankruptcy, by Satyajit Chatterjee, Dean Corbae, Makoto Nakajima and José-Víctor Ríos-Rull (2007). The model is a heterogenous agent life-cycle model with incomplete markets, which builds upon Igor Livshits, James MacGee and Michèle Tertilt (2007). Each period, households face idiosyncratic uncertainty regarding their income and expenses. Upon realization of this uncertainty, households decide whether or not to file for bankruptcy, given some bankruptcy rules. If bankruptcy is not declared, households can borrow (and save) via one-period non-contingent bonds with perfectly competitive financial intermediaries. When making loans, financial intermediaries can observe each household's earnings process, age, and current asset holdings. Therefore, in equilibrium, bond prices vary with income, age, and total borrowing of the debtor.

We find that increased uncertainty plays a relatively small role in explaining the rise in bankruptcies. Using our estimate of the changes in expense uncertainty (due primarily to medical expenses), we find that this channel accounts for at most 20% of the increase in filings (and likely less than 10%). Nor does increased volatility of household earnings appear to play a significant role, primarily because more uncertainty leads to an increase in precautionary savings, or conversely, a decrease in debt. In other words, people self-insure to counter the increased risk they face, and hence bankruptcy does not increase in equilibrium. We also find that the effects of changes in the age structure of the population quantitatively are unimportant (and much smaller than Sullivan, Warren and Westbrook (2000) suggest). Finally, our calculations imply that the increase in the number of unmarried (and divorced) people is unlikely to account for much of the rise in bankruptcies. In sum, our results suggest that papers emphasizing uncertainty-based explanations (such as Warren and Warren Tyagi (2003) and the SMR study summarized in Charles Luckett (2002)) overstate the importance of these stories.

Our findings identify changes in credit markets as the primary factor driving the increase in bankruptcies. Specifically, we find that a decline in the cost of bankruptcy together with a decline in the cost of lending closely matches the U.S. experience. The intuition is straightforward. A reduction in the cost of default makes bankruptcy more attractive, which increases the probability of default for a given level of debt. If this were the only change, one would expect a reduction in the level of debt outstanding as lenders responded with higher interest rates for any given level of borrowing. Lower lending costs offset this effect by making borrowing more attractive. As a result, together these

two channels can generate an increase in bankruptcies, charge-off rates, and debt that matches the U.S. data. We view these channels as useful reduced-form proxies for more general changes in credit markets, and believe that modelling technological change in financial markets in more detail is a promising avenue for future research.[1] Particularly interesting is the impact of information technology that has improved the capacity of credit card companies to assess risk.[2]

Closest in spirit to our work are David A. Moss and Gibbs A. Johnson (1999), Kartik Athreya (2004), and Gross and Souleles (2002), who analyze subsets of the alternative explanations considered in this paper. In contrast to our analysis, these papers do not consider changes in income or expense uncertainty. Moss and Johnson (1999) provide an informative overview of credit and borrowing data as well as some historical literature. They argue that interest rate deregulation and falling inflation, the rise in home equity lending, and the bankruptcy amendments of 1984 encouraged creditors to lend more to low-income consumers, leading to more bankruptcies. While these arguments are plausible, the paper does not assess these channels quantitatively. Gross and Souleles (2002) examine a data set of credit card accounts from 1995 to 1997 and argue that the higher default rate at the end of their sample is consistent with a decline in the cost of bankruptcy. Athreya (2004) argues that a decline in the transactions cost of borrowing alone could have been responsible for the increase in filings for the 1991-1997 period. In our set-up, filings are less sensitive to this transaction cost because our model is a life-cycle model and because we allow for "expense" shocks in addition to income uncertainty.

A key difference between this paper and the previous literature on equilibrium models of consumer bankruptcy is that we use our model to evaluate quantitatively a set of alternative mechanisms for the rise in bankruptcies, while the previous literature explored the implications of different bankruptcy rules.[3] To accomplish our goal, we extend the model of Livshits, MacGee and Tertilt (2007) to incorporate binding usury regimes (maximum interest rate restrictions) and several different bankruptcy costs.

The remainder of the paper is organized as follows. We summarize background information on consumer bankruptcy in Section I. We present the model used to evaluate the stories in Section II. Sections III, IV and V present our results, and Section VI concludes.

I. Bankruptcy and Consumer Credit in the U.S.

Here we provide background information on consumer credit markets in the U.S., starting with a brief description of consumer bankruptcy law. We then summarize studies of bankrupts in order to assess changes in the characteristics of bankrupts over time. Finally, we describe some aggregate data on consumer credit markets between 1980 and

[1] A recent paper in this spirit is Lukasz Drozd and Jaromir B. Nosal (2008) who model the process by which credit card companies find customers explicitly.

[2] Indeed, several recent papers explore this avenue: Borghan N. Narajabad (2008), Kartik Athreya, Xuan S. Tam and Eric R. Young (2008), Juan M. Sanchez (2008), and Igor Livshits, James MacGee and Michèle Tertilt (2009). Satyajit Chatterjee, Dean Corbae and José-Víctor Ríos-Rull (2008*b*) examine a model of credit scoring, but do not analyze technological changes over time.

[3] This literature includes Chatterjee et al. (2007), Livshits, MacGee and Tertilt (2007) and Wenli Li and Pierre-Daniel Sarte (2006). Kartik Athreya (2005) provides an excellent survey.

2000. We focus on this time period because most of the rise in filings took place during this time and because of data availability. These facts will play an important role in distinguishing among the alternative explanations of the rise in consumer bankruptcies.

A. Consumer Bankruptcy Law

American households can choose between two bankruptcy procedures, Chapter 7 and Chapter 13.[4] Legal actions by creditors and most garnishments are halted upon a household's filing for bankruptcy, as are phone calls and letters from creditors seeking repayment. Under Chapter 7, all unsecured debt is discharged in exchange for non-collateralized assets above an exemption level, and debtors are not obliged to use future income to repay debts.[5] Chapter 13 permits debtors to keep their assets in exchange for a promise to repay part of their debt over the ensuing 3 to 5 years.

Most bankrupts (approximately 70 percent) file under Chapter 7, which is the focus of this paper. Debtors who file under Chapter 7 are not permitted to refile under Chapter 7 for six years, although they may file under Chapter 13. Filers must pay the bankruptcy court filing fee of $200 and fees for legal advice, which typically range from $750 to $1,500 (Sullivan, Warren and Westbrook (2000)). In addition, a debtor filing for bankruptcy has to submit a detailed list of all creditors, amounts owed, all assets, and monthly living expenses as well as the household's source and amount of income. A typical Chapter 7 bankruptcy takes about 4 months to complete.

B. Bankrupts over Time: Have They Changed?

We begin with a brief review of the limited evidence on changes in the characteristics of bankrupts over the past 25 years. What we find is surprising: despite the dramatic increase in bankruptcy filings, the typical bankrupt today is remarkably similar to the typical bankrupt of twenty years ago (Sullivan, Warren and Westbrook (2000), Elizabeth Warren (2002)). They are lower middle-class (with income roughly 30-50% lower than the average household's), in their thirties, and have an extremely high debt-to-income ratio. If any change can be discerned it is that bankrupts today have lower income relative to the median household, slightly higher debt-to-income ratios, and hold more unsecured debt, especially credit card debt.

Table 1 reports data on bankrupts' debt and income from several U.S. studies. Where possible, we report both the average and median values as well as the implied debt-to-income ratios. It is worth emphasizing that there is a paucity of systematic studies of bankrupts over time. The studies that are available are based upon samples from different states, and should be interpreted with care.

The first four rows of Table 1 summarize data from two surveys of Chapter 7 and Chapter 13 filers conducted by Sullivan, Warren and Westbrook (2000). Their data

[4]See Leonidas Ralph Mecham (2004) for a detailed description of consumer bankruptcy law in the United States.

[5]The 2005 bankruptcy reform requires households with income above a threshold to enter into a payment plan. (See Michelle J. White (2007) for details on the 2005 reforms.)

Table 1—Liabilities and Assets of Bankrupts in the U.S. (1997$)

Sample	Avg* Debt	Med* Debt	Avg Uns*	Med Uns	Avg Income	Med Income
1981	$68,154	$37,002	$27,365	$12,452	$27,861	$26,439
D/Y*	2.44	1.40	0.98	0.47		
1991	$65,158	$34,795	$26,618	$15,128	$23,927	$21,115
D/Y	2.72	1.65	1.11	0.72		
78/79 D/Y	1.86	0.34	1.14	0.15		
1980 D/Y	1.56	0.78	0.87	0.46		
Ohio 1997	$61,320	$24,303	$29,529	$19,515	$19,641	$18,756
D/Y	3.12	1.30	1.50	1.04		
1997/98	$81,696	$42,810	$43,032	$23,190	$26,568	$22,800
D/Y	3.07	1.87	1.62	1.02		
Utah 1997	$73,327	$31,981	n/a	n/a	$18,864	$16,440
D/Y	3.89	1.95	n/a	n/a		

* Avg = average, Med = median, Uns = unsecured debt, D/Y = ratio of debt to income. Source: The rows labeled 1981 and 1991 are from Sullivan, Warren and Westbrook (2000), Table 2.4, while the 78/79 and 1980 values are from Ian Domowitz and Thomas L. Eovaldi (1993). The Ohio 1997 data are from Sullivan, Warren and Westbrook (2000), Table 2.4. The 1997/98 data is reported by Gordon Bermant and Ed Flynn (1999). The Utah 1997 data are from Jean M. Lown and Barbara R. Rowe (2003). A description of the samples used in these studies is in the web appendix.

indicate that while the average and median amounts owed by bankrupts (in constant dollars) remained roughly constant during the 1980s, debt-to-income ratios increased slightly. The remaining rows in the table summarize data for Chapter 7 filers only. The surveys also suggest that the debt-to-income ratios of bankrupts have increased while the average real income of the typical bankrupt is about the same over time. While Domowitz and Eovaldi (1993) do not report average income by category of filers, they do report that the average incomes were between $24,300 and $26,600 (in 1991 dollars). These figures are close to those reported by Bermant and Flynn (1999), although the average incomes in the Ohio and Utah studies were lower.

In sum then, the rise in bankruptcies has been accompanied by an increase in the debt-to-income ratio of bankrupts. We will make use of this fact later in the paper to help us evaluate alternative explanations of the rise in consumer bankruptcies, as some of the explanations counterfactually imply a large *decrease* in the debt-income ratio of bankrupts.

C. Aggregate Data: Bankruptcy and Borrowing 1980-1999

In this section we document four key facts about consumer bankruptcies and unsecured borrowing (summarized in Table 2). Later in the paper we use these facts to evaluate

the proposed explanations.

Since our model will abstract from durable goods, the relevant bankruptcies in the data are non-business Chapter 7 filings.[6] The average number of non-business Chapter 7 filings per annum between 1995 and 1999 was roughly 850,000, or 0.83% of all households. Filings during 1980-1984 were much lower, averaging $210,000$ per annum, corresponding to an annual filing rate of 0.25% of households.

Table 2—Key Observations.

Fact	1980-84	1995-99
Chapter 7 filings	0.25%	0.83%
Average borrowing interest rate	10.95 – 12.05%	10.93 – 12.84%
Debt/Income	5%	9%
Charge-off rate	1.9%	4.8%

Contemporaneous with the increase in filings was a substantial growth in consumer borrowing. Figure 2 shows this increase for four different debt measures. Given our focus on Chapter 7 filings, the relevant target for our model is unsecured debt.[7] Unfortunately, the reported data do not break out secured versus unsecured consumer credit. Consumer credit — which includes secured loans for vehicles, student loans, and unsecured loans such as credit cards, installment loans, and lines of credit — remained roughly constant relative to disposable income between 1970 and the mid 1990s. The closest reported measure of unsecured consumer debt is revolving credit, which consists mainly of credit card debt and outstanding balances on unsecured revolving lines of credit. While revolving credit has increased dramatically, the rise is partially due to the substitution of credit card for installment credit. To correct for this, we constructed an estimate of unsecured credit over 1983-1999. We define unsecured credit as the sum of revolving credit and the unsecured portion of non-automobile non-revolving consumer debt (a more detailed discussion is in Appendix VI). The estimates are plotted in Figure 3 as a percentage of personal disposable income, along with revolving credit. While our calculations suggest that the rise in revolving debt significantly overstates the increase in unsecured debt, they also imply a substantial increase between 1983 and 1999 in the unsecured debt to income ratio. Unsecured debt as a fraction of personal disposable income has grown from roughly 5% in the early 1980s to about 9% in the late 1990s.

[6]The filings data is an upper bound on consumer bankruptcies, since some households are counted twice when partners choose to file separately and because some filings caused by the failure of unincorporated small businesses are counted as chapter 7 non-business filings.

[7]We focus our attention on the stock of unsecured credit rather than household net worth for three reasons. First, many household assets are (partially) exempt and hence net worth underestimates the value of consumer debt that could be discharged in Chapter 7. Secondly, it is costly to seize assets, so that even when assets technically are not exempt, from a creditor's perspective the value of debt that is unsecured is larger than a net worth measure would indicate. Finally, many people have argued that credit card debt is underreported in the SCF (which is the most common source of household net worth data) by as much as 50%. Thus we use actual data on unsecured credit instead. We discuss this in more detail in a separate online appendix.

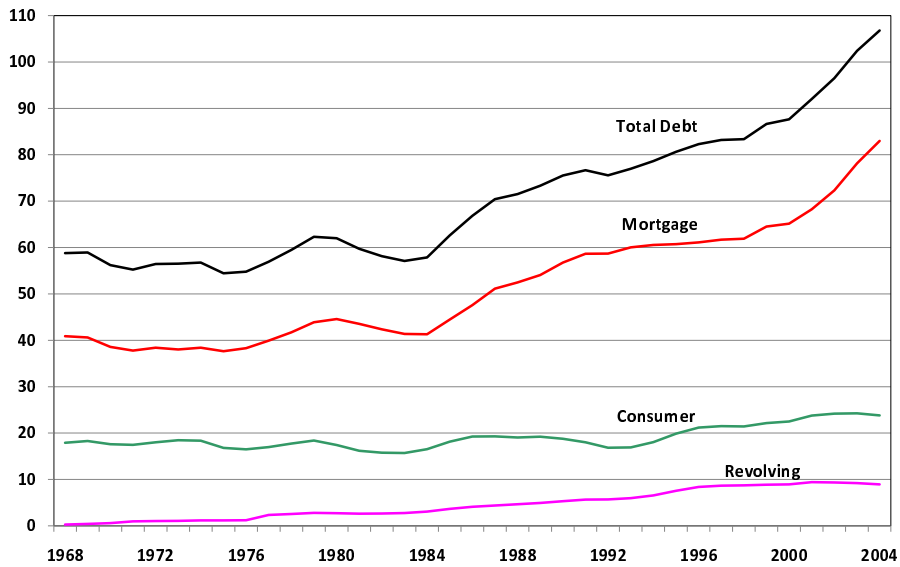

Figure 2. Debt as % of Disposable Income, USA.

The Federal Reserve reports two interest rates on unsecured loans for the time periods we examine: the average (nominal) interest rate for two-year personal loans and the average interest rate on credit cards. We compute the real rate of interest using the one-year ahead CPI inflation rate and then compute the average for each of the two periods, 1981-1985 and 1996-2000. This calculation implies an average real cost of unsecured consumer borrowing of between 11% (personal loans) and 13% (credit cards). Somewhat surprisingly, we find little change in these interest rates over time.[8]

The small change in real borrowing interest rates is even more surprising given the increased rate of non-repayments on consumer loans. One common gauge of non-payment is the *charge-off rate*, which measures the value of loans written off (net of recoveries) and charged against loss reserves as a percentage of average loans.[9] Unfortunately, the

[8]One might expect an increase in the real rate given the high inflation rates during the late 1970s and early 1980s. However, nominal interest rates on personal loans fell during this time (from 17% to 13.7%), while average inflation declined from 5.5% in 1981-85 to 2.5% in 1996-2000.

[9]See Mark Furletti (2003) for an overview of data sources and measurement methodology of charge-offs. While roughly 40% of credit card charge-offs are due to bankruptcies, the rest are mandatory

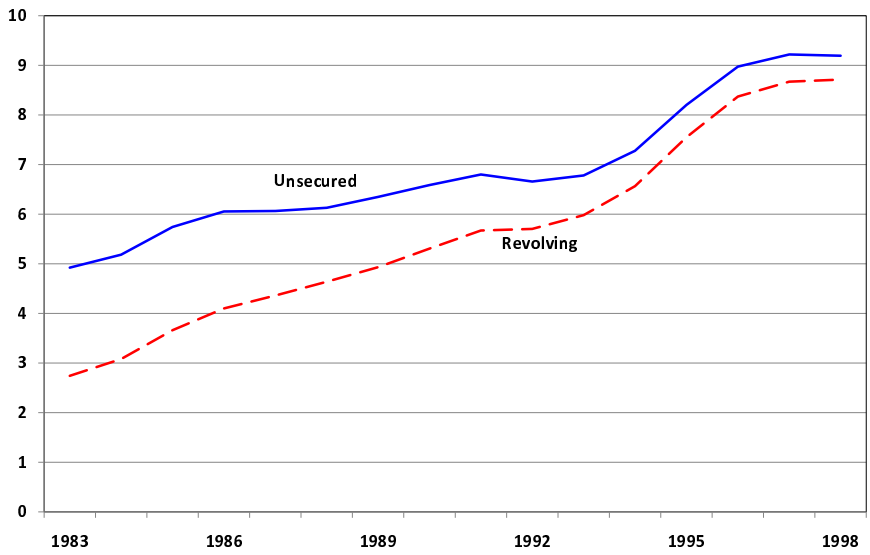

FIGURE 3. UNSECURED AND REVOLVING CREDIT AS % OF DISPOSABLE INCOME.

charge-off rate series constructed by the Federal Reserve Board begins in 1985. To extend this series backwards, we splice it with another series reported by Lawrence M. Ausubel (1991). The average one-year ahead charge-offs on credit cards rose from about 1.9% to 4.8% between the 1981-85 and 1996-2000 periods. As Figure 4 illustrates, charge-offs move in parallel with the bankruptcy rate.

II. Environment for Evaluating the Explanations

In this section we outline the model we use to evaluate the different stories, and describe our benchmark parametrization.

A. The Model

We extend the "Fresh Start" model of consumer bankruptcy in Livshits, MacGee and Tertilt (2007) by allowing for three additional costs of bankruptcy (a utility cost, a burning

charge-offs in response to delinquent loans, many of which ultimately end up in bankruptcy.

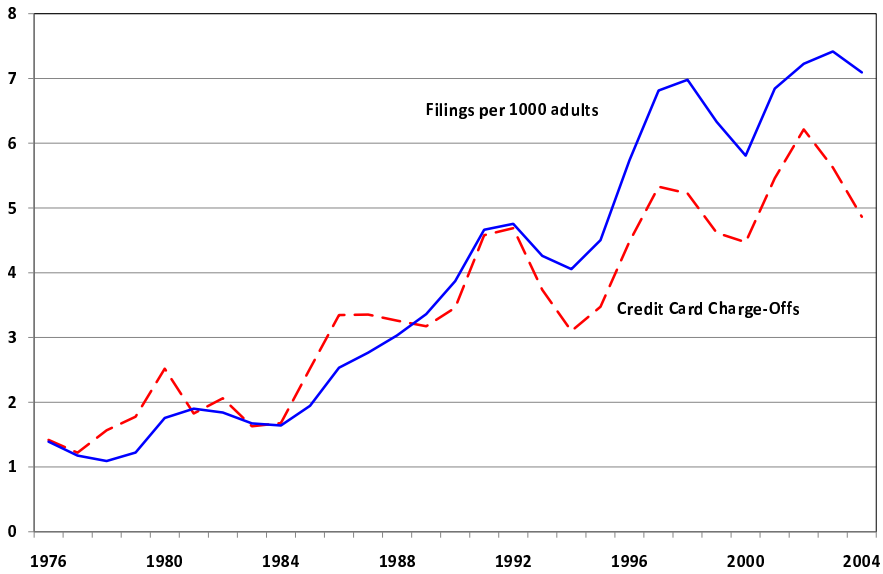

Figure 4. Bankruptcy Filings and Credit Card Charge-Off Rates. %.

cost, and a fixed cost of filing) as well as an interest rate ceiling. These extensions allow us to evaluate several channels through which changes in the credit market environment could have caused the rise in bankruptcies.

The model economy is populated by overlapping generations of J-period lived households. Each generation is comprised of measure 1 of households facing idiosyncratic uncertainty. There is no aggregate uncertainty. Markets are incomplete and agents can borrow using non-contingent person-specific one-period bonds and save at an exogenously given interest rate.[10] Households have the option to declare bankruptcy.

[10] As this paper focuses on the market for unsecured debt (which comprises a small fraction of total borrowing in the U.S.), significant feedback effects on the aggregate risk-free interest rate seem unlikely.

Households. — Households maximize expected discounted life-time utility from consumption:

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

where β is the discount factor, c_j is household consumption and n_j is the size of a household of age j in equivalence scale units.

The labor income of a household i of age j is the product of an age-dependent labor endowment and productivity shocks:

$$y_j^i = \overline{e}_j z_j^i \eta_j^i, \tag{2}$$

where $\overline{e}_j$ is the deterministic endowment of efficiency units of labor, z_j^i is a persistent shock to the household's earnings, and η_j^i is a transitory shock.

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

A household can file for bankruptcy. As in Chapter 7, upon filing all debts are discharged, and the household enters the following period with a balance of zero (unless hit by an expense shock that period).[11] Filers also face several types of "punishment" which proxy for specific features of Chapter 7. First, bankruptcy cannot be declared in two consecutive periods. In our numerical experiments, each period lasts for 3 years, so this captures the fact that under Chapter 7 households have to wait at least 6 years before filing again. Second, to capture the requirement that borrowers make a good faith effort to repay their debt, we force bankrupt households to repay a fraction γ of their earnings during the period in which they file.[12] Since we lack a direct measure of these implicit constraints on bankruptcy, we calibrate this bankruptcy cost parameter to match the debt facts.

In our quantitative experiments we evaluate explanations based on a decline in the cost of bankruptcy. To do this we consider three costs: a utility cost of filing, χ, the "burning" of a fraction λ of filers' consumption during the bankruptcy period, and a fixed cost of

[11] This means that bankrupts cannot save or borrow during the default period because all assets are seized during a Chapter 7 bankruptcy. In our experiments, this no-savings constraint binds for a small fraction of households and the results do not change significantly when this assumption is relaxed.

[12] The U.S. bankruptcy code specifies that borrowers must act in "good faith", so that someone who borrows and immediately files for bankruptcy risks having their petition denied. Prior to 1984, courts had the implicit right to dismiss a case based on "bad faith" behavior. The Bankruptcy Amendments and Federal Judgeship act of 1984 and the 1986 amendments to section 707(b) of the Code formalized this by explicitly allowing bankruptcy trustees to make a motion for dismissal for substantial abuse. While the interpretation of "substantial abuse" has varied across courts, the ability to repay a significant fraction of one's debt has often played a large role in courts' decisions to dismiss debtors' bankruptcy petitions (see James M. Cain (1997) and Wayne Wells, Janell Kurtz and Robert Calhoun (1991)).

filing, ϕ.

The timing is as follows. At the beginning of the period, each household realizes its productivity and expense shocks. If the household receives an expense shock, then the debt of the household is increased (or savings are decreased) by the amount of the shock. The household then decides whether or not to file for bankruptcy. If bankruptcy is declared, creditors garnishee labor income and the consumer is allowed to spend the remaining income. Filers are not allowed to save or borrow: they consume all earnings net of the bankruptcy costs. Households that do not declare bankruptcy choose consumption and asset holdings.

Financial Intermediaries. — Financial markets are perfectly competitive. Intermediaries accept deposits from savers and make loans to borrowers. The risk-free savings rate r^s is given exogenously. Loans take the form of one-period non-contingent bond contracts. However, the bankruptcy option introduces a partial contingency by allowing filers to discharge their debts. The face value of a loan to be repaid in the next period is denoted by d'. Savings are denoted by $d' < 0$. Intermediaries incur a proportional transaction cost of making loans, τ.

Intermediaries have complete information about borrowers: They observe the total level of borrowing d', the current persistent productivity shock z, and the borrower's age j. This allows intermediaries to accurately forecast the default probability of a borrower, $\theta(d', z, j)$, and price the loan accordingly.

Equilibrium. — In equilibrium, perfect competition and complete information imply that intermediaries make zero expected profit on each loan and that cross-subsidization of interest rates across different types of borrowers does not occur. Therefore the individual bond price is determined by the default probability of the issuer and the risk-free bond price. Without debt recovery, without usury law, and with full discharge of debt, the zero-profit condition is $q^b(d', z, j) = (1 - \theta(d', z, j))\overline{q}^b$, where $\overline{q}^b \left(= \frac{1}{1+r^s+\tau}\right)$ is the price of a bond with zero default probability.

For positive levels of debt recovery, this formula needs to be adjusted. The *unrestricted bond price under debt recovery* is

$$q^{ub}(d', z, j) = (1 - \theta(d', z, j))\overline{q}^b + \theta(d', z, j)E(\frac{\gamma y}{d' + \kappa'})\overline{q}^b \tag{3}$$

where $E(\frac{\gamma y}{d'+\kappa'})$ is the expected rate of recovery, assuming that when a household defaults, the amount recovered is allocated proportionately to expense debt and personal loans.

Lastly, taking into account the interest rate ceiling $\bar{r}$, the *equilibrium bond price* is

$$q^b(d', z, j) = \begin{cases} q^{ub}(d', z, j) & \text{if } q^{ub}(d', z, j) \geq \frac{1}{1+\bar{r}} \\ 0 & \text{otherwise} \end{cases} \tag{4}$$

Households take the bond price schedule as given when making decisions. The problem of a household is defined recursively using three distinct value functions. V is the value of

a "normal period," while $\bar{V}$ is the value of declaring bankruptcy. Although bankruptcy cannot be declared two periods in a row, households have the option to default when they are ineligible for bankruptcy.[13] If a household chooses this option, they face the same proportional costs as they do in bankruptcy. However, unlike in bankruptcy, no debt is discharged. Given that households in default are not borrowing from the market, we assume their debt is rolled over at a fixed interest rate r^r. Note that the only debt held by such a household is debt arising from an expense shock. After the forced repayments and applying interest rate r^r, the next period's debt is equal to $(\kappa - \gamma\bar{e}_j z\eta)(1 + r^r)$. The value function for a household defaulting in the period following bankruptcy is denoted by W. The value functions are given by:

$$V_j(d, z, \eta, \kappa) = \max_{c,d'} \left[u\left(\frac{c}{n_j}\right) + \beta E \max\left\{V_{j+1}(d', z', \eta', \kappa'), \bar{V}_{j+1}(z', \eta')\right\}\right] \quad \text{s.t. } c + d + \kappa \leq \bar{e}_j z\eta + q^b(d', z, j)d' \tag{5}$$

$$\bar{V}_j(z, \eta) = u\left(\frac{c}{n_j}\right) - \chi + \beta E \max\left\{V_{j+1}(0, z', \eta', \kappa'), W_{j+1}(z', \eta', \kappa')\right\} \quad \text{s.t. } c = (1 - \lambda)(1 - \gamma)(\bar{e}_j z\eta - \phi) \tag{6}$$

$$W_j(z, \eta, \kappa) = u\left(\frac{c}{n_j}\right) - \chi + \beta E \max\left\{V_{j+1}(d', z', \eta', \kappa'), \bar{V}_{j+1}(z', \eta')\right\} \quad \text{s.t. } c = (1 - \lambda)(1 - \gamma)\bar{e}_j z\eta, \qquad d' = (\kappa - \gamma\bar{e}_j z\eta)(1 + r^r) \tag{7}$$

An equilibrium is a set of value functions, optimal decision rules for the consumer, default probabilities, and bond prices, such that equations (5)-(7) are satisfied, and the bond prices are determined by the zero profit condition, taking the default probabilities as given. The model can be solved numerically by backwards induction.

B. Benchmark Calibration

Our approach is to choose parameters to match the U.S. economy during the 1995-99 period, and then to run experiments to match 1980-84 data (see Table 2). The description below is brief since we largely follow Livshits, MacGee and Tertilt (2007). However, since we are matching average data over 1995-99, instead of for 1996, and since we have improved upon our earlier measure of unsecured debt, our targets (and hence our parametrization) differ slightly from the earlier work.

[13] We need to introduce this option in order to deal with situations where a household is not able to repay an expense shock in the period immediately following bankruptcy.

Household Parameters. — Households live for 18 three-year periods. During the first 15 periods (ages 20-65) households receive a stochastic endowment. The last three periods correspond to retirement, in which households do not face any uncertainty. The period utility function is $u(c) = \frac{c^{1-\sigma}-1}{1-\sigma}$. We set the annual discount factor equal to 0.94 and the degree of risk aversion σ equal to 2. Household size measured in equivalence units is taken from Livshits, MacGee and Tertilt (2007).

The expense shocks are calibrated using data on expenses that are both unexpected and frequently cited by bankrupts as the cause of their bankruptcy. We consider three different sources of shocks: medical bills, divorces, and unplanned pregnancies. In our experiments, the expense shocks can take on three values: $\kappa \in \{0, \kappa_1, \kappa_2\}$. To calibrate the medical expense shock, we use data from the 1996 and 1997 Medical Expenditure Panel Survey (MEPS) and from the US Health Care Financing Administration (HCFA). MEPS provides detailed data on out-of-pocket medical expenses in 1996 and 1997 for a random sample of 7,435 households. We combine our estimate of these medical expenses with estimates of the cost of divorces and of an "unplanned and unwanted" child. Our calculations generate one shock that is 26.4% of (one model period) average income in the economy; the other shock is equal to 82.18% of average income in the economy. The probabilities of being hit by these shocks are 7.1% and 0.46%, respectively (newly-born and retired households are not subject to expense shocks).

A large literature has estimated the volatility of log earnings using the following structure: $\log y^i = z^i + \eta^i + g(X^i)$, where $g(X)$ captures the deterministic component of earnings, and z and $\eta \sim N(0, \sigma_\eta^2)$ are respectively persistent and transitory random components. The log of the persistent idiosyncratic shock follows an AR(1) process, $z_j^i = \rho z_{j-1}^i + \epsilon_j^i$, where $\epsilon_j^i \sim N(0, \sigma_\epsilon^2)$. We set the benchmark annual value of $\rho = 0.95$, $\sigma_\epsilon^2 = 0.025$ and $\sigma_\eta^2 = 0.05$. These values are within the range of values reported by Kjetil Storesletten, Chris Telmer and Amir Yaron (2004), R. Glenn Hubbard, Jonathan Skinner and Stephen P. Zeldes (1994), and Christopher Carroll and Andrew Samwick (1997). To feed these values into our model, we map the annual values into triennial numbers and discretize the idiosyncratic income shocks using the Tauchen method outlined in Jérôme Adda and Russell Cooper (2003). The persistent shock is discretized as a five-state Markov process, and the initial realizations for newly-born households are drawn from the stationary distribution. When discretizing the transitory shock, we assume that 10% of the population receives a positive (negative) transitory shock each period, and choose the value of the support to match the variance.

We assume that the (exogenous) income of a retired household is the sum of 20% of average earnings in the economy plus 35% of their own persistent earnings realization in the period before retirement. This leads to a progressive retirement income system with an average replacement rate of 55%, which is within the range of numbers reported in Barbara A. Butrica, Howard M. Iams and Karen E. Smith (2004). Note that total retirement income is higher since households also have private savings.

Financial Market Parameters. — The savings interest rate is set equal to 3.44%, as in Pierre-Olivier Gourinchas and Jonathan Parker (2002). The rollover interest rate

r^r is set to 20% annual. The cost of filing for bankruptcy parameters — the utility cost χ, the fixed cost ϕ, and the fraction of consumption lost λ — are set to zero in the benchmark economy.

We choose the three remaining parameters — the debt recovery rate γ, transaction cost τ, and the interest rate ceiling $\bar{r}$ — to match the facts from Table 2 for 1995-1999. This leads to a transactions cost of making loans of 2.56% annually. Together with the risk-free savings rate of 3.44%, the annual risk-free lending rate is 6%. The interest rate ceiling is set to a (high) value of 75% annually. While this value exceeds the current official interest rate ceilings, there are many ways to (partially) get around official legal ceilings. This ceiling is non-binding for almost all households in our experiments. However, having no ceiling can sometimes lead to a (very) small number of people borrowing large amounts at very high interest rates (with little intention of repaying them), which leads to artificially high average interest rates.

The γ implied by this calibration is 0.319. It is worth emphasizing that this parameter captures many features of the default option introduced by bankruptcy, and that we do not interpret γ as mapping directly into what is recovered by lenders *after* a borrower has defaulted. Instead, it is intended to capture the fact that borrowers typically make a sequence of payments on unsecured debt before defaulting (in part to satisfy good faith requirements as discussed in footnote 16). This feature is especially important in our model where, due to computational limitations, each model period corresponds to three years. Moreover, in contrast to (deadweight) costs of default (such as the utility cost χ or transaction cost λ), the γ sets a floor on the minimum recovery rate on debt in the model and thus has a different impact on the charge-off and interest rates than do deadweight default costs.

While the lack of a direct empirical counterpart makes it difficult to assess whether the number implied by our calibration is reasonable, this value allows us to match key features of the data. A substantially lower γ would lead to a much lower level of debt, higher average borrowing interest rates, higher charge-off rate (since less debt would be recovered), and higher defaults. For example, if one decreases γ by half (holding all other parameters fixed), defaults roughly double, debt decreases by roughly two-thirds and interest rates nearly triple.

C. *Quantitative Evaluation of the Proposed Explanations*

We use the quantitative model to evaluate the various stories that have been proposed in the literature to explain the increase in bankruptcies. In addition to matching the aggregate facts, this model also does well in matching the life-cycle profile of bankruptcies and consumption (see Livshits, MacGee and Tertilt (2007)). Since we calibrated the model to the 1995-99 period, we work backwards in our experiments to find out which changes in the quantitative model can replicate the data from the "low filings" period 1980-84. Specifically, for each story we ask whether the implied amount of borrowing, the interest rate, and the charge-off rate are consistent with the data for the early 1980s (Table 2). We begin by examining the uncertainty-based stories, and then proceed to credit market-based channels in Section IV. Section V builds on these experiments and

decomposes the relative importance of a combination of uncertainty and credit market-based stories for the rise in consumer bankruptcies.

III. Did Increased Uncertainty Generate the Rise?

Surveys of bankrupts find that most bankruptcies are triggered by negative shocks to earnings or unexpected "expenses" (e.g., Sullivan, Warren and Westbrook (2000)). This has led some to argue that increased earnings and/or expense uncertainty is the primary factor responsible for the rise in filings. In this section, we use our model to assess the quantitative importance of this idea. Our (surprising) conclusion is that changes in uncertainty cannot account for the rise in consumer bankruptcies.

A. "Expense Shocks"

We begin by using our model to back out the decrease in expense shocks that is required to match the 1980 bankruptcy rate. Since our model has four parameters describing the expense shocks (two shock values and two probabilities), there is no unique way to decrease expense uncertainty. One way of lowering the number of bankruptcies to the 1980 level is to eliminate the small expense shock (experiment 2 in Table 3). Eliminating the large expense shock has a much smaller impact on filings (see experiment 3). Experiments 2 and 3 suggest that expense shocks alone cannot explain the U.S. experience from 1980 to 2000, as they counterfactually imply little change in the consumer debt to income ratio. Moreover, these experiments suggest that a large change in expense shocks is required to generate a significant increase in bankruptcies.

Table 3—Changes in Uncertainty.

	Experiment	Ch. 7 Filings	Avg. r^b	Charge-off Rate	$\frac{\text{Debt}}{\text{Earnings}}$
1	Benchmark	0.83%	11.35 %	4.9%	9.20%
	U.S. 1995-99	0.83%	10.93 - 12.84%	4.8%	9%
	U.S. 1980-84	0.25%	10.95 - 12.05%	1.9%	5%
2	no small shock	0.25%	8.20%	2.1%	9.77%
3	no large shock	0.75%	11.11%	4.7%	9.21%
4	15% decrease	0.73%	10.83%	4.4%	9.27%
5	Transitory 1	0.83%	10.29%	3.9%	9.79%
6	Transitory 2	0.83%	8.83%	2.7%	12.25%
7	Persistent 1	0.80%	8.26%	2.1%	14.87%
8	Persistent 2	0.68%	6.99%	1.0%	27.48%
9	No inc. risk	1.18%	7.26%	1.2%	51.01%

To assess the quantitative contribution of expense uncertainty, we estimate the change

in expense uncertainty over the last two decades. There has been little change in the rate of unwanted pregnancies or divorces since the 1980s (see the web appendix). Hence, we focus exclusively on the implications of the rise in medical costs borne directly by households, net of insurance premia. Real out-of-pocket (OOP) payments per household increased from $1,477 in 1980 to $1,946 in 1998, a 32% jump.[14] However, this rise was offset partially by the rise in median income, so OOP payments as a fraction of median household income increased by only 15% (from 3.55% in 1980 to 4.16% in 1998). The percentage of Americans without health insurance also grew by 17 percent, from 13.6% in 1982 to 16.3% in 1998.[15] This suggests that rather than individuals paying higher amounts in 1998 than 1980, there were *more people* with large out-of-pocket expenditures. Furthermore (based on unreported experiments) the bankruptcy filing rate in the model is more sensitive to changes in the probability of the shock than its magnitude. Thus, decreasing the expense shock probabilities by 15% should yield an upper bound on the contribution of increased medical expenses to the rise in bankruptcies. Experiment 4 in Table 3 reports the results of this experiment. The implication is that medical shocks can account for less than 20 percent of the rise in bankruptcies, and cannot account for the increase in consumer debt. Given the small change in defaults, it is not surprising that this experiment cannot match the large increase in charge-offs.

Comparing the U.S. case with Canada's (where there is universal health care) casts further doubt on the increased medical uncertainty story. Catastrophic medical expenses are unlikely to be the main cause of bankruptcies in Canada, which is consistent with the lower level of bankruptcies relative to the U.S. However, Canada experienced a very similar increase in bankruptcies (see Figure 1). In sum, changes in the cost and extent of insurance against catastrophic medical events do not appear to be the main driver of the rise in bankruptcies.

B. Income Uncertainty

There is a broad consensus that the variance of log earnings increased in the U.S. from the late 1970s to the early 1990s, and then decreased substantially again in the mid 1990s (Robert Moffitt and Peter Gottschalk (2002), Costas Meghir and Luigi Pistaferri (2004), Richard Blundell, Luigi Pistaferri and Ian Preston (2008), Jonathan Heathcoate, Kjetil Storesletten and Giovanni Violante (2004)). There is much less agreement about the relative importance of the permanent, persistent, and transitory components in accounting for the increased variance of log earnings. This is unfortunate, since as Livshits, MacGee and Tertilt (2007) shows, persistent and transitory income shocks have very different implications for bankruptcy filings. Given the lack of consensus, we take generous estimates from the literature to construct an upper bound on the impact of income uncertainty:

[14] These numbers are from the U.S. Statistical Abstracts (U.S. Census Bureau 2000, Table 151). The increase in OOP expenditures reported by Center for Medicare and Medicaid Services (2005) is even lower, so our numbers are an upper bound.

[15] This may underestimate the change in coverage. The manner in which health insurance data was collected changed after 1987, which led to an increase in the fraction of the population reporting health insurance coverage.

a 25% lower variance of the transitory shock and a 60% lower variance of the persistent shock for the 1980s (this number reflects estimates of changes in both persistent and permanent shocks — see the online appendix for details). We also ask how large a change in earnings uncertainty is needed to generate the observed rise in bankruptcies.

The size of the change in transitory income uncertainty turns out to be relatively unimportant, since variations in transitory income shocks have a small effect on filings in the model. Decreasing the variance of the transitory shock by 25% essentially has no impact on filings (experiment 5 in Table 3). Indeed, as experiment 6 illustrates, even shutting down the transitory income shock completely has a minuscule effect on filings. In contrast, persistent shocks have significant effects. Experiment 7 reduces the variance of the persistent shocks by 60% (corresponding to a 2.5-fold increase over the two decades). This decline in the variance decreases filings to 0.80% of households, while increasing unsecured debt to nearly 15% of earnings. Shutting down persistent shocks completely (experiment 8) reduces filings to 0.68%, while driving up the debt-income ratio to 27.5%. Thus, a change in the variance of persistent income shocks cannot account quantitatively for the rise in filings, and generates counterfactual changes in unsecured debt. We also conducted experiments (reported in an online appendix) that increase the persistence parameter. These actually increase the number of bankruptcies.

To summarize, changes in transitory income shocks have almost no effect; changes in persistence generate small changes in the wrong direction; and changes in the variance of persistent shocks have a quantitatively small effect on filings and a large effect (in the wrong direction) on debt. The inability of realistic changes in transitory income shocks to generate large changes in filings is not surprising. Households tend to smooth transitory income shocks over time through borrowing and saving rather than by declaring bankruptcy. Since borrowing and saving are not as useful in smoothing persistent income shocks, in principle they can have a large effect on filings. However, households' borrowing decisions are sensitive also to changes in persistent income uncertainty. Due to market incompleteness, increased persistent income uncertainty pushes up the desired level of precautionary savings, which has a large negative effect on the amount borrowed. The precautionary savings effect is significant: Whereas average savings in the benchmark economy are 1.44 times average income, this ratio falls to 0.81 in experiment 7 and 0.38 in experiment 8. While greater persistent income uncertainty makes borrowers more likely to default on any given amount of debt in response to a negative income shock, the reduction in equilibrium borrowing has a strong offsetting effect on filing rates. In the extreme case (Experiment 9), we shut down all income uncertainty. Here the large increase in filings is driven by the dramatic rise in household debt resulting from the reduced precautionary saving motive. As a result, expense shocks easily "push people over the edge."

Since most bankruptcies in the benchmark economy are driven by expense shocks, one might suspect that our finding that income uncertainty is unimportant is artificial. To check for robustness, we calibrate the model to 1980-84 and then ask whether an increase in income uncertainty can lead to an increase in bankruptcies. We find that our results are robust to this "reverse experiment." Details are reported in the online appendix.

C. Demographic Changes

Demographic changes, such as the aging of the baby-boomers or an increase in the number of single households, could change the fraction of households facing high levels of idiosyncratic uncertainty. Our analysis of the data, however, suggests that neither the aging of the baby-boomers nor a decline in the fraction of married households is quantitatively important for explaining the rise in bankruptcy filing rates. The aging baby-boomer story is relatively unimportant since the age composition of the population changed very little between 1980 and 2000. While the stock of single households more than tripled, their share of the overall population remained relatively small, and their bankruptcy rate was only somewhat higher than the average. Hence, this compositional change in the population leads to only a modest increase in filings (see the web appendix for a more detailed discussion).

IV. Changes in Consumer Credit Markets

The past thirty years have witnessed significant innovations in consumer credit markets, as improvements in information technology have reduced the cost of processing information (Barron and Staten (2003), Allan Berger (2003), Douglas G.. Baird (2007)). In addition, there have been several legal changes that may have had important implications for consumer credit markets. Bankruptcy reform during the late 1970s may have made bankruptcy more attractive (Shepard (1984)), while the Supreme Court's *Marquette* decision, which led to the removal of state interest rate caps, may have facilitated the extension of credit to higher risk borrowers. To assess the importance of these changes, we examine two "reduced-form" channels through which changes in credit markets may have made bankruptcy more attractive and expanded households' access to credit. First, we evaluate the impact of a decrease in bankruptcy costs. These costs capture both the direct costs of bankruptcy (such as filing fees) as well as the indirect costs (such as more expensive credit after bankruptcy). The second channel we consider is a fall in the transaction cost of making loans (τ). This captures both the direct reductions in processing costs of loans as well as a fall in the costs of funds of credit card companies. We also investigate whether a combination of these credit market channels can account for the rise. Our conclusion is that these credit market changes are responsible for most of the rise in bankruptcies.

A. A Decline in the Cost of Bankruptcy

A common explanation for the rise of bankruptcies is that bankruptcy has become less costly and thus more attractive (Gross and Souleles (2002), Todd J. Zywicki (2005)). Several studies argue that a change in social norms weakened the social "stigma" associated with bankruptcy (Buckley and Brinig (1998), Fay, Hurst and White (2002)). Improved access to credit after bankruptcy also may have reduced the perceived cost of bankruptcy (Michael Staten (1993)). Alternatively, legal changes may have made filing for bankruptcy easier and thereby reduced the cost of filing (Shepard (1984)).

The idea behind all of these stories is that a lower cost of filing increases the value of filing for any level of debt and income. We consider three different ways to introduce bankruptcy costs in the model in order to gauge the plausibility of this channel. First, we consider a utility cost associated with an individual filing for bankruptcy, χ. This cost captures the idea of a weakened social "stigma," but may also be seen as a reduced form way of capturing real costs associated with filing for bankruptcy. The second cost we consider is a proportional "tax" on consumption in the bankruptcy period, a cost we call "burning". Here we are motivated by reports that bankrupts face higher transaction costs when purchasing goods. Finally, we consider the possibility that the fixed cost of filing for bankruptcy has fallen.

Since there are no direct measures of these bankruptcy costs, we use the model to back out how large a change in each of these costs is required to reduce filings to the early 1980s level (assuming each of these costs equaled zero in the late 1990s). The results are reported in rows 2a, 2b, and 2c of Table 4. The experiments show very similar results for all three costs, implying that it is difficult to distinguish alternative hypotheses based on declines in different types of bankruptcy costs. It is worth emphasizing that the implied costs are significant. The value of stigma required to match the 1980-1984 filing level corresponds to the ex-ante utility loss from a reduction in the life-time consumption stream of roughly 11.5% in the benchmark economy. The burning experiment involves a consumption tax of 31% of the bankrupt's consumption during the (3-year) filing period. The fixed cost of filing is 12% of the (3-year) average household income, which corresponds to roughly $\$15,000$ in 1998 dollars.

Table 4—Credit Market Changes.

	Experiment	Ch. 7 Filings	Avg. r^b	Charge-off Rate	$\frac{\text{Debt}}{\text{Earnings}}$
1	Benchmark	0.83%	11.36 %	4.8%	9.20%
	U.S. 1995-99	0.83%	10.93 - 12.84%	4.8%	9%
	U.S. 1980-84	0.25%	10.95 - 12.05%	1.9%	5%
2a	Stigma (χ) $\uparrow$	0.25%	7.04%	0.97%	14.00%
2b	Burning $\uparrow$	0.25%	7.04%	0.98%	14.69%
2c	Fixed cost $\uparrow$	0.25%	7.02%	0.95%	12.54%
3a	$\tau\uparrow$ ($\tau = 4.81\%$)	0.79%	15.89%	6.59%	6.00%
3b	$\tau\uparrow$ ($\tau = 5.81\%$)	0.78%	17.97%	7.39%	5.00%
3c	$\tau\uparrow$ ($\tau = 6.81\%$)	0.77%	20.08%	8.19%	4.22%
4	$\chi \uparrow$ and $\tau \uparrow$	0.25%	11.83%	1.19%	5.02%

The numerical results show that while a decrease in the cost of bankruptcy can generate the observed rise in bankruptcies, it also has several counterfactual implications. A decrease in bankruptcy costs implies a significant decline in total borrowing and an

increase in the average borrowing interest rate.[16] In addition, the experiments generate a reduction in the average debt to income ratio of bankrupts over the past twenty years, while the data show an increase in this ratio (see Section B). These counterfactual implications lead us to conclude that a decrease in the cost of bankruptcies alone (whether it be a reduction in the social stigma of bankruptcy, filing fees or other costs) does not tell the whole story.

B. Legal Changes

A potential explanation for a decrease in the cost of bankruptcy is legal reform. Several authors have argued that the 1978 amendments (which took effect in October 1979) to the U.S. bankruptcy code made bankruptcy more attractive by increasing the value of exempt assets and permitting joint filing by spouses (Vern McKinley (1997), Boyes and Faith (1986), Shepard (1984)). The amendments coincided with a 1977 U.S. Supreme Court decision removing restrictions on advertising by lawyers, which may have lowered the cost of acquiring information about bankruptcy (McKinley (1997)). If we interpret these changes as lowering the cost of filing, our experiments suggest that legal changes alone do not offer a complete explanation. Three additional arguments cast further doubt on the importance of the legal changes. First, the U.S. reforms were relatively minor (see Moss and Johnson (1999)). Second, Domowitz and Eovaldi (1993) analyze data on the characteristics of bankrupts before and after the 1978 amendments, and conclude that the amendments did not play a significant role in the rise in consumer bankruptcies. Finally, there were no corresponding changes to the bankruptcy law in Canada, which also experienced a dramatic rise in bankruptcies.[17]

Another potentially relevant legal change was the US Supreme Court's Marquette decision in 1978 that effectively removed state usury laws. However, we are skeptical that this had a significant direct effect on bankruptcy filings. In our model, we find that even a very low ceiling of 7% can account only for about half of the rise in filings. Further, the removal of interest rate ceilings implies a counterfactual large increase in interest rates (see the web appendix for details). Moreover, Canada also experienced a rapid rise in consumer bankruptcies without a deregulation of credit markets (see also Ellis (1998)). Finally, it is unclear whether interest rate ceilings were effectively binding in the United States (see Richard L. Peterson (1983)). Our conclusion is that, while the *Marquette* decision may have contributed indirectly to the rise in bankruptcies by permitting continued lending to high-risk consumers, it was not a significant direct contributor to the rise in filings.

[16] It is important to point out that the relationship between the cost of filing and the level of borrowing is not monotonic. When filing costs are very high, a decline in these costs may lead to more borrowing (and bankruptcies). However, this does not occur at (or near) our calibrated parameters, and the results reported are robust to various sensitivity exercises we conducted.

[17] There are two caveats. First, there were potentially important administrative changes that may have increased access to the bankruptcy system for low-income households during the early 1970s. Second, the flattening of Canadian bankruptcy filings after the tightening of the code in 1997 suggest that legislative changes can have a significant impact upon filings (Jacob S. Ziegel (1997)).

C. A Decline in Lending Costs

One way of capturing technological changes in credit markets is a reduction in the transaction cost of making loans (the wedge between the safe borrowing rate and the saving rate). We interpret this lower cost as a reduced-form representation of many types of changes, not all of which would show up as a spread between the borrowing and saving interest rates in the data (e.g., loan origination fees). There are however, at least three channels that could directly lead to a smaller wedge. First, financial innovations such as securitization lowered the cost of funds (Mark Furletti (2002)), which in our framework translates into a lower transaction cost. Second, increased competition in the banking sector may have reduced the lending margins of credit card providers, narrowing the wedge between the borrowing and lending rates.[18] Third, the increased use of credit scoring to evaluate loan applicants may have reduced the costs of processing consumer loans (Loretta Mester (1997))).

Since we lack a direct measure of the transaction cost of lending, we begin by asking how large a change in τ is required to match the change in bankruptcy filings. We find that changes in τ have a relatively small impact on default rates. Even for large variations in τ, we are unable to match the change in default rates observed in the data. This result is quite different from Athreya (2004), who reports that reductions in the transaction cost of lending can generate a substantial increase in both filings and debt. The small effect we find on filings stems from two differences between our models. First, Athreya (2004) abstracts from expense uncertainty, which drives a large fraction of the defaults in our framework. Expense uncertainty implies that reductions in the cost of borrowing not only encourage more borrowing — which makes households more likely to file for bankruptcy given shocks — but also makes borrowing to pay off expense shocks over time more attractive relative to bankruptcy. Second, the life-cycle nature of our model makes risky young borrowers less sensitive to changes in borrowing rates, and thus generates their continued participation even when the transaction costs are high.

Given the small impact on defaults, we use the model to back out how large a change in τ is required to reduce total borrowing to the early 1980s level. The implied change in the transaction cost is 3.25% (i.e. $\tau = 3.25 + 2.56 = 5.81\%$). As can be seen from row 3b in Table 4, while increasing τ has a very minor effect on filings, it has a large effect on the average borrowing interest rate, and on the charge-off rate. The increase in average borrowing interest rates exceeds the increase in the risk-free borrowing interest rate. This reflects the fact that lower-risk households disproportionately reduce their borrowing, which leads to an increase in the average risk premium on lending. As a robustness check, we also report the results for two other values of the transaction cost of lending, centered around 3.25% (of minus and plus one percentage points), in rows 3a and 3c in Table 4. These two experiments show a similar pattern, with a decrease (increase) in the transaction costs leading to a lower (higher) discharge rate. Our interpretation of these results is that this type of financial market innovations is unlikely to have played

[18] Astrid A. Dick and Andreas Lehnert (2007) argue that the removal of barriers to interstate branch banking increased competition between banks.

a large *direct* role in the rise in filings, but it may have been an important factor in the rise in unsecured borrowing.

The spread between the borrowing and lending rates that is not accounted for by charge-offs can be used as a proxy to help assess whether a large change in the wedge is reasonable. Abstracting from aggregation issues due to borrower heterogeneity, charge-offs in the model are equal to $\frac{r-(r^s+\tau)}{1+r}$, where r denotes the average borrowing interest rate. Using this relationship and the data in Table 2, the implied τ for the late 1990s is between 2.2 and 4 percent. Using the early 1980s data gives a τ of between 5.4 and 6.8 percent. The implied drop in the transaction cost is roughly 3 percentage points, which is close to the 3.25% required to match the early 1980s debt level.

This back-of-the-envelope calculation abstracts from the potential impact of changes in interest deductibility following the 1986 tax reform. Prior to 1986, interest rates on unsecured consumer loans were tax-deductible. David Altig and Steven J. Davis (1992) calculate that the implied marginal subsidy rate to borrowing was 24.7% in 1980. Taking this into account, would lead one to conclude that there was relatively little change in the after-tax interest rate faced by borrowers.[19] While our model does not distinguish between the interest rate paid by borrowers versus that received by lenders, one rough way of determining the impact of this tax is to feed in a 1 percentage point fall in τ (the implied decrease in the effective wedge faced by households). The change in borrowing implied by this experiment is significantly smaller – the implied debt-income ratio is 7.7% (roughly one-third of the observed change in borrowing). However, there are two caveats to this adjustment. First, the interest tax deduction applied only to borrowers who itemized their taxes. More than 60% of tax filers did not itemize prior to 1986 (see Victor Stango (1999)). Second, to the extent that a large share of unsecured debt is held by lower-income households, the tax benefit would be smaller since their marginal tax rate is lower than the average. Given that most bankrupts come from the middle and lower middle portions of the earnings distribution, abstracting from tax considerations may be a reasonable approach here.

A final issue worth highlighting is our assumption that the risk free rate is fixed in all of our experiments, while the transaction cost of lending varies. Our rationale is that the return to saving in the model is a proxy for the return on capital in the economy, which Ellen R. McGrattan and Edward C. Prescott (2003) argue has remained roughly constant over 1980-2000. In effect, we take the view that the opportunity cost of funds to the lenders should be equal to the return on capital, and load all of the costs of intermediation into the τ. As a robustness check, we also experimented with increasing the risk-free rate (r^s) while holding the transaction cost of lending (τ) fixed. As expected, although a slightly smaller increase in r^s is needed to generate the same decrease in borrowing as a given change in τ, the experiments yielded similar results to those shown in Table 4. This suggests that whether borrowing became cheaper due to efficiency gains

[19] Altig and Davis (1992) find an increase in the after-tax wedge between the borrowing and saving rates. The difference is due to the fact that charge-offs are not taken into account and a different measure of the safe interest rate is used. In a more recent paper, Steven J. Davis, Felix Kubler and Paul Willen (2006) find that the after-tax wedge net of charge-offs, using credit card borrowing rates, fell by 2.5 percentage points between 1987 and 2001.

in the lending sector, or due to other macroeconomic factors that lowered the aggregate interest rate, is not important for our results. Instead, what is key is that credit market changes led to an effective reduction in borrowing costs for consumers.

D. Can a Combination of Credit Market Channels Generate the Rise?

Thus far we have considered separately the impact of changes in each of the credit market channels. Could credit market innovations which led to both lower transaction costs and a lower cost of bankruptcy account for the rise in bankruptcy filings?

The answer is yes. Experiment 4 in Table 4 reports the results of an increase in the transaction cost of 4.5 percentage points (from 2.56% to 7.06%) and an increase of the stigma parameter to roughly three-quarters of its value in the "stigma only" experiment (line 2a in Table 4). With these values, the model closely replicates the level of filings, the average borrowing interest rate, and the debt-to-earnings ratio observed in the early 1980s. The model also predicts a sizable increase in the charge-off rate that lines up with the data: an increase from 1.2% to 4.9% in the model, compared to a slightly smaller increase in the data, from 1.9% to 4.8%.

The intuition for this result is as follows. A lower cost of filing makes bankruptcy more attractive, which decreases the bond price schedule (i.e., interest rates are higher for any level of borrowing). This shifts up the average borrowing interest rate and lowers borrowing (see experiment 2 in Table 4). The fall in the transaction cost of lending offsets the rise in interest rates, thereby raising desired borrowing by households. The lower interest rate schedule reduces the cost of repaying loans for any level of debt, which increases the value of repaying relative to the value of bankruptcy. The lower interest rate schedule also raises the cost of being excluded from borrowing during the bankruptcy period. The overall effect is to increase both the fraction of young households who borrow and the amount borrowed by borrowers. Due to these forces, lower transaction costs significantly increase borrowing while lowering the incentive to default for a given level of borrowing. Importantly, this pushes up the debt-to-income ratio of filers, and thus offsets the counterfactual implication of the lower bankruptcy costs.

V. Decomposing the Relative Importance of Uncertainty and Credit Market Channels

Thus far, our results suggest that credit market changes are likely responsible for the rise in filings, while uncertainty plays only a minor role. However, in principle, the various channels might interact and reinforce each other. To better evaluate the relative importance of credit market changes, we now analyze a combination of uncertainty and credit market changes. Looking at these channels simultaneously allows us to assess the contribution of each, while allowing for interactions effects.

We incorporate two uncertainty stories: an increase in expense uncertainty and an increase in transitory income uncertainty. A reasonable upper bound on the change in expense uncertainty is that the probabilities in the early 1980s were roughly 85% of those of the late 1990s. We thus scale down the benchmark probabilities of expense

shocks by 0.85. To capture changes in income volatility, we scale down the variance of the transitory shock by 25% (which is at the upper limit of the values suggested by Heathcoate, Storesletten and Violante (2004)). Given this modified parametrization of uncertainty, we choose the values for the cost of bankruptcy and the transaction cost of borrowing so as to match filings and the debt-income ratio of the early 1980s.

This "combination" is Experiment 2 in Table 5. The required increase in the transaction cost is 4.5 percentage points (from 2.56% to 7.06%), while the stigma parameter is slightly less than half its value in the "stigma only" experiment (line 2a in Table 4). This experiment closely replicates the level of filings, the average borrowing interest rate and the debt-to-earnings ratio observed in the early 1980s. The model also predicts a sizable increase in the charge-off rate, from 1.4% in the 1980s to 4.9% in the late 1990s – compared to a slightly smaller increase from 1.9% to 4.8% in the data.

Table 5—Decomposing Uncertainty and Credit Market Stories.

	Experiment	Ch. 7 Filings	Avg. r^b	Charge-off Rate	$\frac{\text{Debt}}{\text{Earnings}}$
1	Benchmark	0.83%	11.36 %	4.9%	9.20%
	U.S. 1995-99	0.83%	10.93 - 12.84%	4.8%	9%
	U.S. 1980-84	0.25%	10.95 - 12.05%	1.9%	5.0%
2	All, see text	0.25%	11.66%	1.4%	5.05%
3	No Δ Expense	0.30%	11.85%	1.5%	4.99%
4	No Δ Stigma	0.64%	17.32%	6.11%	4.22%
5	No Δ τ	0.31%	7.06%	1.0%	13.64%
6	No Δ Transitory Income	0.26%	11.72 %	1.4%	4.90%
7	No Δ Uncertainty	0.30%	11.92%	1.58%	4.84%
8	Burning, all, see text	0.25%	11.33%	1.02%	5.70%
9	Fixed Cost, all, see text	0.25%	11.37%	1.10%	5.29%

To identify the contribution of each mechanism, we now shut down each channel individually (experiments 3–6 in Table 5). The experiments show that expense and transitory income uncertainty play a small role. In experiment 7 we shut down both uncertainty channels, with very similar results. The decomposition highlights the primary role of credit market changes. The main channel driving the rise in filings is the decrease in the filing cost (modeled as stigma in this experiment), which accounts for roughly two-thirds of the rise. In contrast, the lower transaction cost affects filings very little, but counteracts both the increase in interest rates and the drop in borrowing predicted by the lower stigma.

Experiments 8 and 9 of Table 5 report the results for the two alternative bankruptcy costs: burning and the fixed costs of filing. As in section A, these experiments indicate that our conclusions are robust to alternative specifications of the cost. However, the nature of the costs matters for the implied change in the average debt-to-income ratio of

bankrupts. Both the burning and the fixed cost experiments generate an increase in the average debt-to-income ratio of bankrupts, while the stigma experiment predicts a small decrease. This finding suggests that with better data on changes in the characteristics of bankrupts over time, potentially one could better identify the nature of the changes in bankruptcy costs.

These experiments reinforce our interpretation of the earlier findings that shifts in uncertainty are not the primary driving force of the rise in bankruptcies. Instead, credit market innovations appear to be responsible for up to 90% of the rise in filings and for virtually all of the increase in unsecured borrowing.

A. Welfare Effects and Savings

We can also use our experiments to evaluate the welfare effects of the rise in bankruptcies. Our welfare measure is the percentage increase in the lifetime consumption stream required to equalize expected life-time utility across two experiments: the equivalent consumption variation (ECV). Overall, the changes from the early 1980s to the late 1990s (i.e. comparing experiment 2 with row 1 in Table 5) generate a welfare improvement of more than half a percent of consumption (ECV = 0.57%). It is worth noting that while this welfare gain is significant, it is roughly one-tenth of the cost of business cycles estimated by Kjetil Storesletten, Chris Telmer and Amir Yaron (2000).

This net welfare gain stems primarily from the decrease in the transaction cost of lending. If this were the only change from the early 1980s to the late 1990s (experiment 5 versus experiment 2), households' welfare would have increased even more (ECV = 1.19%). The impact of lowering the cost of defaulting is more complicated. On the one hand, starting from the 1980s benchmark (experiment 2), reducing stigma to the 1990s level increases welfare (ECV = 0.27%). However, lowering both the transaction cost and stigma generates a smaller increase in total welfare (ECV = 1.17%) than does the decline in transaction costs alone. Intuitively, as the lending technology becomes more efficient, households prefer slightly higher default costs, since this allows them to borrow more. The negative impact of higher levels of income and expense uncertainty are as expected. Had only expense risk increased, welfare would have declined by -0.29%. Similarly, had only transitory earnings risk increased from the early 1980s to the late 1990s, welfare would have decreased by -0.33%. While the costs of increased uncertainty were significant, they were much lower than the benefits to consumers of being able to borrow at lower costs both for life-cycle borrowing purposes and to smooth idiosyncratic shocks. This simple decomposition shows that the welfare consequences of a rise in bankruptcies depend upon the underlying driving forces.

Finally, we ask what our experiments imply for household wealth. In the data, the ratio of median net worth to median income fell from 1.24 in 1984 to 0.89 in 1998, a 28% decline.[20] We find a similar decline in our experiments. Specifically, in our experiments

[20]These values for median net worth are based on data from SIPP as reported by the U.S. Census Bureau, see http://www.census.gov/hhes/www/wealth/detailed_tables.html. Median income is from the Report of the President, see http://www.gpoaccess.gov/usbudget/fy01/sheets/b_31.xls.

the ratio of median net worth to median income declines from 0.60 in the early 1980s (experiment 2 in Table 5) to 0.40 in the late 1990s (the benchmark experiment) – a decline of 34%, which is close to what we see in the data. The one caveat is that the model understates median net worth by roughly half. However, this is not surprising since the model abstracts from two important factors of wealth accumulation: bequests and durable goods (especially housing).[21]

VI. Conclusion

This paper explores why consumer bankruptcies increased between 1980 and 2000. Our results suggest that uncertainty-based stories cannot account quantitatively for these trends. Instead, we find that at least three-quarters of the rise in filings can be explained by changes in credit markets. Specifically, our findings suggest that credit market innovations that both reduced the cost ("stigma"?) of bankruptcy and the cost of borrowing played an essential role in accounting for the rise in bankruptcies and unsecured consumer borrowing.

These results differ from papers which argue for a monocausal explanation of the rise. Our results are closest in spirit to those of Athreya (2004) and Moss and Johnson (1999), in that we point to credit market changes as the key driving force behind the rise. However, our results also suggest that a decrease in the cost of bankruptcy is much more important than these papers suggest. Our findings leave open the question of what exactly caused this cost to fall. We believe that endogenizing this cost is an important challenge for future research. One hypothesis is that the cost has declined because of easier access to credit after bankruptcy — a story documented by Staten (1993). Further research, exploring the interaction between access to credit after default and the cost of defaulting (such as Satyajit Chatterjee, Dean Corbae and José-Víctor Ríos-Rull (2008*a*)) is needed to improve our understanding of consumer credit markets.

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[21] The web appendix discusses savings rates by age in the model and the data.

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Figures

Figure 1: Consumer Bankruptcies per 1000 18–64 year-olds.

United States: Consumer bankruptcies are non-business Chapter 7 plus Chapter 13 filings. The data prior to 1980 are from Table 1 of (McKinley 1997), and the 1980 to 2004 data are from the ABI website.

Canada: Bankruptcies are the total number of *bankruptcy petitions* (including consumer proposals) filed. Joint filing is permitted when two people have interrelated finances, so this may understate the total number of bankrupts.

Figures 2 and 3: Debt as % of Disposable Income

Total debt is mortgage debt plus consumer debt. Mortgage debt is the quarterly end-of-period balance outstanding from the Flow of Funds of Account, Table D.3, converted to annual by averaging. Consumer credit is revolving plus non-revolving consumer credit balances from G.19. The data were converted from monthly to annual by averaging, and are based on the 2004 revision which includes student loans in non-revolving credit. Personal disposable income is from the NIPA, Table 2.1.

The unsecured credit measure in Figure 3 was constructed as follows. Before 1999, G.19 reported consumer credit in three categories: revolving, automobile (non-revolving), and other non-revolving (after 1999, G.19 reports consumer credit as either revolving or non-revolving). To estimate unsecured consumer credit, we: (1) constructed a non-automobile non-revolving debt measure by subtracting automobile debt from non-revolving debt; (2) used linear extrapolation to construct the fraction of personal loans in non-automobile non-revolving debt using the values reported by (Karen Dynan, Kathleen Johnson and Karen Pence 2003) from the SCF for 1983, 1989, 1992, 1995 and 1998; and (3) constructed our measure of unsecured consumer credit with the following formula: revolving + non-auto non-revolving * fraction personal.