Accounting for the Rise in Consumer Bankruptcies in Canada and the United States*

Igor Livshits and James MacGee
University of Western Ontario
and
Michele Tertilt
Stanford University

May 3, 2004

Preliminary and Incomplete

Abstract

Personal bankruptcies have increased dramatically: rising from 1.4 per thousand working age population in 1970 to 8.5 in 2002 in the United States and from 0.2 in 1970 to 4.3 in 2002 in Canada. We use a heterogeneous agent life-cycle model with competitive financial intermediaries who can (imperfectly) observe households' earnings process, age and current asset holdings to evaluate 6 commonly proposed explanations of the rise in bankruptcies. Our analysis suggests that financial innovation (specifically, the spread of credit scoring) and financial liberalization play an essential role. We document improvements in credit technology, and show that changes in household debt and bankruptcies are consistent with lenders being better able to identify individual households' default probabilities. While demographic changes and increased uncertainty also play a significant role in accounting for the rise, declining "stigma" and bankruptcy code reforms do not appear to be important.

Keywords: Consumer Bankruptcy, Adverse Selection, Life Cycle.

JEL Classifications: E21, E49, G18, K35

*Corresponding Author: Igor Livshits, Department of Economics, University of Western Ontario, Social Science Centre, London, Ontario, N6A 5C2, fax: (519) 661 3666, e-mail: livshits@uwo.ca. We thank seminar participants at the 2003 Western-Toronto Macro Conference, the Paris SED Meetings and the European Central Bank for helpful comments. The Economic Policy Research Institute (EPRI) provided generous financial support for this project for which we are very grateful. We would like to thank Jie Zhou for excellent research assistance.

1 Introduction

The past thirty years has witnessed an explosive growth in the number of consumer bankruptcy filings in Canada and the United States. As Figure 1 documents, filing rates in both countries have experienced similar secular trends over the past thirty years. Personal bankruptcies have increased dramatically: rising from 1.4 per thousand working age population in 1970 to 8.5 in 2002 in the United States and from 0.2 in 1970 to 4.3 in 2002 in Canada. This dramatic and sustained increase in consumer bankruptcies has generated considerable public debate in both the U.S. and Canada on the relative merits of alternative consumer bankruptcy rules. As a result, legislation has been introduced in both countries which would make it more costly for households to declare bankruptcy.

In this paper, we take a step back from the debate about alternative bankruptcy rules, and ask to what extent six commonly offered potential explanations can account for the dramatic increase in bankruptcies. The first four of these stories – financial market liberalization, financial innovation, increase in idiosyncratic risk faced by households, demographic changes – all argue that various changes have increased the number of households at risk of bankruptcy. The first of these stories is motivated by the US Supreme Court's *Marquette* decision, which effectively lifted interest rate ceilings in the US. The argument is that this facilitated the expansion of credit to higher risk individuals by allowing lenders to charge higher risk premia on loans. Numerous people have commented on how increased information sharing between lenders and the development and the spread of credit scoring has facilitated the widespread use of high risk credit instruments such as credit cards and highly leveraged home equity loans (Barron and Staten (2003), Edelberg (2003)). This in turn has led to an increased extension of credit to risky households. The third potential explanation is that households may be facing more uncertainty today due to higher probability of job separation and increased income inequality. There is also some evidence that the number of households in the U.S. without medical insurance has increased. The fourth story is that demographic changes, such as an increased number of single-parent households and the passing of the baby-boomers through the prime bankruptcy ages may have also contributed to the rise in bankruptcies. The other two stories – changes in bankruptcy code, and decreased "stigma" – are based on the idea that bankruptcy has become increasing attractive to households over time. Some researchers have argued that amendments to bankruptcy codes in the U.S. has mae bankruptcy more attractive to potential filers. Perhaps the most common explanation, however, is that

bankruptcy has become more attractive due to reduction in social stigma attached to bankrupts (Gross and Souleles (2002), Buckley and Brinig (1998)).

In evaluating each of these explanations, we use both quantitative dynamic equilibrium models of bankruptcy and data on households as well as bankrupts over time. Equilibrium bankruptcy models allow us to sort through various predictions of each explanation for the characteristics and numbers of bankrupts, the level, composition and distribution of household debt, and interest rate spreads. The rise in bankruptcies coincided with significant increase in household debt levels in both countries (Figures 2 and 3), primarily due to increased mortgage debt. We will require our theories of the rise in bankruptcies to also match these facts and the behavior of interest rate spreads on consumer debt.

The Canada - US comparison is particulary useful in helping to disentangle the alternative explanations. In the U.S., amendments to the bankruptcy code, interest rate deregulation and changes in advertising restrictions all occurred during the late 1970s. In Canada, none of these changes took place during the this time period. We can use thus use the cross country comparison to help identify the impact of these changes in the U.S.

We document that there has been an increase in at risk households in both countries. Particularly striking is the increase in credit card debt of lower income households. This is an important fact for two reasons. First, Domowitz and Sartain (1999) find that increased credit card debt leads to significantly higher probabilities of a household filing for bankruptcy. Second, the spread of credit cards is closely linked to the adoption and spread of financial market innovations building upon credit scoring and other information intensive technologies.

The use of equilibrium models of bankruptcy is essential to evaluate these stories. As we argued in earlier work, the quantitative evaluation of consumer bankruptcy laws involves an assessment of the magnitude of two opposing forces. On the one hand, bankruptcy weakens agents' ability to commit to repaying their debt in the future which limits their ability to smooth consumption across time. On the other hand, in incomplete markets environments, bankruptcy increases households' ability to smooth across states as it introduces contingencies into non-contingent debt contracts. The easier it is for consumers to discharge some (or all) of their debt, the greater the insurance against "bad luck" such as divorce, job loss or medical problems. In other words, consumer bankruptcy laws can help consumers smooth their consumption across states at the cost of distorting their ability to smooth over time (see Zame

(1993) or Dubey, Geanakoplos, and Shubik (2000)).[1] This trade-off implies that any evaluation of bankruptcy regimes must consider the quantitative costs of credit market distortions and the extent of "bad luck".

The benchmark model we begin with is a heterogeneous agent life cycle model which draws heavily upon Livshits, MacGee, and Tertilt (2002). Each period, households face a consumption-savings decision. Households also decide whether or not to file for bankruptcy, given the bankruptcy rules. These rules specify both the amount that can be garnished from households who default on debts and the cost of filing. Households can borrow (and save) via one period non-contingent bonds with perfectly competitive financial intermediaries. Intermediaries are able to observe household's current income, current level of borrowing and age when making loans. An equilibrium result is that the price of debtors bonds' varies with their current income, age and level of borrowing. It should be noted that in this paper we abstract from durable goods and focus solely on the market for *unsecured* consumer credit.

The dramatic rise in bankruptcies, and the extensive policy debates it has spawned, has motivated a recent interest in modelling consumer bankruptcy. In an important paper, Chatterjee, Corbae, Nakajima, and Rios-Rull (2002) outline a dynamic general equilibrium model where interest rates vary with borrowers' characteristics, and match the level of U.S. bankruptcy filings[2]. Li (2001) and Repetto (1998) examine two period models where households face uncertainty about their productivity in the second period of their life. Athreya (2000) and Athreya (2002) build on earlier work by Aiyagari (1994) and others to quantitatively analyze the effects of bankruptcy laws in an exchange economy where infinitely lived households face idiosyncratic income uncertainty. Markets are incomplete, as agents can save/borrow only via one period bonds. Athreya (2002) finds that eliminating consumer bankruptcy would improve welfare, as the gains from relaxing borrowing constraints exceeds the benefits of the insurance provided by bankruptcy. Li and Sarte (2002) introduce production and a partially exempt asset into this framework and analyze the consumers choice of Chapter 7 versus 13. In contrast to Athreya (2002), they find that eliminating the bankruptcy option is welfare reducing in the U.S. However, they conclude that amending the current U.S. bankruptcy code to allow for means testing would lead to small welfare gains.

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

[2] Pavan (2003) examines the effects of cross-state variations in exemption levels on bankruptcy filings. She introduces durables into a model that shares many features common to this paper and Chatterjee, Corbae, Nakajima, and Rios-Rull (2002).

Despite the substantial recent work on using numerical models to analyze consumer bankruptcy, little work has been undertaken to use these models to evaluate alternative explanations of the rise in bankruptcies. There does exist a substantial literature which has discussed alternative explanations of the rise in consumer bankruptcies. Closest in spirit to our work is Moss and Johnson (1999), who also discuss several alternative explanations of the rise in consumer bankruptcy. However, they do not attempt to use formal theory to evaluate the explanations.

The remainder of the paper is organized as follows. Details on the bankruptcy law in the U.S. and Canada as well as the characteristics of people filing for bankruptcy are given in Section 2. Detailed data of changes in the financial positions of households and changes in the characteristics of bankrupts are summarized in Section 3. A basic environment for evaluating the potential stories is presented in Section 4. Sections 5 and 6 present our results of assessing the six potential stories, and Section 7 concludes.

2 Consumer Bankruptcy in the U.S. and Canada

This section provides some background information on consumer bankruptcy law in Canada and the United States. We also review the available evidence on changes in the characteristics of consumer bankrupts over the past thirty years in both countries.

2.1 Overview of Consumer Bankruptcy in Canada and the United States

The Canadian and the American consumer bankruptcy codes are "fresh start" systems. In both countries, consumers can file for bankruptcy and receive a discharge of debt in exchange for assets (except for some exempt assets). Legal actions by creditors and most garnishments are halted upon the date of filing for bankruptcy (or the date on which bankruptcy is declared). This extends to phone calls and letters from creditors seeking repayment.

2.1.1 United States

American households can choose between two bankruptcy procedures: Chapter 7 and Chapter 13. Under Chapter 7, all unsecured debt is discharged in exchange for non-collateralized assets above an exemption level. However, debtors are not obliged to use any of their future income to repay debts. Debtors who file under Chapter 7 are not permitted to refile under Chapter 7 for six years, although they may file

under Chapter 13. Approximately 70 percent of consumer bankruptcies are filed under Chapter 7. Filers must pay the bankruptcy court filing fee and the cost of legal advice. The current cost of filing is $200. Sullivan, Warren, and Westbrook (2000) report that legal fees typically range from $750 to $1,500. In addition, a debtor filing for bankruptcy has to submit a detailed list of all creditors, amounts owed, source, amount, and frequency of income, all assets and monthly living expenses. A typical chapter 7 bankruptcy takes about 4 months from start to completion.

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

2.1.2 Canada

Consumer bankruptcy regulations in Canada are very similar to U.S. regulations, and contain provisions which resemble both Chapter 7 and 13.[3] There are two options for consumers: (straight) bankruptcy and consumer proposal. While couple's can jointly file for bankruptcy, each person is counted as a separate bankrupt in the official statistics. Although court hearings must be held for repeat bankrupts, there is no limit on how often someone can file. Overall, Canadian rules are slightly more restrictive than in the U.S.

A potential bankrupt must be deemed insolvent before they can file. Insolvency is defined as: (i) owing at least $\$1,000$ and (ii) not be able to meet debts due to be paid. If deemed insolvent, potential bankrupts must complete two counselling sessions which outline basic financial management options and alternatives to bankruptcy. After counselling, the applicant can file either for bankruptcy or for a Consumer Proposal (similar to Ch. 13). The cost of the simplest bankruptcies are $1347 and counselling costs of $170 (plus GST). Some firms provide bankrupts with a payment plan for these fees.

As in the U.S., the granting of bankruptcy involves the discharge of a consumers

[3]The following description of current Canadian law draws heavily upon "Dealing with Debt: A Consumers Guide" and other information available from the Office of the Superintendent of Bankruptcy website at http://strategis.ic.gc.ca/SSG/br01061e.html, and "The Most Common Questions Asked About Personal Bankruptcy", http://www.bankruptcycanada.com/question1.htm.

debt in return for any non-exempt assets.[4] Canadian exemptions are smaller than those of most American states, although they also vary across provinces. Unlike the U.S., discharge is not granted until nine months after a first time bankrupt files for bankruptcy unless the trustee recommends a conditional discharge or creditors object. The trustee is required to recommend a conditional discharge if either: (i) the bankrupt did not pay the agreed amount of surplus, (ii) the bankrupt filed for bankruptcy instead of proposing a viable repayment plan (consumer proposal).[5] During this time, a consumer is considered an undischarged bankrupt and must make payments to the trustee for distribution to creditors. The amount that the bankrupt must pay ranges from 50 to 75% of their monthly disposable income above an exemption level which depends upon family/household size. Failure to make these payments can lead to a denial of discharge.[6] If creditors oppose a discharge, and mediation is unable to resolve the issue, then a court hearing is held to resolve the matter. In practice, however, very few bankrupts face court hearings as most consumer bankruptcy cases qualify for summary administration. In 1999, more than 90 percent of consumer bankrupts declared total assets of less than $\$10,000$ (the cut-off for summary administration) and more than 85 percent had incomes below the cut-off for garnishment (Terms of Reference, Personal Insolvency Task Force).

A consumer proposal is an offer made by a debtor to their creditors which seeks to reschedule and/or to lower their debt. In return, the debtor is protected from additional action from creditors. Any insolvent person whose non-mortgage debt is less than $\$75,000$ can make a consumer proposal. To be accepted, a proposal must be accepted by a majority of creditors, and is administered by the trustee. A Consumer Proposal costs both a filing fee and payment to the Administrator (trustee). Consumer proposals were first introduced in 1993, and accounted for nearly 15 percent of all filings in 2002.

2.2 Bankrupts over Time: Have they Changed?

Changes in the characteristics of bankrupts over time will play a crucial role in distinguishing between several of the potential explanations of the rise on consumer

[4]Some debt, such as the award of damages related to assault, claims of alimony, spousal or child support, debts arising from fraud, court fines, and student loans less than 10 years after the bankrupt has ceased to be a student, are non-dischargeable.

[5]In this case, a bankrupt may wait up to 12 additional months before their debt is discharged.

[6]Bankrupts must also transfer any windfalls (lottery winnings or inheritances) received during the bankruptcy period for distribution to creditors.

bankruptcies. In this section, we review the available evidence on characteristics of bankrupts over time, and document how the characteristics of bankrupts have changed as filing rates have increased. As we discuss below, there are two large studies of Canadian bankrupts roughly 20 years apart, which provide considerable detail on how bankrupts have changed over time.[7] We also draw upon several U.S. studies, particularly those reported in Sullivan, Warren, and Westbrook (2000). It is worth emphasizing that (particularly in the U.S.) there is reason for skepticism about these findings due to comparability issues across different samples of bankrupts.

Our reading of these studies leads us to conclude that changes in bankrupt's characteristics in Canada and the U.S. are similar. What we find surprising is that despite the substantial increase in bankruptcy filings, the typical bankrupt today is remarkably similar to the typical bankrupt of twenty years ago (Schwartz (1999b), Sullivan, Warren, and Westbrook (2000)). A typical bankrupt is white, lower middle-class (30-50% poorer than the average household), in their thirties with an extremely high debt-to-income ratio (Sullivan, Warren, and Westbrook (2000)). In most cases, unsecured creditors did not receive any money from the bankrupts estate. The age distribution of bankrupts reveals that default rates are highest for households with a middle aged head.

The available survey evidence, however, suggests two robust changes in bankrupts over the past 25 years. First, there has been a substantial increase in the fraction of female bankrupts. Second, bankrupts unsecured debt, particularly credit card debt, has increased. As we discuss in section 3, this is consistent with changes in aggregate debt holdings, as the share of unsecured (especially credit card) debt held by lower income households has increased. Finally, there is some evidence that the income (in real terms) of the average bankrupt has declined. The drop in the income of the average bankrupt in the U.S. appears to be slightly larger than in Canada. The average amount borrowed (in real terms) of bankrupts does not appear to have increased. However, U.S. studies suggest that debt-income ratios are slightly higher since the average income of bankrupts may have decreased.

2.2.1 Demographic Changes

Dramatic Increase in Female Bankrupts

There has been a dramatic increase in female filing rates over the past thirty years. Sullivan and Warren (1999) report that female initiated bankruptcies increased from 17 percent of all bankruptcies in 1981 to 39 percent in 1999. This was accompanied

[7] In the appendix, we outline these surveys.

by a decrease in joint filings by couples from 57 to 33 percent, while the share of male filings remained roughly constant. Pollak (Commercial Law Journal, 333-338 1997) finds a similar pattern in filing in Nebraska. The share of bankruptcies filed by females increased from 11 percent in 1977 to 22.2 percent in 1987, and 32.4 percent in 1996-97. The fraction of male filings declined slightly from 33.9 to 27.8 to 27 percent (These figures are for all bankruptcies, although the Chapter 7 figures are similar.).

A similar trend can be observed in the Canadian data. As Table I reports, married (including common law) couples share of bankruptcies has fallen below their share of the Canadian population. This is partly driven by an increase in female filers, from roughly 30 percent in the Brighton, J.W. and Connadis, J.A. (1982) sample to more than 40 percent in 1997.[8] Interestingly, the number of filers without dependents has increased slightly, from 38 percent in 1977 to 46 percent in 1997.

Table I
Family Status of Bankrupts in Canada

	Year	Married/Cohabitating	Formerly Married	Single
Bankrupts	1977	70	22	8
Pop 15-64	1976	64	6	30
Bankrupts:	1997	43	29	28
Pop 15-64:	1995	60	7	32

Source: Schwartz (1999b).

Slight Increase in Elderly Filers

The probability of bankruptcy varies systematically over the life cycle. Sullivan, Thorne, and Warren (2001) report filing rates by age for 1991 and 2001 in the U.S. While filings rates for all age groups except the youngest have increased, the fastest increase (albeit from a very low level) has been for 65+ year olds.

The age profile reported by Brighton, J.W. and Connadis, J.A. (1982) and Schwartz (1999b) is coarser than that reported above. A similar trend is apparent, as filings by older bankrupts has increased even faster than those of the young and middle aged.

2.2.2 Employment and Income

Typical Bankrupt is Slightly Poorer

[8]Schwartz (1999) reports that the median debt to income ratio of single men was 1.36 and for women 1.31. However, the median unsecured debt to income ratio was 1.16 for women versus 0.93 for women. Single women also had larger families than did single men.

Table II
Age Profile of Bankrupts: U.S. Data

Age	< 25	25-34	35-44	45-54	55-64	65 +	avg.
1991	3.76	9.74	8.86	6.98	3.3	0.75	6.08
2001	3.49	11.65	13.34	11.00	5.30	2.35	8.55

Source: Sullivan, Thorne, and Warren (2001), Figure 2. The numbers are per 1000 adults, and the authors have adjusted the filing rates to take into account joint filings.[9]

Table III
Age Profile of Bankrupts: Canada

Age	18-29	30-49	50 +	avg.
1977	0.90	1.10	0.21	0.78
1994	1.98	3.92	0.98	2.45
1997	5.20	4.59	1.49	3.74

Source: 1977 is from Brighton, J.W. and Connadis, J.A. (1982), 1994 is from Ramsay (1999) (Ontario only), while 1997 is from Schwartz (1999b). The filing rate is per 1000 18 and above, and is for consumer bankruptcies only (consumer proposals in 1997 were not included).

The second crucial change is that the average income of the typical bankrupt appears to have fallen over the past twenty years. Sullivan, Warren, and Westbrook (2000) report that the mean (median) income of bankrupts has gone down from $\$23,643$ ($\$22,436$) in 1981 to $\$20,305$ ($\$17,952$) in 1991 to $\$16,675$ ($\$15,924$) in 1997 (in 1991 dollars) (Table 2.3).[10] Sullivan et al (1999b) cite a study that finds significantly lower incomes for female filers than for joint petitions in 1998/99 (median income $\$18,012$ for single filing women vs. $\$34,632$ for joint filers, note that this is in 1998/99 dollars and hence not directly comparable to the numbers above.) Given the growth in real incomes during this period, this suggests that much of the growth in bankruptcy has come from the lowest income groups.

The Canadian data suggests that there has been little change in the income of the typical bankrupt. Schwartz (1999b) report that the mean (median) income of bankrupts was $\$28,622$ ($\$24,000$), while Brighton, J.W. and Connadis, J.A. (1982) report a mean pre-tax income of $\$29,687$ ((in 1997 dollars).[11]

[10]The 1997 figures may be misleading, as they are based on a sample of chapter 7 (while the earlier samples included chapter 13) from Ohio.

[11]These values should be interpreted with care. In both surveys a number of respondents did not list their income, and most respondents in 1977 listed their net (post-tax) income. The mean net income was only 65% of the gross mean, which suggests that the true mean income could have been

The relative occupational status of bankrupts appears to have remained very similar. Schwartz (1999b) compares the occupational structure of bankrupts in 1997 with those of the 1977 sample, and concludes that in both cases consumer bankrupts were primarily lower skilled workers. In contrast, Sullivan, Warren, and Westbrook (2000) argue that the occupational structure of American bankrupts was very similar to that of the population.

The education of bankrupts is slightly above average, although university degree holders are underrepresented. Schwartz (1999b) reports that 53 percent of the bankrupts in 1997 had some post secondary education. However, only 54 percent of the bankrupts with some post-secondary had a degree or certificate, while 81 percent of those in the Canadian population had one. Unfortunately, Brighton, J.W. and Connadis, J.A. (1982) did not report educational attainment data, so we are unable to determine if there have been substantial changes in the educational composition of Canadian bankrupts.

Small Business Bankrupts

A substantial fraction of bankrupts identify themselves as self-employed. Ramsay (1999) note that roughly one in four bankrupts were self-employed. However, Schwartz (1999b) reports that while one in four bankrupts had been self-employed within the past five years, only 10 percent of their sample of bankrupts claimed to be self-employed at the time of filing.[12] Sullivan, Warren, and Westbrook (1999) report similar numbers for 1981, as 10.4% of their sample identified themselves as currently self-employed, while a further 9.6% identified themselves as former entrepreneurs.

One issue that must be kept in mind when interpreting bankruptcy statistics is the dramatic difference between self-employed (especially those who own a small business) bankrupts and "consumer" bankrupts. A number of personal bankruptcies are actually due to the failure of an unincorporated business. These bankrupts tend to have much larger debt and asset holdings than the typical bankrupt. Ramsay (1999) reports that the mean (median) value of liabilities for "pure consumer" bankrupts was $\$86,943$ ($\$32,649$), while the corresponding figures for business bankrupts was $\$497,757$ ($\$118,500$).

2.2.3 Debts

Total Debts and Debt-Income Ratio: Little Change

even lower in 1977.

[12]This complicates the identification of bankrupts, as it is difficult it distinguish between a business failure prior to filing to bankruptcy and a career switch that is unrelated to the bankruptcy filing.

The amount borrowed by individual bankrupts (in constant dollars) appears to have remained roughly constant. There is some evidence that the debt-income ratio of the typical bankrupt has increased, primarily due to the decline in the average income of bankrupts.

Anderson and Schwartz (1998) report total liabilities from their survey and from Brighton and Connadis (they adjust the debt figures for inflation). Although the median and mean figures for 1977 are slightly higher, the difference is small compared to the standard deviation. The asset figures likely overstate the increase in realizable assets, since most bankruptcy cases do not realize any significant assets. The bankrupt survey data appears to be consistent with the aggregate data available for Canada. Figure ? reports data collected by the Office of the Superintendent of Bankruptcy. There does not appear to be any secular trend in liabilities, although there is a slight upward trend in declared assets. However, since the amount realized from declared assets tends to be very small, it is likely that there has been very little change in the average loss per bankruptcy over the past twenty years.

Table

Liabilities and Assets of Bankrupts in Canada (1996 Canadian $)

Sample	Avg. Debts	Median Debts	Avg. Assets	Median Assets
1977	$66,281	$28,249	$16,232	$1,040
1997	$55,440	$26,016	$26,111	$3,000

Source: Schwartz (1999b) and Anderson and Schwartz (1998).

Sullivan, Warren, and Westbrook (2000) report similar data for the U.S. Once again, although the mean and median values of debt show a slight decline over time, these declines are small compared to the sample standard deviations.

Table

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

Sample	Avg. Debts	Median Debts	Avg. Assets	Median Assets
1981	$68,154	$37,002	$51,831	$24,764
1991	$65,158	$34,795	$45,344	$14,907
1997	$55,440	$40,960	$–	$–

Source: Sullivan, Warren, and Westbrook (2000), Table 2.4.

Finally, we can look at the debt-income ratios. For the U.S., the median debt-income ratio has increased while the mean has fallen slightly. Unfortunately, comparable debt-income rations were not computed for Canada. However, Ramsay (1999)

reports that the median total debt-income ratio was 2.14, while the median non-mortgage debt-income ratio was 1.22. These values are quite similar to those reported by Sullivan, Warren, and Westbrook (2000) in the table below.

Table
Debt-Income Ratio of Bankrupts

Sample	Average $\frac{\text{Debts}}{\text{Income}}$	Median $\frac{\text{Debts}}{\text{Income}}$	Average Non-Mortgage $\frac{\text{Debts}}{\text{Income}}$	Median Non-Mortgage $\frac{\text{Debts}}{\text{Income}}$
1981	3.2	1.41	1.88	0.75
1991	2.51	1.68	1.48	0.96
1997	2.76	2.44	1.87	1.54

Source: Sullivan, Warren, and Westbrook (2000), Table 2.5.

This table also reveals another interesting fact. As we document in section 3, the increase in the debt/income ratio for the U.S. (and Canadian) population is almost exclusively due to an increase in mortgage debt. This is not true for the bankrupt population, where non-mortgage debt has also soared. The median total non-mortgage debt to income ratio went up from 0.75 in 1981 to 0.96 in 1991 to 1.54 in 1997. Most of this increase is due to an increase in unsecured credit. The median bankrupt held $\$10,566$ in unsecured credit in 1981, $\$12,838$ in 1991 and $\$16,568$ in 1997. We discuss the changing composition of bankrupts debts in more detail below.

Debt Composition: Increase in Credit Card Debt

There has been significant changes in the composition of bankrupts debts. Particularly striking is the rise in both the number of debtors with credit cards debt and the value of credit card debt.

Table ? reproduces the results of three different bankruptcy studies reported by Sullivan, Warren, and Westbrook (2000). They find a substantial increase in credit card debt in both absolute terms and relative to the income of bankrupts between 1981 and 1997. Where the average bankrupt in 1981 held only $\$3,635$ in credit card debt, by 1997 the figure was $\$14,260$. The median credit card debt-income ratio increased from 1.41 in 1981 to 1.68 in 1991 to 2.44 in 1997.[13] As a result, the credit card share of total unsecured debt increased from 20% in 1981 to 50% in 1997.

A similar trend appears in the Canadian data, although the level of credit card appears to be slightly lower than that observed in the U.S. Brighton, J.W. and Connadis, J.A. (1982) report that just over 30 percent of bankrupts had outstanding

[13]One should be careful, as the samples are significantly different. While the 1981 and 1991 sample includes both Chapter 7 and 13 filers from multiple states, the 1997 sample is based on a survey of Chapter 7 filers in Ohio.

Table
Credit Card Debt of American Bankrupts

	1981	1991	1997
Mean (1997$)	$3635	$11529	$14260
Median	2649	6913	9345
Mean Debt/Income	0.177	0.531	0.767
Median Debt/Income	0.088	0.310	0.469
75 percentile Debt/Income	0.179	0.645	0.874
Mean $\frac{\text{Credit card debt}}{\text{Unsecured Debt}}$	0.210	0.426	0.497
Median $\frac{\text{Credit card debt}}{\text{Unsecured Debt}}$	0.159	0.379	0.503

Source: Sullivan, Warren, and Westbrook (2000). The 1997 data is not directly comparable to 1981 and 1991, since it only includes Chapter 7 filers while the earlier samples included both chapter 7 and 13 filers.

balances on bank credit cards, and 15 percent owed balances on gas and other credit cards.[14] By 1997, the fraction of bankrupts with credit card debt had increased to 68.5 percent (Schwartz (1999b)). This may underestimate the fraction with credit card debt, as Ramsay (1999) reports the 81 percent of bankrupts had credit card debt, and the mean amount of credit debt outstanding was $7615 and the median $4,800. However, credit card debt still comprised under 9 percent of the total amount of unsecured debt owed by bankrupts.

The Canadian data also exhibits another compositional change: a dramatic increase in government debt. Schwartz (1999b) report that 60.2 percent of bankrupts had government debt (with a median value of $6,000 as compared to a median credit card debt of $3,547), whereas only 26 percent of bankrupts in 1977 had government debt.[15] Part of this increase is due to student loans, as the fraction of bankrupts with student loan debts increased dramatically, from roughly 1 percent in 1977 to 25 percent in 1997.[16] For more than a quarter of the young (under 30) bankrupts, student loan debt was more than 50 percent of their total debt. As Schwartz (1999a) discusses, the resulting losses was a contributing factor to legislative changes which prohibited the discharge of student loans until at least ten years after the end of full time studies.[17]

[14]Unfortunately, they do not report how many households held both types of credit cards.

[15]The 1997 figure likely overstates the fraction owing money to the government, as sometimes Revenue Canada is listed as debtor even when no balance is owed due to a legal requirement that they be notified upon filing.

[16]Ramsay (1999), however, finds that only 9 percent of the bankrupts had student loan debt.

[17]Interestingly, until 1991, defaults on student loans were not even reported to credit bureaus.

Homeowners: Large but Narrowing Gap between Canada and U.S.

The fraction of bankrupts who are homeowners (and have mortgage debt) in Canada is roughly half that of the U.S. Roughly half of the bankrupts in the 1981 and 1991 studies of Sullivan, Warren and Westbrook were homeowners. In contrast, Schwartz (1999b) reports that 22.7 percent had mortgage debt and Ramsay (1999) found that 25 percent owned a home. However, Ramsay (1999) reports that roughly 20 percent of bankrupts had disposed of their house in the five years prior to bankruptcy.[18]. These numbers suggest that the fraction of bankrupts with mortgage debt has increased slightly in Canada, as Brighton, J.W. and Connadis, J.A. (1982) report that 16 percent of bankrupts had mortgage debt.

There are two other points worth noting. First, homeowners are much less likely to file for bankruptcy than renters in both countries. Second, homeowners constitute a disproportionate share of total bankrupt debt, since the size of mortgage debt was typically much larger than the value of other debt.

2.2.4 Cause of Bankruptcy

The main cause of bankruptcy is shocks to income and expenses. Unfortunately, there is little direct evidence of changes in the cause of bankruptcy over time. Sullivan, Warren, and Westbrook (2000) report that 67.5 percent of fillers in their 1991 sample claimed that the main cause of their bankruptcy was the loss of a job (multiple responses were permitted). Family issues such as divorce (22.1%), and medical expenses (19.3%) were also frequently cited as the primary cause of bankruptcy (Repetto (1998) reports data from the 1996 PSID with similar results). Work by Jacoby, Sullivan, and Warren (2000) suggests that medical problems can account for an even larger fraction of American bankrupts. Based on a study of 1,492 bankruptcies in 1999, they find that 34% of bankrupts owed substantial medical debt, and that 46% of filers report either a medical reason or substantial medical debt. Domowitz and Sartain (1999) also find that medical debt plays a significant role in consumer bankruptcy, as their findings suggest that medical debt alone can account for roughly 30 percent of U.S. consumer bankruptcies in 1994.[19]

[18]Two potential explanations for this cross country difference come to mind. First, Canadian bankruptcy law does not offer the same protection to debtors with secured debt available through Chapter 13. Second, many U.S. states have much larger homestead exemptions than Canadian provinces, especially Ontario (Westbrook (1999))

[19]Fay, Hurst, and White (2002) look at data from the PSID, and regress households bankruptcy decision on a number of potential explanatory variables such as a households debt, income, and assets. They find that including variables such as health problems, unemployment and divorce does

Although the Canadian studies all report a breakdown of reasons cited for bankruptcy, their comparability is limited since each study allowed different responses as to the cause of bankruptcy. Compared to the U.S., medical problems appear to play a much less important role. The most frequently cited cause of bankruptcy in each study was too much debt (presumably relative to income).

3 Changes in Consumers Debt in Canada and the United States

In this section, we document changes in the level of household debt, its composition and net worth households in the U.S. and Canada. At the aggregate level, most of the increase in the debt to disposable income ratio over the past thirty years is due to an increase in (secured) mortgage debt. However, the aggregate numbers disguise considerable shifts in the composition of holders of secured and unsecured debt. Lower income households in both countries hold an increasing share of unsecured credit, which has led to an increase in the number of households (particularly in Canada) with low net worth and low incomes.

3.1 Aggregate Data on Household Debt

The ratio of total household debt to disposable income has nearly doubled in both Canada and the U.S over the past thirty years (see figures 2 and 3). Most of the increase is due to a dramatic increase in the mortgage debt. Consumer credit – which includes secured loans for vehicles as well as unsecured loans such as credit cards, installment loans and lines of credit – has remained roughly constant relative to disposable income in the U.S., although there has been a slight increase in Canada during the 1990's.[20]

The rise in the debt-disposable income is roughly contemporaneous with the increase in bankruptcy filings. There are at least two reasons, however, to be skeptical about claims that the rise in the total debt to disposable income ratio has caused the

not significantly change their results. This leads them to conclude that bad luck is not an important factor in consumer bankruptcies. However, as Luckett (2002) points out, since back luck often affects debts, income and assets directly, the effect of bad luck is probably captured in these variables.

[20]U.S. tax law reform in 1986 eliminated the tax deductability of interest payments on non-mortgage consumer debt, which increased the relative attractiveness of mortgage debt for consumers. Canadian tax law does not allow the deduction of interest payments on either mortgage or consumer debt (with one exception: government sponsored student loans).

rise in consumer bankruptcies. First, unsecured credit plays a much more important role in consumer bankruptcy than secured debt. As the figures reveal, there has been little change in the ratio of consumer credit to disposable income. The second reason is that the ratio of required debt payments (interest plus principal) to disposable household income has remained relatively flat (see Figure 4, DSR) despite the rise in total debt since nominal interest rates have declined (Maki (2000)).

Figure 4 suggests, however, that some households may may face increased debt services burdens. The series FOR adds in other payments (automobile lease payments, rental payments on tenant-occupied property, homeowner's insurance and property tax payments). This series has also not changed very much over the past twenty years. However, the series for renter's only did increase from roughly 25% to 31%. The difference between the renter's FOR and the Homeowners FOR is due to both higher debt payments and rental payments. Renter's tend to be lower income households, and their debt service burden is 5 points higher than that of homeowners. The remaining difference is due to the higher rental payment relative to income (Dynan, Johnson, and Pence (2003)).

The widening gap between the renter FOR and the average FOR suggests that there has been changes in the composition of debt holdings. During the 1990s, the fraction of U.S. households who owned their primary residence increased from 64% to 68%. Dynan, Johnson, and Pence (2003) report estimates that most of this increase was due to the entrance of households with low downpayments, which increased the average homeowners FOR by roughly one point. Dynan, Johnson, and Pence (2003) note that the median income of renters in 2001 ($\$24,700$) was much lower than the median income of homeowners ($\$52,100$). In 2001, 14 percent of renters and 4 percent of homeowners reported being delinquent 60 days or more on a loan in the past year. Moreover, credit card debt accounted for 40 percent of the total debt of renters, as compared to 7 percent of the total debt of homeowners, for whom mortgage debt accounted for 82 percent of their total debt.

Net worth also plays a key role in households bankruptcies decisions. For the household sector, the ratio of debt to net worth follows a similar pattern to that of the debt-disposable income ratio. While the ratio of debt to net worth has increased, this is driven entirely by an increase in mortgage debt, while the ratio of consumer and other debt to net worth has remained roughly constant.

Our reading of this data is that the aggregate data does not suggest that we should observe a rapid increase in consumer bankruptcy. However, the aggregate data reveal little about how the *composition* of borrowers has changed over time. We turn to this

Table: U.S. Ratio of Debt to Net Worth

Inc. Quintile	1983	1989	1992	1995	1988
Debts	13.0	14.1	14.6	15.0	14.1
Mortgage	8.5	10.0	10.8	10.5	9.8
Consumer	3.4	3.6	3.1	3.6	3.2
Other	1.1	0.6	0.6	0.8	1.0

Source: Bertaut and Starr-McCluer (2000), Table 1 (based on the SCF).

next.

3.2 Household Debt Portfolios in Canada and the U.S.

In this section, we examine changes in the composition of borrowers. The data suggests that the share of non-mortgage debt held by low income and low net worth households has increased over time. Relatedly, low-income households have increased their share of credit card debt. This is potentially important for understanding the rise of in bankruptcies, since credit card borrowing features prominently frequently cited as playing a key role in the rise in consumer bankruptcies. As we discuss later, the spread of credit cards is closely linked to stories of financial innovation, as credit card issuers are heavy users of credit scoring and information technology.

To document these facts, we draw on household surveys of debts in Canada and the U.S. For the U.S., we use data from the Survey of Consumer Finances (SCF). For Canada, household level data on income, asset holdings and debts exists is available for Canada for 1977, 1984 and 1999 (see the appendix for more details). We also draw upon work by others using these data sets.

3.2.1 Increase in at Risk Households

We identify households that are at high risk as those in which households have both low net worth and low income. We first look at the fraction of households with net worth less than 0.1 of total income. The fraction of the sample of various family types is presented in table ?.

This understates the increase in at risk households. Most of the increase in low net worth households has been in the lowest income quintiles and has been accompanied by an increase in the debt to disposable income ratio and a decrease in the net worth to disposable income ratio.

Table

Canadian Households with Net Worth < 0.1 Disposable Income

Inc. Quintile	1977	1984	1999	1977	1984	1999	1977	1984	1999
	%			$\frac{\text{Debt}}{\text{Dis. Inc.}}$ %			$\frac{\text{Debt}}{\text{Dis. Inc}}$ %		
1	6.23	7.83	9.29	29.53	34.15	58.23	-17.15	-16.88	-38.62
2	5.56	4.68	5.62	36.63	27.42	40.42	-13.30	-9.70	-19.27
3	3.71	2.84	3.4	45.43	38.81	59.93	-15.01	-9.05	-17.97
4	2.19	1.63	2.09	57.39	44.91	85.42	-21.20	-17.62	-17.66
5	0.84	0.59	0.77	56.16	63.72	92.87	-13.39	-8.50	-6.13
Total	18.53	17.58	21.18						

Table

American Households with Net Worth < 0.1 Disposable Income

Inc. Quintile	1983	1992	1998	1983	1992	1998	1983	1992	1998
	%			$\frac{\text{Debt}}{\text{Dis. Inc.}}$ %			$\frac{\text{Debt}}{\text{Dis. Inc}}$ %		
1	6.11	5.28	5.06	31.69	61.91	66.40	-18.69	-34.32	-33.36
2	4.25	2.03	2.37	39.44	63.66	75.51	-5.72	-28.45	-21.48
3	2.84	1.34	1.41	28.57	74.15	91.69	-3.41	-23.56	-28.69
4	1.26	0.65	0.59	35.72	74.01	106.53	2.59	-17.62	-24.65
5	0.46	0.14	0.15	44.04	856.77	553.68	-8.31	-372.01	-118.95
Total	14.92	9.43	9.57	34.99	166.91	120.51	-5.82	-68.22	-34.34

There is also evidence that the debt levels of the lowest income deciles have increased....

To Be Completed

3.2.2 Credit Card Borrowing

In this section, we document two key facts. First, there has been a increase in credit card debt. Second, lower income households credit card debt has grown faster than that of higher income groups, as their share of total credit card debt has grown.

As can be seen in Figure 2, the revolving credit (credit cards plus outstanding balances on unsecured revolving lines of credit) has increased rapidly in the U.S. Much of this increase has been the result of consumers substituting credit card debt for installment purchase debt. This increase is driven both by an increase in the number of household with credit cards and by an increase in the average credit card debt held by households. Durkin (2000) reports that the fraction of American households with a credit card has increased from 51% in 1970 to 73% in 1998. The fraction of

households with a positive balance has also increased, from 22% in 1970 to 742% in 1998.

Table
Bank Type Credit Cards, U.S.

	1970	1977	1983	1989	1995	1998
Carrying balance	37%	44%	51%	52%	56%	55%
Mean Balance (1998$)	$839	$889	$1282	$2404	$3160	$4073
Median Balance	$630	$972	$818	$1315	$1605	$1900

Source: Durkin (2000) (SCF).

The growth in aggregate credit card debt obscures compositional changes. The share of credit card debt held by lower income households has increased, as can be seen from Table ?.

Table
Bank Type Credit Cards by Income, U.S.

Income Quintile	1970	1977	1983	1989	1995	1998
Lowest						
Have card	2%	11%	11%	17%	28%	28%
Carrying balance	27%	40%	40%	43%	57%	59%
Mean Balance (1998$)	$896	$731	$1147	$784	$2386	$2240
Median Balance	$336	$538	$818	$592	$995	$700
Share Total Balance	2%	4%	4%	2%	6%	5%
Second Lowest						
Have card	9%	22%	27%	36%	54%	58%
Carrying balance	39%	42%	49%	46%	57%	58%
Mean Balance (1998$)	$659	$1055	$906	$17124	$2622	$3028
Median Balance	$504	$565	$655	$1315	$1605	$1400
Share Total Balance	9%	13%	8%	8%	14%	13%
Middle						
Have card	14%	36%	41%	62%	71%	72%
Carrying balance	47%	45%	58%	56%	58%	58%
Mean Balance (1998$)	$820	$883	$1161	$2159	$2952	$4129
Median Balance	$630	$672	$736	$1262	$1605	$1900
Share Total Balance	22%	19%	19%	21%	21%	23%

Source: Durkin (2000), Table 2. (SCF) .

This increase in credit card debt of low income groups is consistent with the finding of several papers that borrowing by riskier households has increased. Black and Mor-

gan (1999) examine the 1989 and 1995 Survey of Consumer Finances, and conclude that credit card borrowers in 1995 were riskier than credit card borrowers in 1989. This increase in risk was due to both an extension of credit to riskier borrowers and to an increase in the debt to income ratio of cardholders. Credit cardholders in 1995 were more likely to be single, more likely to rent, had less job seniority and lower average income in 1995 than cardholders in 1989. As a result, the new borrowers had higher debt and higher debt service to to income ratios. Stavins (2001) reports that from 1983 to 1995, the percent of U.S. families with income below the poverty line holding at least one credit card more than doubled, with their average credit card balance rising from $780 to $1380 (1995 dollars).

To Be Completed

4 A Basic Environment for Evaluating the Stories

We consider an overlapping generations model of households who live for J periods. Each generation is comprised of a continuum of households of measure 1. All households are ex-ante identical. They maximize their life-time discounted utility from consumption and leisure. Households face idiosyncratic uncertainty, but there is no aggregate uncertainty. Markets are incomplete: the only assets in this economy are person-specific one-period non-contingent bonds. A crucial element of the model is the households option to declare bankruptcy.

4.1 Households

Each household has preferences defined over a consumption good. Preferences can be represented by:

$$\sum_{j=1}^{J}(\prod_{i=1}^{j-1}\beta_i)u\left(c_j\right) \tag{4.1}$$

where β_i is the period discount factor of a household of age i, c_j is consumption at age j, and $u(\cdot)$ is an increasing and concave function.

An agent of age j is endowed with $\overline{e}_j$ efficiency units of labor. Her output is determined by productivity and the labor endowment. The labor income of an age j consumer is $y_j = z_j\overline{e}_j$, where z_j is the household's productivity at age j. The productivity parameters z are a random variable with finite support. Productivity is modelled as a Markov chain with an age independent transition matrix $\Pi(z'|z)$. The productivity of an age 0 consumer is drawn from the stationary distribution.

Households face a second type of uncertainty: They may be hit with an idiosyncratic expense shock $\kappa \geq 0$, $\kappa \in K$, where K is the finite set of all possible expense shocks. The probability of shock κ is denoted $\pi(\kappa)$. 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.

4.2 Financial Markets

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

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

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

4.3 Bankruptcy

A household can declare bankruptcy. In that case, all their debts are discharged, and the household starts the following period with 0 balance, unless hit by an expense shock that period. A bankruptcy rule is characterized by two elements:

1. A garnishment rule that specifies the amount of a household's assets and earnings that can be seized by creditors.

2. A (small) fixed cost of filing for bankruptcy.

In addition to losing the seized income specified in the bankruptcy rule, bankrupt debtors face three further "punishments". First, bankrupts pay transaction costs λ_1 and λ_2, proportional to consumption expenditures, during and immediately following the default period, respectively. Secondly, they incur utility costs ("stigma") χ_1 and χ_2 in the two periods respectively. Finally, bankrupts cannot save or borrow during the default period.

All assets of a household can be seized by creditors. We consider linear wage garnishment rules during the default period:

$$\Gamma = [\max\{y - \bar{y}, 0\}]\gamma$$

where Γ denotes the total amount garnished and transferred to creditors, $\overline{y}$ is an earnings exemption that cannot be seized and $\gamma \in [0, 1]$ is the marginal rate of garnishment. The garnishment technology is costless.

4.4 Timing within the Period

The timing within the period is as follows. At the beginning of the period, each household realizes its productivity and expense shocks. If the household receives an expense shock κ, then the debt of the household is increased (or savings decreased) by κ. The household then decides whether to file for bankruptcy or not. Work then takes place, and all earnings are deposited directly into a "bank account". If the agent has filed for bankruptcy, the amount that is garnished is deducted, and the consumer is allowed to spend the remainder.

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

4.5 Consumer Problem

We define the consumer's problem recursively. We will define three distinct value functions - the value of declaring bankruptcy, the value of repaying debts immediately

following bankruptcy, and the value of repaying debts in a "normal" period. At each date, the households chooses whether to default or not, the level of current consumption and next period's debt (savings), taking the bond price schedule as given.

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

$$\begin{aligned} V(d, z, \kappa, j) = &\max_{c,d'} \left[u(c) + \beta_j E \max\left\{V(d', z', \kappa', j+1), \bar{V}(z', j+1)\right\}\right] \\ &\text{s.t. } c + d + \kappa \leqslant \bar{e}_j z + q^b(d', z, j) d' \end{aligned} \tag{4.2}$$

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

$$\begin{aligned} \bar{V}(z, j) = &\ u(c) - \chi_1 + \beta_j E \max\left\{W(z', \kappa', j+1), \bar{V}(z', j+1)\right\} \\ &\text{where} \quad c = (1 - \lambda_1)[\bar{e}_j z - \Gamma] - \phi, \qquad \Gamma = \gamma \max\{y - \bar{y}, 0\} \end{aligned} \tag{4.3}$$

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

$$\begin{aligned} W(z, \kappa, j) = &\max_{c,d'} \left[u(c) - \chi_2 + \beta_j E \max\left\{V(d', z', \kappa', j+1), \bar{V}(z', j+1)\right\}\right] \\ &\text{s.t. } c \leqslant (1 - \lambda_2)[\bar{e}_j z + q^b(d', z, j) d' - \kappa] \end{aligned} \tag{4.4}$$

When the constraint sets in problems (4.2) and (4.4) are empty, set the corresponding value function to $-\infty$.

Let I denote the consumer's decision to default. In equilibrium Borrowers default if and only if the value of bankruptcy is *strictly* greater than the value of repayment.

4.6 Intermediaries

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

$$q^b(d', z, j) = (1 - \theta(d', z, j))\overline{q}^b + \theta(d', z, j) E\left(\frac{\Gamma}{d' + \kappa'} | I = 1\right)\overline{q}^b \tag{4.5}$$

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

4.7 Equilibrium

Definition 4.1. *Given a bankruptcy rule $(\bar{y}, \gamma, \phi)$, and risk-free bond prices $(q^s, \overline{q}^b)$, a recursive competitive equilibrium is value functions $V, \bar{V}, W$, policy functions c, d', $I(d, z, j)$, a default probability $\theta(d', z, j)$, and a pricing function q^b such that:*

1. *The value functions satisfy the functional equations (4.2) - (4.4), and c, d' and I are the associated optimal policy functions.*
2. *The bond prices q are determined by zero profit condition (4.5).*
3. *The default probabilities are correct: $\theta(d', z, j) = E\left(I(d' + \kappa', z', j + 1)\right)$*

4.8 Computation and Existence

The solution is computed numerically. The algorithm solves backwards all the possible household problems as a function of the state variables, beginning in the last period of life. We compute the optimal decisions using a grid for the possible asset holdings. A proof of existence is provided in Livshits, MacGee, and Tertilt (2002).

4.9 Calibration

In this section, we outline our choice of functional forms and our calibration of parameters for the United States and Canada.

Households live for 10 periods. The length of each period is 5 years, and life begins at age 20. The utility function is $u(c) = \frac{c^{1-\sigma}-1}{1-\sigma}$, where $1/\sigma$ is the intertemporal elasticity of substitution. We use standard parameter values for the preference parameters as follows, and set $\beta = 0.96$ and set $\sigma = 2$.

There are two interest rates to calibrate. The savings interest rate is set equal to 4%, which is the average rate of return on capital reported by McGrattan and Prescott (2000) for the U.S. This implies that the risk free return on savings for a five year period is $(1.04)^5 - 1 = 22\%$. The second component of the borrowing interest rate is the transaction cost. We set this equal to 2.5%.

To calibrate the expense shock, we look at data on expenses that are both unexpected and beyond the direct control of a household. We consider three different sources of shocks: medical bills, divorces and unplanned pregnancies. All three of these shocks are frequently cited by bankrupts as the proximate cause of their bankruptcy. A more detailed discussion of our benchmark expense calibration is contained in Livshits, MacGee, and Tertilt (2002). In our experiments, the expense shocks can take on three values: $\kappa \in \{0, \kappa_1, \kappa_2\}$.

The income process is a five state Markov process, with support $\{z_1, z_2, z_3, z_4, z_5\}$.

4.10 Bankruptcy Rules

The parameters associated with bankruptcy, λ_1, λ_2, γ, $\overline{y}$, ϕ, χ_1, and χ_2 also need to be specified. We set $\lambda_1 = 0.04$ and $\lambda_2 = 0.02$. An important issue in calibrating garnishment levels is that households typically have to wait some time before defaulting. Bankruptcy codes contain general provisions that borrowers must act in "good faith," so that borrowing and immediately filing for bankruptcy runs some risk of being denied. The parameter γ is intended to capture this fact by requiring that agents must repay at least some fraction of their debt. Our benchmark value of γ is 0.25. We set the exemption level, $\bar{y}$, equal to 5% of mean earnings. We set $\phi = 1\%$ of average income, and χ corresponds to 15% and 5% of average consumption.

4.11 Some Suggestive Numerical Results

	Experiment	Defaults	Avg. r^b	d/y Bankrupts	d/y Borrowers	Debt / Income
1	Benchmark	0.75%	9.94%	3.22	1.21	11.83%
2	Lower κ	0.21%	8.59%	2.74	0.90	10.58%
3	Double χ	0.71%	9.87%	3.33	1.24	12.15%
4	$r^b = 0.09$	0.72%	11.45%	3.07	1.11	8.31%
5	$\bar{r} = 0.0986$	0.65%	9.35%	2.54	0.60	2.11%
6	$\bar{r} = 0.09$	0.66%	8.20%	2.40	1.19	0.26%

5 Have Households Become More Likely to File?

In this section we discuss two potential explanations of the rise in bankruptcy. The key prediction of both of these stories is that, holding household characteristics (i.e. income, debt-income, debt-net worth) constant, the probability of bankruptcy has

increased over time. The first story is that the "stigma" of filing for bankruptcy has fallen. This has reduced the cost of filing, which has led to more households filing for bankruptcy (Gross and Souleles (2002), Buckley and Brinig (1998)). The second story we discuss is whether legal changes lowered the "cost" of filing, and thus contributed to the rise.

5.1 A Decline in Stigma

There are two distinct versions of the stigma story. One version, which we discuss in this section, argues that changes in social norms have reduced the "utility" cost of filing for bankruptcy. The second version is that credit markets changes – in particular, the emergence of sub-prime lending – has reduced the cost of filing for bankruptcy by increasing the availability of credit after bankruptcy. We will return to this story in section 6.5.

The social norms story has been advanced by numerous authors. Buckley and Brinig (1998) argue that differential social norms account for much of the increase in filings over 1890-1991 and the variation in bankruptcy filings across federal judicial districts. Their conclusion is based on the results of a regression of the district bankruptcy filing rate per adult, a vector of legal variables, a vector of economic variables and a vector of social and economic variables. In an interesting and innovative paper, Gross and Souleles (2002) examine a dataset of credit card accounts representative of open credit card accounts in 1995. They follow a sample of these accounts for 24 months. They argue that the probability that a card holder with a given set of characteristics would default increased over their sample period.

5.1.1 Using Theory to Evaluate a Decline in Stigma

We can use our model to more fully understand the implications of a decline in stigma for consumer credit markets and bankruptcies. This corresponds to the experiment reported in line 3 in the table in Section 4.11. Here we double the "stigma" utility costs. We find that such an increase in stigma has little effect on defaults. Defaults decrease from 0.75% to 0.71%, and the overall debt to income ratio increases from 11.83% to 12.15%. These changes are very small compared to our other experiments. More importantly, higher stigma generates higher debt to income ratios for bankrupts (as well as for the entire economy). This is very intuitive, since higher values of stigma generate higher equilibrium thresholds for declaring bankruptcy. This prediction is problematic for explanations of the rise in bankruptcy based on decreased stigma (or

more lenient bankruptcy law). In the data, the debt to income ratio has increased, not decreased, over the last two decades. Moreover, there is no evidence the debt-income ratio of bankrupts has fallen over this period (if anything, it may have increased in the U.S.). Based on this, we conclude that decreased in stigma is not a promising explanation for the rise in consumer bankruptcies in the U.S. and Canada.

To Be Completed

5.2 Legal Changes

Several authors have argued that 1978 amendments to U.S. bankruptcy code play a key role in the rise of consumer bankruptcies. These amendments also coincided with a 1977 U.S. Supreme Court decision which removed restrictions on advertising by lawyers (McKinley (1997)). The 1978 amendments were motivated in part by concern over the high rate of consumer bankruptcies (Moss and Johnson (1999)). One objective was to make Chapter 13 more attractive (in part by allowing the discharge of certain debts not dischargeable under Chapter 7), so as to encourage debtors to repay part of their debts. Federal exemptions were also established which were more generous than those allowed in some states (bankrupts could chose federal or state exemptions)

Moss and Johnson (1999) point out that there are several reasons to doubt claims that the 1978 bankruptcy reform played a significant role in the rise of bankruptcy. First, subsequent reforms in 1984 (introducing good faith requirements) and 1994 appear to have had little effect on filing rates. Second, these amendments were actually quit minor.

The Canadian evidence provides an additional support to this view. As can be seen from Table ?, while Canadian bankruptcy legislation was tightened twice during the 1990's, no legislative relaxation occurred during the 1970's or 80's. The main changes in 1997 were to require additional contributions by bankrupts during the bankruptcy process from "surplus income". In addition, bankruptcy trustees were given the authority to determine if a bankrupt could file a consumer proposal (introduced in 1993) instead of seeking a discharge and the option to recommend that discharge be granted conditionally. New mediation provisions were also introduced to resolve conflicts between debtors, trustees and creditors so as to reduce the number of disputes reaching the court system. The flattening of bankruptcy filings after 1997 suggest that these amendments (which came into effect April 30, 1998) succeeded in their stated objective of making bankruptcy less attractive (Ziegal (1997)). In addition consumer proposals increased from roughly 3 percent of all consumer filings in 1996 to nearly

15 percent in 2002.

Table

Major Amendments of Canadian Consumer Bankruptcy Legislation

Year	Main Changes
1997	Surplus Income must be paid into estate for 9 months. Increased push for Consumer Proposals (means testing) Student loan non-discharge extended to 10 from 2 years
1992	Consumer proposals + Mandatory Counselling introduced (Ch. 13) Wage assignments unenforceable in bankruptcy Automatic discharges for first time bankrupts if unopposed Joint filings permitted (one fee)
1949	Summary-Administrative: streamlined filing if assets $<$ \$10000
1919	Gave consumers right to discharge without creditors approval

Source: Personal Insolvency Task Force Final Report (2002).

The 1992 amendments did relax the Canadian bankruptcy system along one dimension. Anderson and Schwartz (1998) note that joint filings were permitted in Canada, and only one filing fee was required for a joint filing, after the 1992 amendments.[21] The Office of he Superintendent of Bankruptcy (OSB) counts the number of people who file as the number of bankruptcies. This implies that there may have been a slight over counting of bankrupts in Canada after 1992. It is worth noting that this effect should be small, since joint filings were only 6 percent of the total in 1996.

A more important caveat, however, is that there was a significant administrative change in Canada in 1972. Prior to 1972, all bankrupts had to pay the trustees filing fee. Many trustees were unwilling to accept as clients people who were unable to the fee (roughly \$500 in 1970). To address this problem, the federal government introduced the Federal Insolvency Trustee Agency (FITA) in 1972 to provide bankruptcy services to Canadians who could not afford a trustee. By 1977, between one third and one half of all bankruptcies proceeded under FITA. The program was discontinued in 1979, after the bankruptcy system was streamlined so as to reduce the cost of processing cases and private trustees agreed to provide services to all applicants (Brighton and Connadis (1982).

To Be Completed

[21]Prior to 1992, joint filings only occurred in Quebec.

6 Has the Number of High Risk Households Increased

In this section, we discuss four stories of the rise of bankruptcies. All of these stories are predicted on an increase in the number of households at risk of bankruptcy.

There have been two sets of changes in consumer credit markets. The first set of occurrences has to do with deregulation. The second is technological change that has led to changes in the cost of granting credit and in the ability of lenders to evaluate borrower risk. Both of these factors may have led to increased borrowing by high risk individuals.

6.1 Has Uncertainty Increased?

In Livshits et al (2001) we emphasize the importance of unexpected bills in the bankruptcy decision together with uncertain future incomes. Certainly, increases in the volatility of income and increases in the magnitude or probability of sudden expenses would then lead to more bankruptcies. In this section we document the extent to which this uncertainty has changed over the last two decades. We find that it has changed surprisingly little.

6.1.1 Expense Uncertainty

The three events that are typically associated with unexpected expenditures are unplanned births, divorces, and sudden illness. The number of unintended and unwanted births has actually changed very little over the last two decades. The number of births has decreased slightly from 15.9 per 1,000 population to 14.3. The fraction of births that were intended has gone up from 61.9% in 1982 to 69% in 1995. On the other hand, births to unmarried women have gone up by almost 50%. However, since unintended births have declined, it seems hard to interpret the births by unmarried women as an increase in unplanned events. Moreover, births to other demographic groups typically associated with unplanned pregnancies, like the teenage birth rate, have actually declined quite slightly since 1980.[22] Similarly, divorce rates have declined as well from 5.3 divorces per 1,000 population in 1980 to 4.1 in 2000. It is true that the number of divorced (and not remarried) people have gone up, but the rate is what is of interest from the uncertainty point of view. Together, all this seems to

[22]Going back to 1970, the teenage birth rate has declined quite substantially, from 68.3 births per 1,000 women aged 15-19 in 1970 down to 43 in 2002.

	1980	1998
Births per 1,000 population	15.9	14.3
Births per 1,000 women aged 15-44	68.4	64.3
Intended Births*	61.9%	69%
Births per 1,000 unmarried women	29.4	43.3
Births per 1,000 teenagers (15-19 yrs old)	53	50.3
Divorces per 1,000 population	5.3	4.1#
Divorced percent of population	6.2%	9.9%
Medical oop spending per capita	$265	$737
Percent of Americans w/o health insurance	12.9$	15.5
Percent of 55-64 yr old w/o health insurance	9$	13

* Intended birth numbers are for 1982 and 1995 respectively.

This is from 2000. $ This is from 1987.

imply that, if there was any change at all, "demographic uncertainties" have declined not increased during the last two decades.

Medical expenses, on the other hand, have increased by a large amount. The average out-of-pocket (oop) medical spending has increased from $265 per person in 1980 to $737 in 1998. This is partly due to each person spending more on health care, but also due to more people not having health insurance. This trend is particularly pronounced for the elderly, the percentage of 55 to 64 year old persons without health insurance has increased by almost 50%.

Given the evidence above, an obvious question to ask is to what extend the change in "medical shocks" by itself can account for the increase in consumer bankruptcies since 1980 in the United States. The results of such an experiment is reported in the second line in table in Section 4.11. The table below shows the numbers used for the expense shocks both for the original calibration and for the experiment. The medical expense data used for the 1998 calibration uses medical out-of-pocket spending from the Medical Expenditure Panel Survey (MEPS).[23] This is combined with data on unwanted children and costs of divorces, and then for computational reasons collapsed into 3 shocks (see Livshits et al (2001) for details).

Unfortunately no medical panel survey exists for earlier years. The U.S. Health Care Financing Administration reports that aggregate out-of-pocket spending has increased from $265 per person in 1980 to $737 in 1998.[24] Assuming that the only

[23]The data is from the 1996 and the 1997 waves of the panel.

[24]See U.S. Statistical Abstract (2000) Table 151.

parameter in the household distribution of out-of-pocket spending that has changed is the mean, we can infer a distribution for 1980. We keep the shock probabilities constant and compute the average medical out-of-pocket expenditures for the highest 0.26 percent of the population as well as the next highest 11.5%. We report the shock magnitudes as a percentage of annual median income in 1980.

	π_1	π_2	$1-\pi_1-\pi_2$
Shock probability	11.5%	0.26%	88.24%
1980 Magnitude (percent of annual median income)	12.7	84	0
1998 Magnitude (percent of annual median income)	38	167	0

The computational results suggest that changes in expense uncertainty may be an important factor in explaining the rise in consumer bankruptcy in the United States. Using the 1980 expense shocks as described above, the default rate decreases from a quarter percent to a fifth of a percent of all households. The debt over income ratio on the other hand remains relatively high at 90% of income, relative to 121% in the benchmark calibration. This is in line with the data: overall debt to income ratio have changed relatively little. We conclude that changes in the health care system are an important factor in explaining the rise of consumer bankruptcies in the United States. More work needs to be done to assess this channel more carefully.

6.2 Income Uncertainty and Income Inequality

The increase in income inequality in the United States has been well-documented. Several authors have tried to disentangle the increase in earnings inequality from earnings instability. More uncertainty in income over the life-cycle could potentially play a big role in explaining the increase in consumer bankruptcy. However, the literature is inconclusive on the change in income uncertainty. Gottschalk and Moffitt (1999) summarize the findings of many different studies, some of which find no change in various measures of job and income uncertainty, while others do find an upward trend. Using data from the Survey of Income and Program Participation,Gottschalk and Moffitt (1999) find no upward trend in job turnover as well as no change in "involuntary" job separations. In another study, Gottschalk and Danzinger (1997) use PSID data and find no change in family income mobility between 1968 and 1991.

To Be Completed

6.3 Demographics Changes

6.3.1 Are the Boomers to Blame?

As outlined in section 2.2.1, bankruptcy filing rates are hump-shaped. This suggests that the aging of the baby-boomers could have contributed to the rise of bankruptcy filings by increasing the fraction of the population who belong to the high risk age groups.

Sullivan, Warren, and Westbrook (2000) used the filing rates they computed in 1991 to predict the effect of the aging population on U.S. bankruptcies during the 1980s. They concluded that this could account for nearly a fifth of the increase during the 1980s.

We undertook a similar experiment for Canada. Specifically, we fixed the bankruptcy filing rates at their 1977 level, and then multiplied each age group by the share of the population belonging to that age group. The demographic effect is minimal, and predicts less than a 2 percent increase in bankruptcies in Canada. This leads us to conclude that the direct effect of the aging baby boomers in the rise of Canadian bankruptcies is minimal.

6.3.2 Changes in Family Structure

TO BE COMPLETED

6.4 Deregulation of Consumer Credit Markets

A commonly heard story is that the liberalization of usury laws in the U.S. led to a rapid expansion of consumer credit, which in turn led to the rise in consumer bankruptcies (Athreya (2001), and Ellis (1998)).

Until the late 1970's, most states imposed maximum interest rates on consumer loans. These laws were removed by the early 1980s as a result of the Supreme court decision involving Marquette National Bank of Minneapolis v. First Omaha Service Corporation, 439 US 299 (1978). This ruling permitted banks in Nebraska to offer loans to resident of Minnesota at rates in excess of the maximum allowed under Minnesota legislation. This effectively removed the ability of individual states to limit interest rates. The argument is that this facilitated the increase in credit cards, as large credit card issuers relocated to states with the highest interest rate ceiling (Delaware and North Dakota).

The argument that this led to increased consumer bankruptcy is based upon the

timing. As figure ? illustrates, consumer bankruptcies in the U.S. begin to rise in the early 1980s – just after the removal of usury laws. During this time, there is also a rapid growth in high interest rate credit card debt, and the expansion of credit to riskier borrowers.

There are several reasons to doubt that the removal of usury laws was the cause of the rise of bankruptcies. First, as several authors have pointed out, financial innovations led to a fall in the costs of loan evaluation (i.e. credit scoring). Second, the Canadian evidence suggests that financial deregulation alone was not the cause of the rise of bankruptcies. Interest rate ceilings on bank loans were formally removed in the Bank Act of 1967, although these ceilings were largely ineffective, as borrowers were free to "voluntarily" agree to pay higher interest rates in the form of an upfront charge at the time of the loan (Scholnick (2000)). The Canada-U.S. comparison suggests that the Marquette decision itself did not cause the rise of consumer bankruptcies in the U.S. However, it may have facilitated this increase as it removed legal barriers to taking advantage of new lending technologies.

While this evidence leads us to doubt the direct impact of financial deregulation, we also report the results of several experiments on the impact of deregulation in Section 4.11. The benchmark calibration has no ceiling on interest rates. The average borrowing interest rate in that economy is 9.94%.[25] We then introduce a ceiling close to this average rate, i.e. no one is allowed to borrow at more than $\bar{r} = 9.86\%$. This does not change defaults by much. On the other hand, such a ceiling leads to a large decrease in consumer borrowing, as total debt falls from 11.83% to 2.11% of total labor income. Decreasing the ceiling even further (to 9%) makes no difference for the filing rates, but further decreases debt.

6.5 Financial Innovation

The past thirty years have witnessed the diffusion and introduction of numerous innovations in consumer credit markets. Many of these changes have been driven by the rapid improvements in information technology, which has led to large increases in information sharing and reduced the cost of processing information (Barron and Staten (2003). One example of the impact of these changes in the rapid spread of credit cards. A key contributor to this spread was the development of credit scoring models, and the reduction in information processing costs (Evans and Schmalnsee (1999)). More recently, these technological changes have contributed to the spread

[25]The maximum interest rate at which people actually borrow is not much higher either.

of other products, notably home equity lines of credit and a rapid increase in the "sub-prime" credit market, which provides credit to high risk consumers.

These changes may have important implications for our understanding of changes in the consumer credit and in the composition of credit across different households (see section 3). If financial market innovations led to increased credit for high risk households, then it may help to account for the rise in consumer bankruptcy. In this section, we highlight some of the key innovations that have occurred over the past thirty years. We use these facts to motivate a simple model that can qualitatively account for the extension of credit to risky households and increased bankruptcies.

6.5.1 Technical Innovations in Credit Markets

The information technology revolution has led to significant reductions in the cost of analyzing data. In credit markets, this has motivated increase analysis of the relationship between borrower characteristics and loan performance by lenders to better price loans (Barron and Staten (2003)). Berger (2003) argues that one of the main impacts of information technology has been in the increased sharing of information on borrowers between financial intermediaries. These factors are particulary important for credit markets, as lenders decisions on what terms to offer prospective borrowers depends crucially upon the information they have and the extent to which it helps them infer the borrowers credit worthiness. There are three sources of data with which to evaluate prospective borrowers. First, lenders have their own records (database) of past relationships (if any) with a prospective borrower and other borrowers. Second, they have the information on the borrower provided by the credit bureau. Third, they have the information provided by the borrower during the credit application process.[26]

One indication of the impact of these technological changes is the rapid increase in information on borrowers that is currently collected by credit bureaus and purchased by lenders. For every credit-using person in the United States, there is at least one (more likely three) credit bureau file (Hunt (2002)). The information in these files is widely used by lenders, as more than 2 million credit reports are sold by credit bureaus in the U.S. daily (Riestra (2002)).[27] The rapid growth in the number of credit reports

[26]This often includes current income and demographic statistics which are not included in credit reports.

[27]In Canada and the U.S., credit bureaus report data on both a borrowers payment history and on the stock of current debt. In addition, a borrowers employment history and income may also be reported. In some countries, only data on the payment history is available. The appendix contains

issued in the U.S. however, is even more striking. The number of consumer credit reports increased from 100 million in 1970 to 400 million in 1989, to more than 700 million today.

The widespread adoption of credit scoring to evaluate loan applicants has also contributed to the increased demand for information sharing and to the ability of lenders to sue this information. Credit scoring is the evaluation of the credit risk of loan applicants using historical data and statistical techniques (Mester (1997)). Credit scores are used both to evaluate initial loan applications, and to update the terms of revolving (credit card) debts. For example, credit card companies use credit scores to adjust credit limits (up and down) as well as to vary other terms (See Fair and Isaac articles). While lenders often have access to a large number of variables reported on loan applications and by credit bureaus (include monthly income, outstanding debt, financial assets, length of time in current job, past delinquencies, home ownership status and the type of bank account), credit scoring models often use only eight to 12 variables (the most predictive) since many of the potential variables are highly correlated.[28] There are two types of credit scores: those based solely on individual credit histories (usually based on credit-bureau records) and those that weigh additional factors (Avery et al (2000)). The first type are often called "bureau scores" or "credit history scores", while the second type are called "application scores" or "origination scores".[29]

Although the first attempt to implement credit scoring date from at least 1941, it has only become widely adopted over the past thirty years (Lewis (1992)).[30] After WW II, some U.S. retailers attempted to implement credit scoring rules when evaluating loans. The early use of credit scoring was limited (due to the lack of computers) to a few tables which were supposed to be used by loan offices to help evaluate

a more detailed discussion of the data reported by credit bureaus.

[28]Lenders are prohibited from using certain variables as well: the borrowers age, sex, marital status, race and religion.

[29]Avery et al (2000) note that "bureau scores" may suffer from omitted variable bias. Bureau scores typically use only credit history data, and omit factors such as income, employment experience and health status. To check the extent of this problem, they examine a sample of Equifax credit scores. These scores do not have detailed data on household characteristics, so they use data from census areas (match using ZIP codes on the credit scores) on average income, average demographic characteristics and unemployment rates. They conclude that the omitted variable bias exists, but is quantitatively small, although people with poor credit histories are likely to find it difficult to access future credit.

[30]Durand (1941) attempted to identify the characteristics of good and bad borrowers using 7200 installment loans from 73 companies.

applicants (although many loan officers initially resisted the new technology). The initial work on computer based models of credit scoring was begun by William Fair, Earl Isaac and Earl Follett in the 1950s. They argued that statistical information on the likelihood of their repaying credit could be used to rank borrowers credit quality. Moreover, this technique would allow intermediaries to identify the quality of different groups credit risk instead of pricing credit based on the average population. Another motivation for credit scoring was to reduce the costs of evaluating loans applications by automating the credit evaluation process.

There was a substantial spread of credit scoring throughout the consumer credit industry during the 1980s and 1990s (McCorkell (2002), Engen (2001), Asher (1994)). The significant development of credit scoring coincided with – and was necessary for –the development of the credit card industry (Evans and Schmalnsee (1999), Johnson (1992)).[31] Not surprisingly, larger banks have tended to be much more likely to adopt credit scoring than smaller banks (Berger (2003)), although banks of any size could access this technology by purchasing scores from other providers. The diffusion of credit scoring is reflected in usage figures. The American Banking Association (ABA) reported that the fraction of large banks using credit scoring as a loan approval criteria increased from half in 1988 to nearly seven-eights in 2000 (Installment Lending Report ?).[32] The fraction of large banks using fully automated loan processing (for direct loans) increased from 12 percent in 1988 to nearly 29 percent in 2000.

There is substantial evidence that the spread of credit scoring has lowered transaction costs and led to more accurate pricing of loan risk. Mester (1997) reports the findings of several case studies which documented a decrease in the time required to evaluate loan applications from weeks to hours. She also reported that credit scoring facilitated the low cost evaluation of loan applicants, with one study reporting that the price per loan of a commercially available credit scoring model averages about \$1.5 to \$10.00 per loan (depending upon volume).

Edelberg (2003) also argues that lenders have become better at identifying higher risk borrowers and have adjusted interest rates accordingly. Barron and Staten (2003) provide an interesting discussion of changes in credit card markets during the early 1990s. They argue that credit cards companies have rapidly expanded their use of risk based pricing, which led to substantial declines in interest rates for low risk customers and increased interest rates for higher risk consumers. Finally, an early

[31]This change can be seen in the displacement of installment credit by credit card debt. Prior to credit cards, most credit was tied to the purchase of a specific product - refrigerators, washing machines - or to the purchase of goods within a merchants store.

[32]Small and medium size banks are slower adopters.

study by Chandler and Parker (1989) argued that the use of credit bureau information in credit scoring formula's could dramatically increase the ability of lenders to predict problem loans.

Further support for the significant impact of credit scoring on lending comes from studies of small business lending. Frame et al (2001) find that the adoption of credit scoring by banks to evaluate small business loans led to an increase in the quantity of loans offered. Berger, Frame and Miller (2002) found that the use of scoring for small business credit led to the extension of credit to "marginal applicants". These loans tended to be at higher interest rates and higher risk when originated.

The evidence on changes in household borrowing is also consistent with credit market improvements. Black and Morgan (1999) document, the most rapid increase in both credit card usage and debt has been among the poorest households. Kennickell, Starr-McCluer and Surette (2000) also find that the largest increases in the ratio of debt payments to income over 1989 to 1998 were for low income household.

TO BE COMPLETED....

6.6 Improvement in Credit Technology and Adverse Selection

In this section, we outline a simple model of how improvements in credit technology can lead to increased defaults. The basic story is intuitive. Suppose that creditors cannot initially distinguish between different types of households who have different default probabilities. Now suppose that the credit technology improves, so that the lender is able to distinguish between different types of households. It may then find it profitable to increase the amount of credit extended to some (risky) households which were previously excluded from the market. This would lead to higher default rates and higher credit for what were initially considered to be high risk households.

6.6.1 A Simple Model of Credit Technology Improvements with Adverse Selection

This two-period model is populated by three types of people: G, B and U. Their respective measures are μ_G, μ_B and μ_U. Type G is always recognized by lenders at no cost. The other two types may be indistinguishable from the lenders' perspective. They have the same deterministic endowment e_1 in period 1. Their endowment in period 2 takes value e^H with probability π_i, and e^L with probability $1 - \pi_i$. It is helpful to think of the following parameter restrictions: $e^H > e^L$, $\pi_G \geqslant \pi_B \gg \pi_U$,

and $e_1 < e^L$ or "sufficiently small".

Households' preferences are represented by $U(c_1, c_2) = u(c_1) + \beta E u(c_2)$. Households can borrow from or save with competitive financial intermediaries. In the second period, households have an option of defaulting on their loans. The punishment for default is twofold: there is a cost γ proportional to income (endowment) and type-specific fixed cost ϕ_i.

We will follow the following convention:

$$\phi_U + e^L\gamma < \phi_B + e^L\gamma < \phi_U + e^H\gamma < \phi_B + e^H\gamma \tag{6.1}$$

Note that everyone will always repay loans up to $\bar{d} = \phi_U + e^L\gamma$.

6.6.2 Blind Lenders

Consider the environment where lenders cannot distinguish households of type U from those of type B. This can arise either when the costs involved are prohibitively high or when the signal about the types is sufficiently uninformative.

For a range of parameter values (see example below), the unique equilibrium is one in which all households of types B and U borrow (promise to repay) exactly $\bar{d}$ in the first period and always fulfill their obligations.

Depending on their beliefs, lenders offer the following price schedules:

- If the lenders believe that everybody is equally likely to deviate,

$$q(d) = \begin{cases} \bar{q} & b \le \phi_U + e^L\gamma \\ \frac{\mu_B + \mu_U\pi_U}{\mu_B + \mu_U}\bar{q} & \phi_U + e^L\gamma < d \le \phi_B + e^L\gamma \\ \frac{\mu_B\pi_B + \mu_U\pi_U}{\mu_B + \mu_U}\bar{q} & \phi_B + e^L\gamma < d \le \phi_U + e^H\gamma \\ \frac{\mu_B\pi_B}{\mu_B + \mu_U}\bar{q} & \phi_U + e^H\gamma < d \le \phi_B + e^H\gamma \\ 0 & d > \phi_B + e^H\gamma \end{cases} \tag{6.2}$$

- If the lenders believe that deviants come from type U only,

$$q(d) = \begin{cases} \bar{q} & d \le \phi_U + e^L\gamma \\ \pi_U\bar{q} & \phi_U + e^L\gamma < d \le \phi_U + e^H\gamma \\ 0 & d > \phi_U + e^H\gamma \end{cases} \tag{6.3}$$

In order for this to be an equilibrium, a few conditions should be satisfied (generating corresponding restrictions on parameter values):

- Type B households do not want to borrow more than $\bar{d}$ at equilibrium rates. This restriction is almost trivial in the second specification of beliefs, while in the first specification requires sufficiently large μ_U and/or sufficiently low π_U.
- Type U must want to borrow more than $\bar{d}$ at risk-free rate (whether for consumption smoothing or out of pure opportunism).

Consumers of type G face prices

$$q_G(d) = \begin{cases} \bar{q} & d \leq \phi_G + e^L\gamma \\ \pi_G\bar{q} & \phi_G + e^L\gamma < d \leq \phi_G + e^H\gamma \\ 0 & d > \phi_G + e^H\gamma \end{cases} \tag{6.4}$$

borrow $d_G \in (\phi_G + e^L\gamma, \phi_G + e^H\gamma]$ and default with probability $(1 - \pi_G)$.

The default rate in this environment is $\frac{(1-\pi_G)\mu_G}{\mu_G+\mu_B+\mu_U}$.

6.6.3 Enlightened Lenders

When lenders can distinguish households of type U from those of type B, the unique equilibrium (for our range of parameter values) is characterized by borrowing profiles $d_U = \bar{d} = \phi_U + e^L\gamma$ and $d_B \in (\phi_B + e^L\gamma, \phi_B + e^H\gamma]$. The individual bond prices are:

$$q_B(d) = \begin{cases} \bar{q} & d \leq \phi_B + e^L\gamma \\ \pi_B\bar{q} & \phi_B + e^L\gamma < d \leq \phi_B + e^H\gamma \\ 0 & d > \phi_B + e^H\gamma \end{cases} \tag{6.5}$$

$$q_U(d) = \begin{cases} \bar{q} & d \leq \phi_U + e^L\gamma \\ \pi_U\bar{q} & \phi_U + e^L\gamma < d \leq \phi_U + e^H\gamma \\ 0 & d > \phi_U + e^H\gamma \end{cases} \tag{6.6}$$

Borrowers of type B default with probability $(1 - \pi_B)$, while borrowers of type U always repay their debts. Behavior of type G borrowers is the same as in the previous environment. Thus, the aggregate bankruptcy rate is $\frac{(1-\pi_G)\mu_G+(1-\pi_B)\mu_B}{\mu_G+\mu_B+\mu_U}$.

6.6.4 An Example

Take utility function $u(c) = \frac{c^{1-\sigma}-1}{1-\sigma}$ with $\sigma = 2$ and $\beta = 0.9$; endowments $e_1 = 1, e^L = 3, e^H = 10$ with corresponding probabilities $\pi_G = 0.98, \pi_B = 0.95, \pi_U = 0.3$; interest rate $r = 0.2$, and bankruptcy parameters $\phi_G = \phi_B = \phi_U = 0.1, \gamma = 0.25$.

Note that in this economy people always repay debts up to $\bar{d} = 0.85$ and never repay debts over $\bar{D} = 2.6$.

If lenders cannot distinguish between B and U, the equilibrium is $d_G = \bar{D} = 2.6$, $d_B = d_U = \bar{d} = 0.85$. The aggregate default rate is $\frac{0.02\mu_G}{\mu_G+\mu_B+\mu_U}$.

If lenders can distinguish between all the types, the equilibrium is $d_G = d_B = \bar{D} = 2.6$, $d_U = \bar{d} = 0.85$. The aggregate default rate is $\frac{0.02\mu_G+0.05\mu_B}{\mu_G+\mu_B+\mu_U}$.

7 Conclusion

TO BE COMPLETED

References

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

Anderson, L., and S. Schwartz (1998): "An Empirical Study of Canadians Seeking Bankruptcy Protection," Industry Canada, http://strategis.ic.gc.ca/SSG/ca0089e.htm.

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

——— (2001): "The Growth of Unsecured Credit: Are We Better Off?," *Economic Quarterly*, 87(3), 11–33.

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

Barron, J. M., and M. Staten (2003): "The Value of Comprehensive Credit Reports," in *Credit Reporting Systems and the International Economy*, ed. by M. J. Miller, pp. 273–310. MIT Press.

Berger, A. (2003): "The Economic Effects of Technological Progress: Evidence from the Banking Industry," *Journal of Money, Credit and Banking*, 35(2), 141–176.

Bertaut, C., and Starr-McCluer (2000): "Household Portfolios in the United States," Federal Reserve Board of Governors, mimeo.

Black, S., and D. Morgan (1999): "Meet the New Borrowers," *Federal Reserve Bank of New York Current Issues in Economics and Finance*, 5(3), 1–6.

Brighton, J.W. and Connadis, J.A. (1982): *Consumer Bankrupts in Canada*Consumer and Corporate Affairs Canada, Ottawa.

Buckley, F., and M. F. Brinig (1998): "The Bankruptcy Puzzle," *The Journal of Legal Studies*, XXVII, 187–207.

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

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

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

Durkin, T. A. (2000): "Credit Cards: Use and Consumer Attitudes, 1970-2000," *Federal Reserve Bulletin*, pp. 623–634.

Dynan, K., K. Johnson, and K. Pence (2003): "Recent Changes to a Measure of U.S. Household Debt Service," *Federal Reserve Bulletin*, pp. 417–427–21.

Edelberg, W. (2003): "Risk-based Pricing of Interest Rates in Household Loan Markets," *mimeo, Federal Reserve Board*.

Ellis, D. (1998): "The Effect of Cosnumer Interest Rate Deregulation on Credit Card Volumes, Charge-Offs and the Personal Bankruptcy Rate," *FDIC Bank Trends*, 98(5).

Engen, J. (2001): "Blind Faith," Banking Strategies.

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

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

Gottschalk, P., and S. Danzinger (1997): "Family Income Mobility – How Much is There and Has It Changed?," *Boston College Working Paper 398*.

Gottschalk, P., and R. Moffitt (1999): "Changes in Job Instability and Insecurity Using Monthly Survey Data," *Journal of Labor Economics*, 17(4), S91–S126.

Gross, D., and N. Souleles (2002): "An Empirical Anaylsis of Personal Bankruptcy and Delinquency," *The Review of Financial Studies*, 15(1), 319–347.

Hunt, R. A. (2002): "The Development and Regulation of Consuemr Credit Reporting in America," *Federal Reserve Bank of Philadelphia Working Paper No. 02-21*.

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

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

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

Lewis, E. (1992): *Credit Scoring and Credit Control from Four Points of View*vol. Credit Scoring and Credit Control. D.B. Clarenden Press, Toronto.

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

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

Livshits, I., J. MacGee, and M. Tertilt (2002): "Consumer Bankruptcy: A Fresh Start," *Federal Reserve Bank of Minneapolis Working Paper*.

Luckett, C. (2002): *Personal Bankruptcies*vol. The Impact of Public Policy on Consumer Credit, pp. 69–102. Kluwer Academic Punlishers.

Maki, D. M. (2000): "The Growth of Consumer Credit and the Household Debt Service Burden," Board of Governors of the Federal Reserve System, mimeo.

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

McKinley, V. (1997): "Balloning Bankruptcies," *Regulation*, pp. 33–40.

Mester, L. (1997): "What's the Point of Credit Scoring," *Federal Reserve Bank of Philadelphia Business Review*, pp. 3–16.

Moss, D. A., and G. A. Johnson (1999): "The Rise of Consumer Bankruptcy: Evolution, Revolution or Both?," *American Bankruptcy law Journal*, 73, 311–352.

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

Ramsay, I. (1999): "Individual Bankruptcy: Preliminary Findings of a Socio-Legal Analysis," *Osgoode Hall Law Journal*, 37(1), 16–82.

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

Scholnick, B. (2000): "Regulation, Competition and Risk in the market for Credit Cards," *Canadian Public Policy*, XXVI(2), 171–181.

Schwartz, S. (1999a): "The Dark Side of Student Loans: Debt Burden, Default and Bankruptcy," *Osgoode Hall Law Journal*, 37, 307–338.

——— (1999b): "The Empirical Dimension of Consumer Bankruptcy: Results from a Suvey of Canadian Bankrupts," *Osgoode Hall Law Journal*, 37, 84–125.

Sullivan, T., D. Thorne, and E. Warren (2001): "Young, Old and In Between: Who Files for Bankruptcy?," *Norton Bankruptcy Law Adviser*.

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

Sullivan, T. A., E. Warren, and J. L. Westbrook (1999): *As We Forgive Our Debtors: Bankruptcy and Consumer Credit in America*. Beard Books, Washington, D.C.

——— (2000): *The Fragile Middle Class*. Yale University Press, New Haven and London.

Westbrook, J. l. (1999): "Comparative Empiricsim," *Osgoode Hall Law Journal*, 37, 143–154.

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

A Figures

Figure 1: Bankrupts per 1000 18-64.

Canada: Consumer Bankruptcies plus consumer proposals. The numerator is the total number of *bankruptcy petitions* filed. Joint filing is permitted when two people have interelated finances, so this may understate the total number of bankrupts.

B Surveys of Bankrupts

We report results from three studies of Canadian bankrupts. These are:

1. Brighton, J.W. and Connadis, J.A. (1982) Survey of bankrupts in 1977 conducted for Consumer and Corporate Affairs. The data were drawn from files of bankrupts who filed during 1977. The total number of files examined was 1509, while the total number of filings in 1977 was 12, 772. The sample oversampled those who filed under FITA, as 577 out of 4,729 FITA files were sampled while 921 of 8043 private (non FITA) files were examined.

   The FITA subsample had substantially smaller liabilities then the non-FITA subsample, with a mean of $\$10,733$ versus \$28863.

2. Anderson and Schwartz (1999):

   This is a followup survey of bankrupts (commissioned by the Office of Consumer Affairs of Industry Canada) conducted in March, April 1997 by Anderson and Schwartz (1999). Many of the results of this study are reported by Schwartz (1999). The survey was conducted by contacting bankruptcy trustees who had handled at least 100 cases in 1996. In total, 129 trustees were contacted. The fifteen trustees who had handled the largest number of cases in each province were selected (with the condition that each firm could have at most one trustee in the sample) and an additional 33 trustees were randomly selected. (This sample selection procedure effectively over samples the small provinces in Canada - which matters since PEI has a population of roughly 130,000 while Ontario has a population of roughly 9 million. Despite this, the completed sample of bankrupts slightly underweights the eastern provinces, Quebec and Ontario and slightly oversamples the West). In the end, 75 of the trustees contacted agreed to participate. The trustee's were asked to encourage each bankrupt they dealt with to fill out a questionnaire. In the end, 1094 completed surveys were received from 63 trustees. During early March-May of 1997, 17,115 people filed

for consumer bankruptcy. The sample population was slightly younger than the population.

3. Ramsay (1999): Survey of bankrupts in Toronto in 1994.

   Ramsay (1999) examines a sample of Ontario bankrupts from 1994. The sample is drawn from Toronto, which processed just under 20 percent of all bankruptcies in 1994. A random sample of 1147 (out of 10,354 consumer bankruptcies + the individual business bankruptcies (a subset of the total 1556 business bankruptcies))) individual bankruptcies files from January-December 1994 from the Toronto bankruptcy district were used. Since only monthly income was reported in the bankruptcy files, annual incomes were constructed by multiplying monthly income by 12.

   Ramsay (1999) found that bankrupts are both asset and income poor when they file. Roughly one-third of bankrupts were unemployed when they filed, he argued that the evidence suggested that individuals had exhausted assets to avoid bankruptcy. He also found that 44 percent of his sample was female, 55 percent was married or in common law relationship and 10.1 percent were divorced (only 5.3 percent of the Ontario population was divorced). He also reported that over 40 percent of bankrupts had total liabilities less than $\$30,000$, and almost 1/3rd had liabilities over $\$100,000$ (most of which was mortgage debt).

While there are several empirical studies of U.S. bankrupts. Unfortunately, empirical studies of U.S. bankrupts have not been conducted on quite as large a scale. The most well known are those associated with the work of Sullivan, Warren, and Westbrook (1999) and Sullivan, Warren, and Westbrook (2000).

1. Sullivan, Warren, and Westbrook (1999): The 1981 study involved a sample of 1,550 debtors from ten judicial districts in three states: Illinois, Pennsylvania and Texas. This study was based upon what was reported in the bankruptcy file.

2. Sullivan, Warren, and Westbrook (2000): This is a 1991 study of bankrupts in 16 federal districts in Illinois, Pennsylvania, Texas, California and Texas. In this study, written surveys were used to collect information on each bankrupt. In addition, financial data on bankrupts in five of the districts were collected from court records.

3. Domowitz and Sartain (1999) examine of sample of household who filed for bankruptcy before and after the 1978 Bankruptcy. The sample includes 580 households who filed from bankruptcy under Chapter VII, 670 under Chapter 7, 239 under Chapter XIII and 403 under Chapter 13. The data is based on court records, which omit demographic factors but does report marriage, employment and occupational status.

C Household Data

For the U.S., we use data from the Survey of Consumer Finances. For Canada, household level data on income, asset holdings and debts exists is available for Household level data for Canada for 1977, 1984 and 1999. The 1977 and 1984 surveys were special questionaires included with the Survey of Consumer Finances in Canada (called the Assets and Debt Survey). The 1999 Survey of Financial Security was conducted as an independent survey, and oversampled upper income households. The sample for these surveys represented families and individuals in the 10 provinces except for military personal, households living on Indian reservations and inmates of institutions. Economic family units are defined as groups of two or more persons who live in the same dwelling and are related to each other by blood, marriage, common-law or adoption and unattached individuals.

D Credit Bureaus and Credit Reports

Credit Bureaus exist in most developed countries. In Canada and the U.S., credit bureaus report data on both a borrowers payment history and on the stock of current debt. In addition, a borrowers employment history and income may also be reported.Pagano and Jappelli (1993) note that credit bureau first arose in the United States in the late nineteenth century. However, there have been three periods of rapid growth in information sharing: the 1920s, the 1950s and the 1980s. During the 1920's, credit bureaus began to supply information about the credit history of borrowers and their current debt exposure in addition to past defaults. During the 1950s the number of credit bureaus increased, with the membership of the ACB increasing from 1453 in 1948 to 1700 in 1950. The number of credit reports reached 60 million in 1960, and coverage of the consumer population become nearly complete. (Pagano and Jappelli (1993)) The growth during the 1970s was reflected in the rapid increase in consumer credit reports, which increased from 100 million in 1970 to 400 million in 1989. Un-

like the earlier growth periods, the 1970s and 1980s witnessed consolidation of the industry, with the disappearance of over 900 independent bureaus and the emergence of three large credit bureaus which dominated the market.

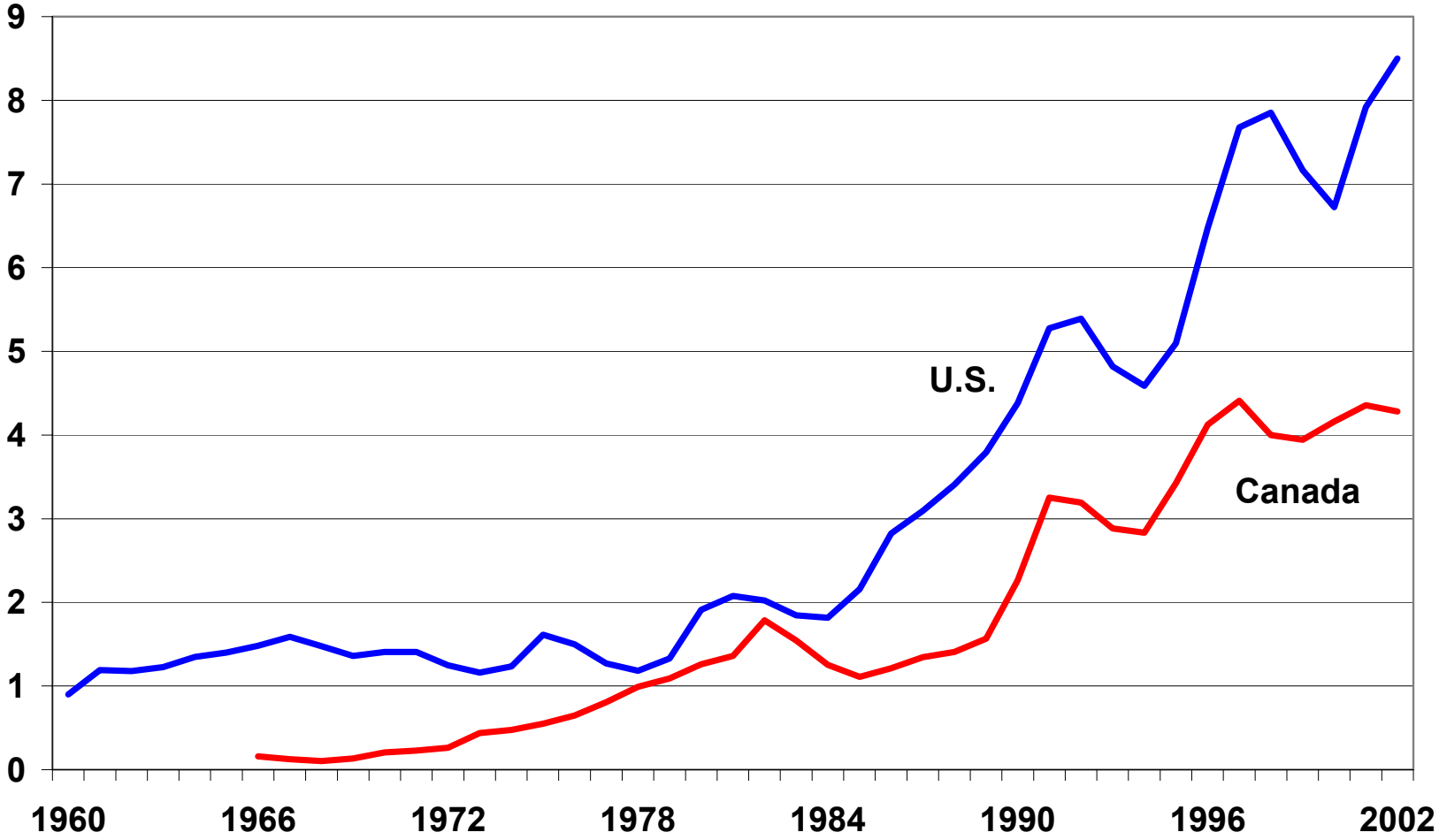
The data that can collected (reported) as well as the maximum length of time that it can be reported by credit bureaus is generally regulated by the government. This partially accounts for differences in both the data reported and the length of time that data is stored across countries. Some countries only permit the reporting of "negative: information such as defaults, while other countries also permit positive data such as a consumers outstanding balances (Riestra (2002)).

Klein (2001) notes that credit reports in the U.S. usually contain the following information:

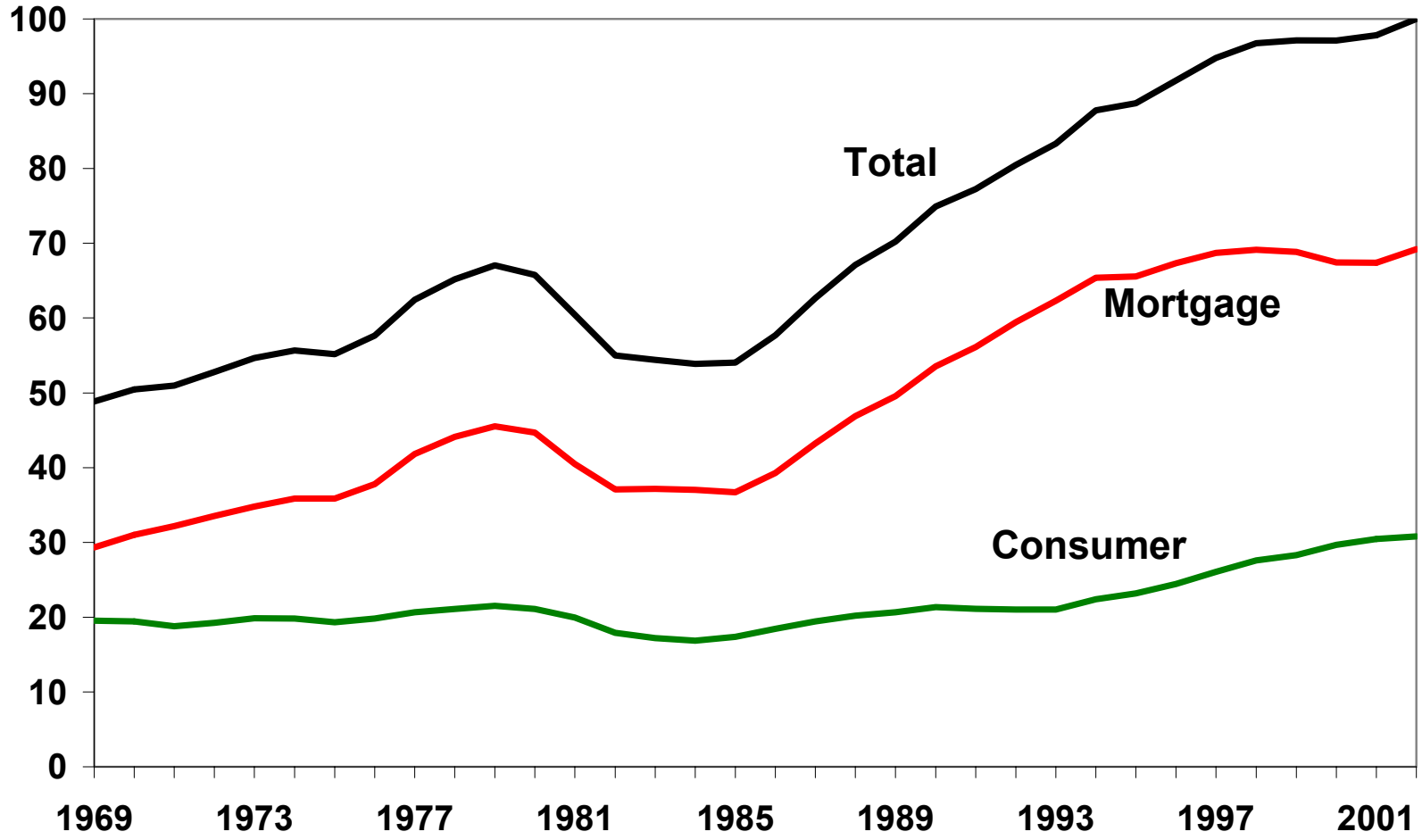
Name, address, Social Security number, place of employment, spouse's name, open credit lines, outstanding credit balances, credit limits, history of timeliness of payments, amount of last payment, bankruptcies, liens, child-support payments, public judgments against consumer.

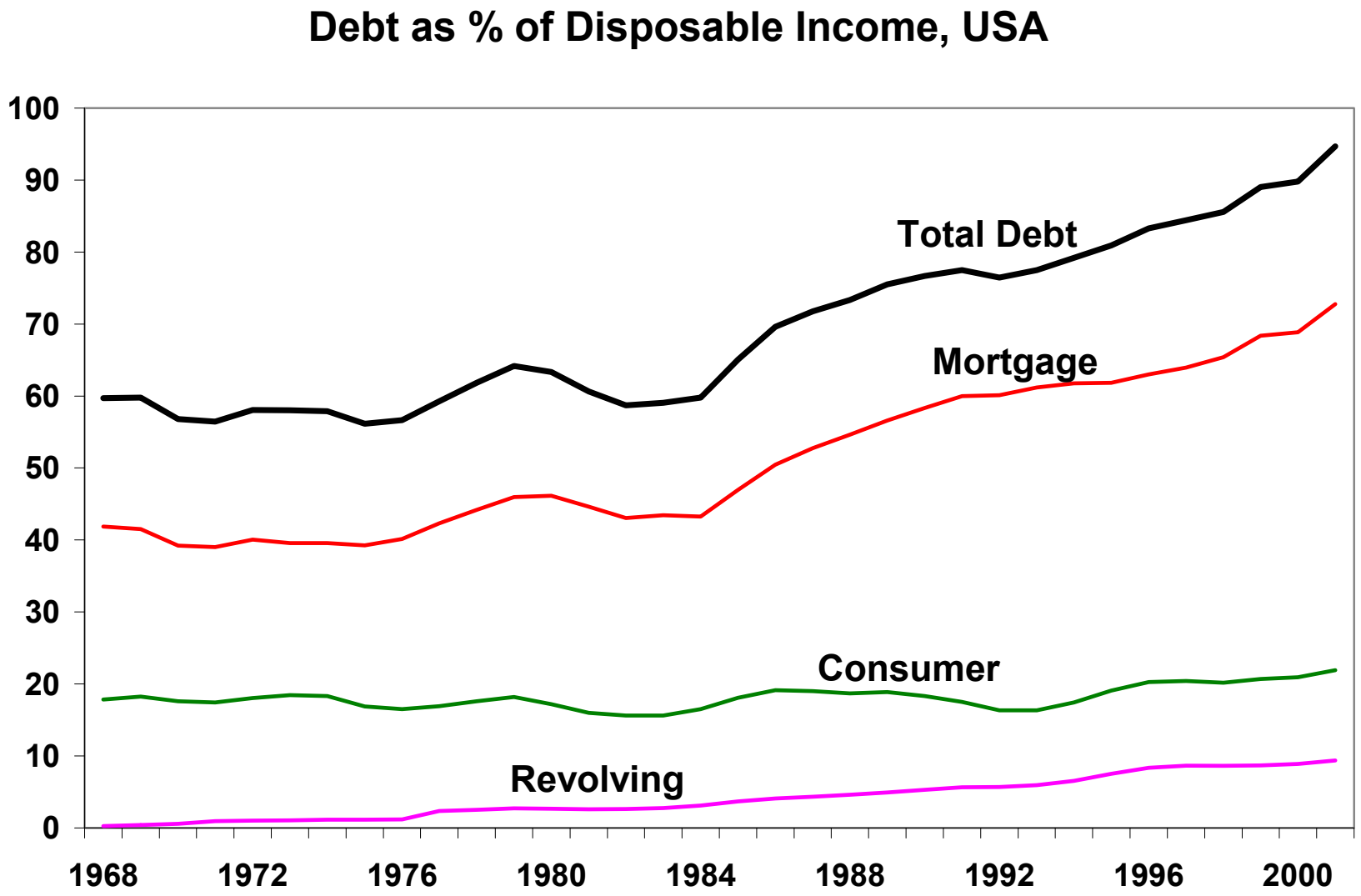
A similar set of variables are reported in Canada. In both countries, there are limitations on how long certain things can be reported in the file.

Consumer Bankruptcies per 1000 of 15-64 yr old



Debt as % of Disposable Income, Canada




Debt as % of Disposable Income, USA
100
90
80
70
60
50
40
30
20
10
0
1968
1972
1976
1980
1984
1988
1992
1996
2000
Total Debt
Mortgage
Consumer
Revolving