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Consumer Debt and default: A Macro Perspective

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1 Introduction

Debt is an important means for households to smooth consumption over time. Consumer debt, excluding mortgages, currently amounts to about 25% of disposable income in the United States.[1] Roughly 70% of households own a bank credit card with almost 40% actually using their card to borrow.

Consumer debt is subject to default as borrowers might be unwilling or unable to service their debts. Consumers can default informally by simply stopping repayments and becoming delinquent or consumers can default formally by declaring bankruptcy. By defaulting on outstanding debt, borrowers have access to an important insurance device. In recent years, formal bankruptcy rates have been as high as 1.5% of all households. However, default matters not only to the defaulter but impacts every borrower in the economy through changes in credit supply. When designing credit contracts, financial intermediaries take into account nonpayment risks. Thus, credit supply depends directly on the prevalence of default. More risky borrowers face tighter credit

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[1]Mortgages are much larger, currently about 65% of disposable income. While mortgages are clearly important, this survey will be narrower in scope and focus exclusively on unsecured consumer credit. Detailed sources for all measures in the introduction are given in Section 3.

constraints and pay higher interest rates in equilibrium. These consequences for credit supply are important on the macroeconomic level: interest rates on consumer credit are well above the risk-free rate. Personal loans carry real interest rates around 8% p.a. and average credit card rates are easily around 12%. Clearly, these rates are much higher than the risk-free interest rate. While some of the observed spread is due to screening efforts and other costs of managing accounts, a significant part is due to the nonpayment risk induced by the possibility of default.

Besides the direct effect of default on credit supply, evidence is mounting that default also directly impacts macroeconomic conditions. Especially since the financial crisis of 2007/08, interest in understanding the importance of default for the business cycle has intensified. Many studies have found the supply of credit and the availability of bankruptcy to have a significant impact on aggregate demand, aggregate supply and employment.[2] Besides having macroeconomic effects, debt and defaults clearly also move with the cycle.[3]

Despite the important role of default, the large majority of macroeconomic models fully abstracts from it. For example, models in the spirit of Aiyagari (1994) assume exogenous borrowing limits such that repayment is feasible and fully enforced in all states of the world. While models with limited enforcement in the spirit of Kehoe and Levine (1993) and Kocherlakota (1996) allow for the hypothetical option of default, borrowing limits are determined such that default never occurs in equilibrium. Consequently, borrowing interest rates cannot reflect default risk.

The goal of this survey is to review the literature that does take equilibrium default and its effects on interest rates, borrowing constraints, and welfare seriously.[4] We also provide a comprehensive overview of the legal framework in the US, document key facts about unsecured debt and default in the US, and use a standard workhorse model to discuss the importance of different default costs.

[2]For example, Auclert, Dobbie, and Goldsmith-Pinkham (2019) argue that the (unsecured) debt forgiveness provided by the U.S. consumer bankruptcy system helped stabilize employment levels during the Great Recession. Herkenhoff (2019) argues that unsecured debt that is subject to consumer bankruptcy is partially responsible for jobless recoveries. Mian, Sufi, and Verner (2017) argue based on international data that high levels of (secured) household debt are causally responsible for slower growth and higher unemployment and Mian, Rao, and Sufi (2013) emphasize the important role that mortgage debt played for the drop in consumption during the 2006-09 economic downturn in the US. Auclert and Mitman (2018) explore the macroprudential potential of bankruptcy legislation.

[3]See Gordon (2015), Fieldhouse, Livshits, and MacGee (2016), and Nakajima and Ríos-Rull (2019).

[4]See also Athreya (2005) and Livshits (2015) for two previous surveys on the subject.

During the last 15 years, a sizeable literature has developed that employs quantitative macroeconomic models to analyze topics in consumer finance with a special emphasis on bankruptcy.[5] As in most of macroeconomics, these questions concern the big picture that is relevant for large parts of the population, rather than focussing on specific subgroups or regions. In contrast to the more recent empirical consumer finance literature that uses novel data sets to shed light on similar issues, the quantitative macroeconomic literature has an important theoretical dimension to it.[6] In this survey we focus on papers that develop structural models, solve them numerically on the computer, calibrate them to data, and then use these quantitative models to examine counterfactuals or conduct policy experiments.

The questions this literature is trying to answer are both of positive and normative nature. For example, what caused the dramatic increase in bankruptcy filings over time? Has financial innovation changed supply and demand for consumer credit? What were the implications of recent legal changes, such as the 2009 *CARD Act* or the 2005 *Bankruptcy Abuse Prevention and Consumer Protection Act*? Why are laws so different across countries and should they be changed in some countries? Is the current bankruptcy law optimal or how could it be improved?

In addition to policy questions, the literature also contributes methodologically. For example, how to best model unsecured lending? Is it best captured through a series of one-period contracts or are long term considerations important? How should credit contracts be represented, as interest rate schedules dependent on the level of debt or rather as lines of credit? Do people face type-specific credit contracts with heterogeneous interest rates or are consumers pooled into a common contract? What are the implications of informal default or delinquency vis-à-vis formal bankruptcy? In light of fixed bankruptcy filing fees, what are the option of a consumer who cannot repay her debt yet cannot afford default either?

We start this survey with a detailed description of U.S. consumer bankruptcy law and relevant changes in the institutional setup over time. We proceed with a comprehensive empirical section, describing facts that serve two purposes: they provide the relevant

[5]The quantitative literature on sovereign debt and default uses somewhat related models, see Aguiar and Amador (2014, Section 4) for a recent survey.

[6]The recent empirical literature includes Agarwal et al. (2015b), Nelson (2019), Gross, Notowidigdo, and Wang (2014), Dobbie and Song (2015) and Herkenhoff, Phillips, and Cohen-Cole (2018) among others.

empirical background and serve as important targets for calibrating quantitative models. Specifically, we construct a long time series of consumer debt, defaults and delinquencies, as well as charge-off and interest rates for the United States. We document the well-known fact that debt and defaults rose in parallel for a long time. Second, we construct life-cycle profiles of these variables using data from the Survey of Consumer Finances. We show that debt and defaults display a clear hump-shaped profile by age. Third, we cut the data on credit card debt based on income quintiles. Several clear patterns emerge – credit card ownership and usage of cards to borrow is much higher at the top of the income distribution than the bottom. However, the poor have been catching up substantially over time. Finally, we document a large amount of heterogeneity in credit card interest rates across consumers. The dispersion of rates has been increasing over time. While some of these facts are well-known, some of the details have not been documented yet. We thus see the empirical section as an important part of our survey.

After laying out the facts, we move on to describe what has by now become the workhorse model of consumer credit and default. Along the way, we discuss various modeling alternatives. We briefly discuss a quantitative version of the model and to what extent it can match the debt and default facts, not just in the aggregate but also over the life-cycle. We use the quantitative model to decompose the main reasons for default. We also use the model to illustrate the importance of the details of default costs. Different kinds of costs have been used in the literature – fixed vs. proportional and monetary vs. utility costs – and we show that these details matter quantitatively. The remainder of the survey then discusses the literature centered around two questions. First, what are the welfare implications of various bankruptcy laws? And second, what caused the rise in filings over time?

Necessarily this survey is limited in scope. Specifically, we focus on formal default rather than delinquency and informal default. The survey analyzes unsecured consumer credit only (most importantly, credit cards) and abstract from secured credit such as mortgages, auto loans, and home equity lines of credit. The empirical emphasis will be on the US.[7] Finally, as mentioned above, we will describe quantitative theory contributions, and mention the growing empirical literature only in passing.

[7] This is a consequence of the overwhelming part of the literature focusing on US data, laws, and policies rather than resulting from deliberate selection. In fact, we strongly believe that investigating credit markets in other countries could lead to fruitful avenues for future research.

In what follows, we first describe the legal framework in the US (Section 2) and document the facts (Section 3). Section 4 describes the workhorse model that is at the core of the vast majority of contributions to the literature. Section 5 uses this model to analyze welfare implications of various bankruptcy laws, while Section 6 discusses the reasons behind the dramatic increase in bankruptcies over time. Finally, Section 7 discusses open questions and points to directions for future research.

2 Consumer Bankruptcy Law

The quantitative consumer bankruptcy literature was largely motivated by the specific institutional features of US consumer bankruptcy law. In fact, most of the models try to capture *Chapter 7* of the US bankruptcy code, the so-called *Fresh Start*. Under Chapter 7 all unsecured debt is discharged in exchange for all non-collateralized assets above an exemption level.[8] The discharge happens immediately after the court filings and there remain no claims towards future income. Only the so-called *good faith requirement* puts some limit on this by allowing the courts to dismiss cases where consumers file immediately after borrowing without making any good faith effort to repay the debt.[9] There are fees associated with filings – court filing fees and attorney fees. These fees increased substantially with the *2005 Bankruptcy Abuse Prevention and Consumer Protection Act (BAPCPA)*. According to Lupica (2012), filing fees for Chapter 7 no-asset cases add up to a mean value of $1,309 post-BAPCPA (up from $868) for no-asset cases.[10] The court filing process takes roughly four months. After declaring bankruptcy it is impossible to file again for the next eight years (six years prior to 2005). Finally, default stays on the credit history for ten years.[11]

While Chapter 7 is not the only way for consumers to file for bankruptcy, it is the most common one. Approximately 70 percent of all consumer bankruptcies are filed under

[8]Exemption levels vary widely across states (Gropp, Scholz, and White 1997). Further, certain kinds of debt are non-dischargeable, most notably student loans, tax obligations, child support, and alimony.

[9]See footnote 12 in Livshits, MacGee, and Tertilt (2010) for details.

[10]These numbers are in 2005 real dollars. Fees for asset cases and for Chapter 13 bankruptcies are even higher. See Lupica (2012) for details.

[11]The US courts system provides a brief overview of Chapter 7 bankruptcy: "Chapter 7 - Bankruptcy Basics," retrieved from `https://www.uscourts.gov/services-forms/bankruptcy/bankruptcy-basics/chapter-7-bankruptcy-basics`.

Table 1: History of US personal bankruptcy law and related legal changes

1800	Congress passed first US bankruptcy law in response to the 1793 depression. Involuntary bankruptcy could be initiated only by creditors. Repealed three years later.
1841	Second US Bankruptcy law followed financial panic of 1837 (again repealed after 18 months): first time in history could debtors seek relief ("Fresh Start" idea was born).
1867	Third US bankruptcy law following large debts after Civil War (repealed in 1878).
1898	First permanent nation-wide bankruptcy law (Nelson Act) established Chapter 7 bankruptcy.
1938	Bankruptcy Act of 1938 (Chandler Act). Introduced Chapter 13 bankruptcy.
1970	Fair Credit Reporting Act (FCRA): regulates the collection, sharing, and use of consumer credit information.
1977	Fair Debt Collection Practices Act (FDCPA): protects borrowers from abuse forms of debt collection.
1977	Supreme Court decision allowing more extensive bankruptcy lawyer advertising.
1978	US Supreme Court's *Marquette decision*: effectively removed state usury laws.
1978	Bankruptcy Reform Act of 1978 (called *Bankruptcy Code*): major overhaul of the system, created network of permanent federal bankruptcy courts. Introduced generous federal exemptions, took effect in October 1979.
2005	Bankruptcy Abuse Prevention and Consumer Protection Act (BAPCPA): removed some legal discretion – introduced mandatory credit counselling and introduced means-testing. Increase in waiting period from 6 to 8 years.
2009	Credit Card Accountability Responsibility and Disclosure (CARD) Act: limited reset credit card interest rates, required advance notice of rate increases, restricted credit card fees, increased transparency requirements.
2010	Dodd–Frank Wall Street Reform and Consumer Protection (Dodd-Frank) Act: Established Consumer Financial Protection Bureau (CFPB) to regulate financial products and oversee bank and non-bank lenders

Sources: Kilborn (2009), Ellis (1998), Shepard (1984), Boyes and Faith (1986) and Agarwal et al. (2015b).

Chapter 7.[12] The main alternative is Chapter 13 which essentially is a 3-5 year repayment plan, followed by a discharge at the end of the repayment period.[13] Chapter 13 allows the debtor to keep their assets and forgo the means-test introduced to Chapter 7 with BAPCPA in 2005.

To understand the history of US bankruptcy legislation, note that until the mid-1800s debtor's prisons were prevalent throughout the United States.[14] Over the course of the 19th century, in addition to several bankruptcy laws on the state level, three attempts were made to establish a nation-wide bankruptcy law. Yet each law was repealed just a few years later. See Table 1 for a timeline. What is now known as Chapter 7 Fresh Start Bankruptcy has its origins in the *Nelson Act* of 1898 which established the first permanent nation-wide bankruptcy law. The law was modified several times during the 20th and early 21th century. In 1938, the *Chandler Act* introduced Chapter 13 bankruptcy. Later, the bankruptcy reform act of 1978 constituted a major overhaul of the system; most notably it introduced generous asset exemptions at the federal level. In 2005, BAPCPA introduced means-testing and mandatory counselling.

In addition to the bankruptcy acts, several other pieces of legislation are relevant for consumer debt and default. In 1970, the *Fair Credit Reporting Act* (FCRA) improved consumer rights regarding the use of credit records for employer background checks, introduced ways to dispute incorrect information in the records, and mandated that bankruptcy records be deleted ten years after filing.[15] In 1977, the *Fair Debt Collection Practices Act* (FDCPA) introduced protection from abusive debt collection and introduced means to dispute unwarranted collection efforts.[16] In 1977 the US Supreme Court allowed advertising of bankruptcy lawyers, which some believe contributed to the increased popularity of bankruptcy. Another supreme court decision in 1978 effectively removed state usury laws through the famous *Marquette Decision*. The 2009 CARD Act restricted credit card fees and increased transparency. Finally, the 2010 Wall Street Reform and Consumer Protection Act established the *Consumer Financial Protection Bureau*

[12] To be precise, Chapter 7 filings range from 59% to 80% over the 1980-2017 period (own calculations based on data used for Figure 1a. The average over the entire time period was 69%.

[13] Consumers can also file under Chapter 11, which was originally designed for corporate bankruptcy. However, actual use of Chapter 11 by consumers is negligible.

[14] See for example Shaiman (1960) for details on debtors' prisons in Pennsylvania.

[15] See 15 U.S.C §1681 et seq. c.f. `http://www.ftc.gov/os/statutes/031224fcra.pdf`.

[16] C.f. See 15 U.S.C. §1692 – 1692p, c.f. `https://www.ftc.gov/enforcement/rules/rulemaking-regulatory-reform-proceedings/fair-debt-collection-practices-act-text`.

to regulate financial products and lenders.

Many other countries have in place stricter consumer bankruptcy rules than the United States. Interestingly, most European countries had no personal bankruptcy law up until the 1990s. Rather, indebted consumers could theoretically be held responsible for their debts until they died. Over the course of the 1990s, most European countries introduced some form of personal bankruptcy law – in most cases resembling Chapter 13 rather than Chapter 7 bankruptcy – i.e. a repayment plan over a fixed time period with some debt forgiveness upon completion.[17]

3 The Facts

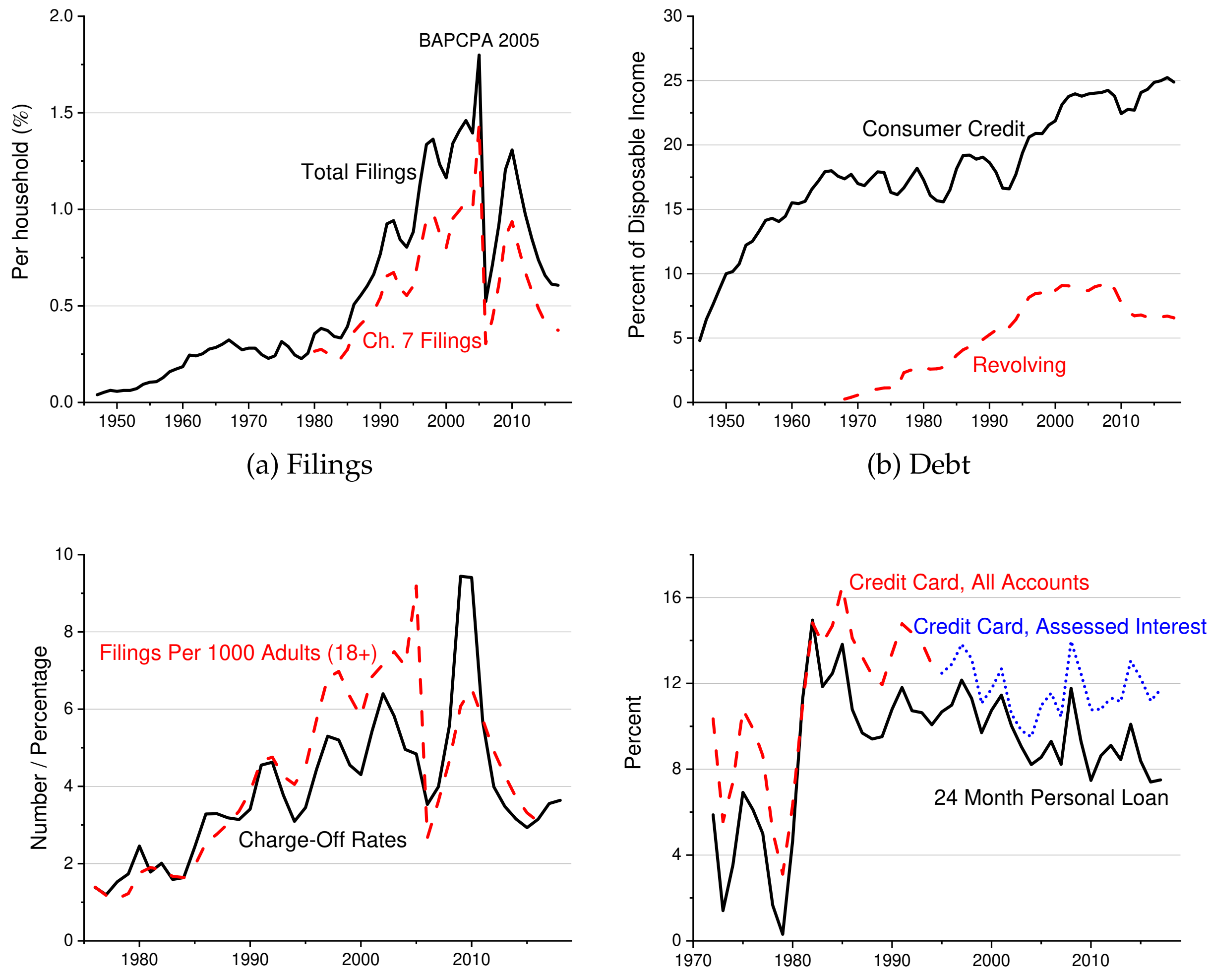
In this section we document the most important empirical facts related to consumer debt and default in the United States. We start with time series data to document changes over time. We then show how debt and default vary over the life-cycle. The last section documents heterogeneity in borrowing along the income distribution, and how it has changed over time. These facts are useful for two purposes. First and foremost, these facts motivate and inform new theories and mechanisms. They document important developments, raise questions, and thereby inspire new research. Second, they can be (and have been) used as target moments to calibrate quantitative models.

3.1 Time Series Facts

Bankruptcy rates (including Chapter 7 and 13 bankruptcies) have risen steadily ever since bankruptcy was made legally possible. Yet, as Figure 1a shows, the rise accelerated sharply in the mid-1980s. The sudden surge in 2005 was quite likely caused by the introduction of BAPCPA. The act was widely anticipated to make bankruptcy more difficult, which led to a flood of filings before the law took effect on October 17th 2005. Consequently, filings dropped sharply in 2006 after the reform was enacted. During the Great Recession from 2007 to 2009 filings increased again, yet filings declined again slowly during the economic expansion of the last decade. To this date, the high pre-BAPCPA rates have not yet been reached again. The figure also shows that Chapter 7

[17] See Alexopoulos and Domowitz (1998), Gerhardt (2009), and Niemi-Kiesiläinen (1997) for details.

Figure 1: US Time Series Data



(a) Filings

(b) Debt

(c) Charge-Off Rate on Credit Card Debt

(d) Real Interest Rates

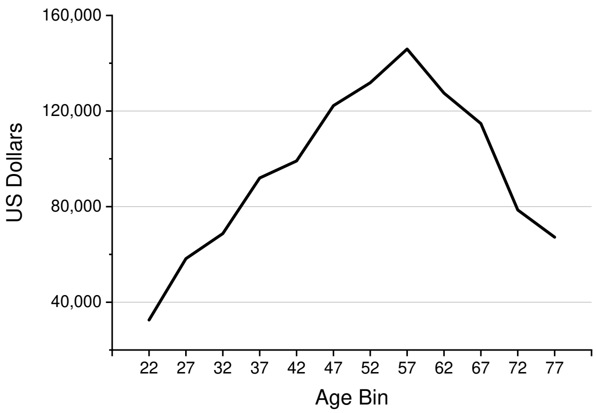
Source: Figures are based on Livshits, MacGee, and Tertilt (2010) updated with recent data. Assessed interest rates are only available after 1995, thus stated interest rates on all accounts are used prior to 1995. See the Data Appendix A for details.

filings make up the bulk of all filing, and that the fraction does not vary much over time. Not surprisingly, charge-off rates – defined as the percentage of outstanding loans written off by lenders due to default – have moved closely with filings rates over time (see Figure 1c). In 1980 only about 2% of credit card debt was discharged in a given year, this increased to a peak of more than 9% right after the financial crisis.

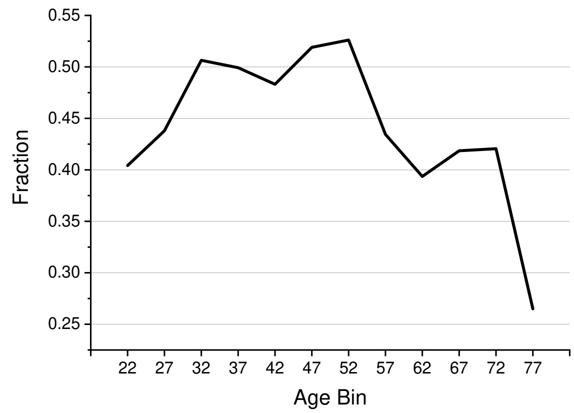
Two other time series are closely related to defaults. First, default only takes place when consumers hold debt. Figure 1b shows that consumer credit – defined as all outstanding credit extended to individuals for household, family and other personal expenditures, excluding loans secured by real estate – steadily increases from 5% of disposable personal income in 1950 to 25% by 2017. Consumer credit includes secured credit such as auto loans, but not mortgages.[18] However, revolving credit (essentially credit card debt) increased significantly as well over this time period – from nearly zero in the mid-20th century to more than 9% during the 2000s. After the financial crisis, there was a decline in revolving credit.[19] In fact, quite a few recent papers analyze the reasons behind this de-leveraging during the recovery.[20]

Since consumer credit is subject to default risk, lenders charge default premia. If default becomes more likely then default premia should rise, making credit more costly. Yet, despite increasing debt and bankruptcies, consumer credit interest rates do not display an upward trend over time (see Figure 1d). The figure shows two series: average interest rates on 24-months installment loans and average rates on credit cards. Both series are deflated with the CPI. The figure shows that both rates shot up sharply during the recessions of 1980 and 1981-82, and then remained at relatively high levels. If at all, one can detect a slight secular downward trend. Clearly rates have not increased in lock-step with defaults, as a simple extrapolation from default premia would suggest.

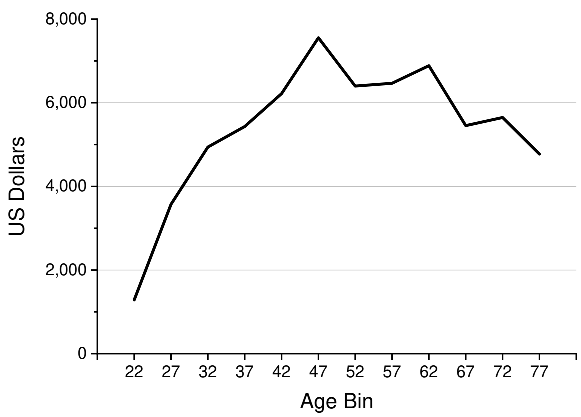
Figure 2: Debt and Default over the Life-Cycle



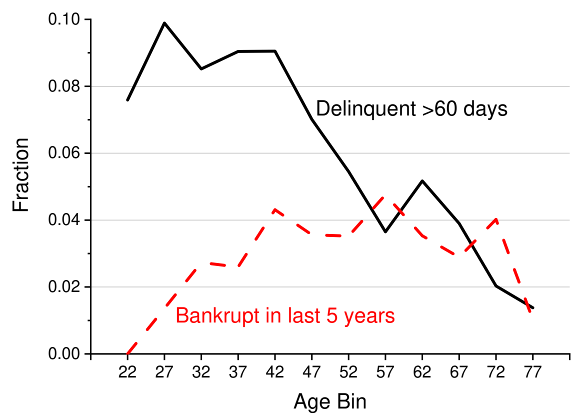
(a) Total Income



(b) Fraction with Positive Credit Card Debt



(c) Average Credit Card Debt of Borrowers



(d) Default

Source: Own calculations, based on SCF 2016. Averages were computed for 5 year age bins. The ages on the x-axis denote the midpoint in each group.

3.2 Life Cycle Facts

Much of the quantitative consumer finance literature is based on life-cycle models.[21] The reason is that many dimensions of consumer finance display a clear life-cycle profile. While there is a large literature on the hump-shaped income and consumption profiles,[22] those patterns in consumer debt and defaults have not received the same attention. The point that people in their middle ages are most prone to bankruptcy was perhaps first stressed in Sullivan, Warren, and Westbrook (2000). Livshits, MacGee, and Tertilt (2007) were the first to investigate this point in a quantitative model.

Figure 2 displays life-cycle patterns based on data from the 2016 Survey of Consumer Finances (SCF).[23] Panel 2a replicates the well-known hump in income using SCF data. Panel 2b shows that the fraction of households with any credit card debt is 40% at the beginning of the life-cycle, increases to more than 50% in the middle years of life, and then rapidly declines towards the end of life, with only about a quarter of 75+ year olds having any credit card debt. Conditional on borrowing, the amount borrowed displays a life-cycle pattern as well. Panel 2c shows that the average 20-24 year old debtor borrows less than $2,000. This increases steadily up to age 50, where the average debtor owes almost $8,000 in credit card debt. After that, credit card debt declines slowly again, so that the average 75-year old debtor is left only with $5,000 of credit card debt.[24]

Not surprisingly, the hump-shape in debt leads to a hump-shape in bankruptcies as well. Panel 2d shows that among the 20-24 year olds, essentially no one has filed for

[18] Mortgages relative to disposable income increased from roughly 20% in 1950 to about 65% in 2017. There was steep increase to about 100% in the buildup of the financial crisis, see Federal Reserve System (2020) and Bureau of Economic Analysis (2020).

[19] Note that consumer credit continued to rise during this period, but this was largely driven by student loans.

[20] See for example, Athreya et al. (2015).

[21] For example Livshits, MacGee, and Tertilt (2010), Livshits, MacGee, and Tertilt (2007), Nakajima (2012) and Athreya et al. (2018) use life-cycle models.

[22] See for example Gourinchas and Parker (2002), Fernández-Villaverde and Krueger (2009), and Attanasio and Weber (2010) among many others.

[23] It should be noted that the SCF is repeated cross-sectional household data. Thus, these are not true life-cycle plots but rather display the cross-section by age in 2016, which would be a good proxy for the life-cycle in a stationary economy. Note that the age we use in the life-cycle plots is the age of the household head, as assigned by the SCF. The head is taken to be the male in case of a mixed-sex couple and the older individual in same-sex couples.

[24] It should be pointed out that credit card debt reported in the SCF does not add up to what is measured as revolving debt in the aggregate (as reported in Figure 1b). See Zinman (2009) for a discussion on the discrepancy and potential reasons.

bankruptcy yet, while among people in their 30s about 2% have filed within the last five years, and about 4% of the 40-year olds have. Beyond age 40, filings stay roughly flat and decline only after the age of 75. Note that relative to the fraction of debtors and the amount borrowed, the hump-shape in bankruptcies peaks later in life. This is not surprising since borrowers take time to build up debt and typically try (and struggle) to repay before finally filing for bankruptcy. This becomes apparent when looking at delinquencies, which are also included in Panel (d).[25] Delinquencies start high at early ages, followed by a mostly declining profile over the life-cycle. At ages 20-24, about 8% of households are 60-days late on their debt repayments.[26] The number remains roughly flat up to age 45 after which we see a steady decline. In their late 50s, only about 4% of households are more than 60-days late, and in their 70s the number is less than 2%.

It is not surprising that delinquencies are high earlier in life than bankruptcies. Delinquencies not only capture borrowers that have trouble repaying their debts but also borrowers who simply forgot to service their debts. Thus, we would generally expect a higher level of delinquencies relative to bankruptcies. Additionally, households might only learn about the option to declare Chapter 7 bankruptcy once in severe financial trouble. Also, courts do not grant filings where bankrupts have not shown significant effort to repay prior to filing. Beside these basic explanations, there are also clear economic forces for why delinquencies serve as a natural precursor to bankruptcy. Once households encounter financial difficulties, it might be optimal to first simply stop repaying. Because bankruptcy is costly, it makes sense for households to officially declare bankruptcy only if financial trouble persists and repayment seems impossible. Athreya et al. (2018) and Exler (2017) show that bankruptcy cost can make it optimal to informally default (i.e. be delinquent) prior to declaring Chapter 7 bankruptcy. Albanesi and Nosal (2018) document this mechanism empirically: insolvencies increased after the 2005 BAPCPA reform raised bankruptcy filing cost.

3.3 Heterogeneity

There is substantial heterogeneity in credit usage across households. In the previous section we already documented heterogeneity by age. We now show differences across the

[25]Delinquency is defined as having missed any debt payments by more than 60 days.

[26]8% might appear a lot, but note that delinquency is defined as being late on any kind of debt, not just credit cards. Hence it cannot be directly compared to the fraction of borrowers in panel 2b.

income distribution and how these have changed over time. Table 2 gives the fraction of households of each income quintile that own a bank credit card for each year in which the SCF was conducted.[27] Among the poorest quintile, card ownership is the lowest in all years, e.g. only 11% in 1983, compared to almost 80% for the top quintile. The strictly monotone relationship between income and card ownership is visible in each year for which we have data. However, the poor have caught up over time. From 1983 to 2016, card ownership almost quadrupled for the poorest quintile, while it went up by only a small amount for the richest quintile.

Table 2: Percent of Households with Bank Credit Card, by Income Quintile

Quintile	1983	1989	1992	1995	1998	2001	2004	2007	2010	2013	2016
1	0.11	0.19	0.25	0.29	0.29	0.37	0.37	0.38	0.34	0.31	0.41
2	0.27	0.40	0.54	0.55	0.59	0.66	0.62	0.57	0.49	0.51	0.60
3	0.41	0.61	0.64	0.72	0.73	0.79	0.77	0.74	0.68	0.69	0.74
4	0.57	0.77	0.80	0.84	0.86	0.88	0.88	0.88	0.82	0.81	0.87
5	0.79	0.89	0.91	0.95	0.96	0.95	0.96	0.94	0.94	0.93	0.96
All	0.43	0.56	0.62	0.66	0.68	0.73	0.71	0.70	0.65	0.64	0.71

Source: Livshits, MacGee, and Tertilt (2016), Table 3a, updated with more recent SCF waves.

The same pattern emerges for access to credit measured by the percentage of households that carry a balance on a card, see Table 3. Of the poorest quintile in 1983, only 4% carried a balance on a card, which increased sixfold to 25% by 2016. The increase was more moderate for middle income households and nearly non-existent for the richest quintile. In contrast to card ownership, the relationship between income and percent with a balance is hump-shaped, with the peak in the fourth quintile in most years. For example in 2010 almost 50% of households in quintile 4 carried a balance on a credit card, compared to less than 40% in quintiles 3 and 5.

The general trends in Tables 2 and 3 are temporarily interrupted during the financial crises starting in 2007. The crisis led to a mild contraction in the fraction of households that own credit cards. The decline in credit card borrowers during the crises was more pronounced (a fall of 7 percentage points from 2007 to 2010). By 2016, credit card ownership and borrowing seem to be growing again.

[27] As is standard in the literature, we focus on credit cards issues by banks and do not include cards issued by other providers such as gasoline cards.

Table 3: Percent of Households Carrying a Balance on Card, by Income Quintile

Quintile	1983	1989	1992	1995	1998	2001	2004	2007	2010	2013	2016
1	0.04	0.08	0.11	0.16	0.17	0.22	0.23	0.22	0.19	0.15	0.25
2	0.13	0.18	0.29	0.32	0.33	0.40	0.38	0.33	0.27	0.28	0.35
3	0.24	0.37	0.39	0.41	0.42	0.49	0.49	0.47	0.38	0.42	0.45
4	0.32	0.45	0.47	0.51	0.52	0.47	0.50	0.59	0.48	0.44	0.48
5	0.37	0.41	0.38	0.46	0.42	0.37	0.43	0.44	0.39	0.36	0.41
All	0.22	0.29	0.33	0.37	0.37	0.39	0.40	0.41	0.34	0.32	0.39

Note: Households carry a balance when there is debt remaining on a credit card after the last payment.
Source: Livshits, MacGee, and Tertilt (2016), Table 3b, updated with more recent SCF waves.

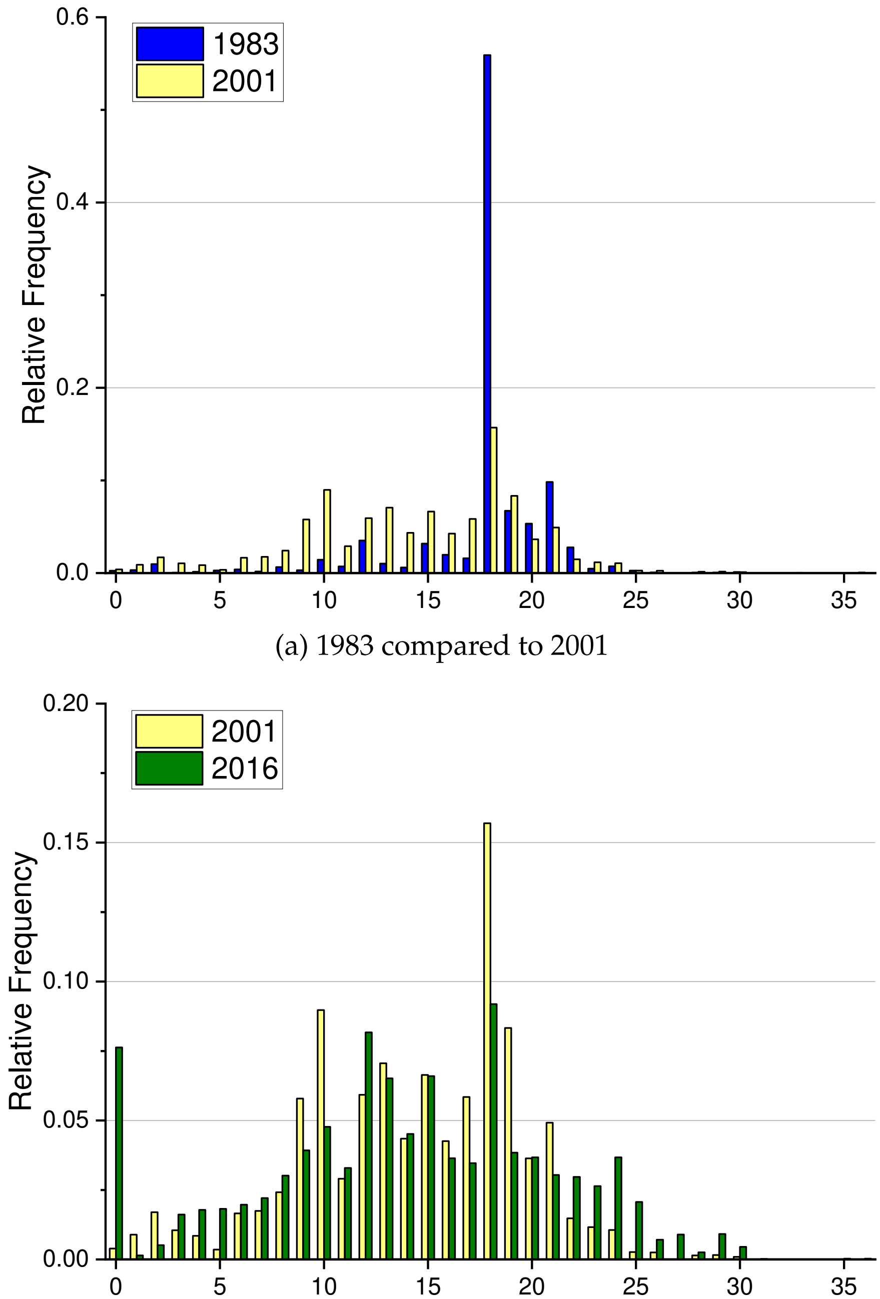
Heterogeneity across households is also clearly visible in interest rates. Table 4 gives the number of different interest rates faced by households in the SCF in various years. Across all SCF households in 1983, 76 different rates were used.[28] Including only households with a positive balance, we still find 58 different rates. This number increased dramatically over time to 318 different rates in 2016. The increase in the number of rates lead to a substantial increase in heterogeneity over time when measured by the coefficient of variation (CV). This increase occurred largely between 1983 and 2004 and has stalled since.

Figure 3 illustrates the interest rate heterogeneity and its change over time with a histogram. In 1983 almost 60% of all households who owned a credit card faced an interest rate of exactly 18%. By 2001 the distribution of rates had visibly flattened and the spike at 18% had shrunk to a mere 16% of all households. The second panel in Figure 3 shows that between 2001 and 2016 the distribution further flattened with many more rates to the left of 10% and the right of 20%. In 2016 the emergence of the zero-percent interest rate is quite visible, with more than 7% of all households paying no interest at all on their debt.[29]

[28]The SCF includes about 4,500 households up until 2007 and then increases to just above 6,000 households for the later years.

[29]This is likely due to the emergence of teaser rates, where people pay zero interest for a limited amount of time.

Figure 3: Histogram of Interest Rates.



(a) 1983 compared to 2001

(b) 2001 compared to 2016

Source: Authors' own calculations based on SCF. See Data Appendix A for details.

Table 4: Credit Card Interest Rates

Year	# of Rates All Households	# of Rates (HH with $B > 0$)*	CV All HH	CV (HH with $B > 0$)*
1983	76	58	0.20	0.19
1995	143	130	0.29	0.31
1998	138	125	0.32	0.35
2001	224	168	0.36	0.39
2004	212	162	0.56	0.56
2007	235	187	0.51	0.56
2010	268	220	0.50	0.51
2013	270	211	0.52	0.54
2016	318	241	0.51	0.53

Source: Livshits, MacGee, and Tertilt (2016), Table 2, updated with more recent SCF waves.
*These columns include only households with strictly positive amounts of debt.

4 Theory and Quantitative Model

4.1 Theoretical Foundations

Clearly, a meaningful theoretical framework to analyze consumer bankruptcies features default in equilibrium. Limited commitment models such as Kehoe and Levine (1993) study debt under the *threat* of default. However, default is penalized such that it will never occur in equilibrium. A more natural starting point to study consumer bankruptcy are incomplete-market models in the spirit of Eaton and Gersovitz (1981). In this framework, competitive lenders offer loans to borrowers that cannot commit to repay. Loans are only repaid if it is individually rational for the borrower ex-post. The borrower thus weighs the costs of repaying the loan against the costs of default such as exclusion from borrowing, monetary default costs, or utility costs.

Eaton and Gersovitz (1981), as well as the majority of equilibrium models of consumer default, abstract from information frictions. Lenders have the same information about a consumer's (conditional) default probabilities as the consumer herself.[30] These

[30]Some recent papers depart from the full information assumption. Adding asymmetric information allows to analyze phenomena such as credit scoring and also how better information acquisition enabled by technological progress affected credit markets. We will get back to this point in Section 6.

individual default probabilities are used to price loans in equilibrium. That is, borrowing interest rates are based on all individual characteristics relevant for the default decision in the following period. Clearly, borrowing interest rates are larger than the risk-free rate and compensate lenders in non-default states for losses they suffer in default states. Since the benefit of default increases with the amount borrowed, so does default risk. In equilibrium, lenders price larger loans at a higher interest rate. Consequently, borrowers face an interest rate *schedule* which is an explicit function increasing in loan size.

At the heart of these models, consumers trade off partial insurance (i.e. smoothing across states) with smoothing consumption inter-temporally (Zame 1993; Dubey, Geanakoplos, and Shubik 2005). Being able to walk away from debt in bad times (e.g. if income is low) introduces some state-contingency that provides partial insurance. However, if borrowers make use of this partial insurance regularly and default often, interest rates rise which hampers their ability to smooth over time.

Chatterjee et al. (2007) and Livshits, MacGee, and Tertilt (2007) were the first to embed this theoretical framework into quantitative models that feature heterogeneous agents and multiple sources of risk (in the spirit of Aiyagari (1994, Bewley (1983), Huggett (1993,1996)). In the following, we will illustrate the key building blocks of such models.

4.2 The Framework

As we have seen in Section 3, debt and default vary substantially by age. Hence, it makes sense to analyze debt and default choices in a life-cycle model, as we do in our quantitative analysis below.[31] One key distinction is that the precautionary savings motive is much less important in life-cycle models as agents have little time to accumulate precautionary savings before they need them. Secondly, earnings display a strong life-cycle component which creates a strong desire to borrow for young agents in a life-cycle model. This effect is not present in infinitely-lived consumer models. Therefore, life-cycle models can match the observed debt levels more easily.[32]

[31] Many papers in the literature abstract from the life-cycle and use infinitely-lived consumer models instead, in particular, Chatterjee et al. (2007) and the literature building upon it.

[32] Alternatively, aging (and death) can be modeled stochastically to match the life-cycle patterns. One example is Corbae and Quintin (2015) in the context of mortgage default.

Agents value bankruptcy because they face some uninsurable idiosyncratic uncertainty. Besides a deterministic life-cycle profile, it is usually assumed that income is comprised of two stochastic components: a persistent and a transitory income shock.[33]

In addition to idiosyncratic earnings uncertainty, most models employ a second type of uncertainty to quantitatively capture the high default levels observed in the data.[34] Here we follow Livshits, MacGee, and Tertilt (2007, 2010) in assuming that agents face *expenditure shocks*. The idea is that agents might get sick, divorced, or pregnant and that these events trigger unavoidable expenses.[35] These are also the types of events mentioned in surveys when people are asked why they declared bankruptcy.[36] For simplicity, these expenses are discretized and typically assumed to be uncorrelated over time and with income. While some persistence in such expenses or correlation of expenses and income shocks would be more realistic, it is not clear what data to use to estimate a more elaborate process and hence no one has done this so far. Alternatively, some authors use shocks to marginal utility or discount factors, which also trigger large sudden expenses, and hence serve a similar purpose.[37] Some recent papers follow the dynamic discrete choice literature and add extreme-value shocks to the household's utility function. These unobservable (to the financial intermediary) shocks help smooth choice probabilities and can explain why two households with the same observables in the data may make different default choices.[38]

Consumers can borrow in incomplete markets and have access to one period non-

[33]The specific income process used in the quantitative application is $y = e_j z\eta$, where e_j is the life-cycle component and z and η are estimated as residual variation of (log) labor income after controlling for observables. z is assumed to follow an AR(1) process and η is white noise.

[34]A few papers are also based exclusively on earnings uncertainty, such as Chatterjee and Gordon (2012). The types of shock are important when analyzing the welfare implications of changes in bankruptcy law. We discuss this point in detail in Section 5 below.

[35]This is particularly important in the United States where medical events can trigger large out-of-pocket expenses. In 2018, there were 27.5 million uninsured individuals in the US, about 8.5% of the population (see Berchick, Barnett, and Upton (2019)).

[36]Jacoby, Sullivan, and Warren (2000) find that 34% of bankrupts owed substantial medical debt, and that 46% of filers report either a medical reason or substantial medical debt. Similarly, Himmelstein et al. (2005) argue that about half of bankruptcies are due to medical shocks. Further Sullivan, Warren, and Westbrook (2000) report that family issues such as divorce were cited in about 22% of the cases as the primary cause of bankruptcy.

[37]Chatterjee et al. (2007) and Chatterjee et al. (2018) model preference or discount factor shocks inducing a sudden urge to spend in the consumer, resembling in some ways expense shocks, but not entirely. The main difference is that even with a very high urge to spend, a consumer can still in principle consume less and not default while with expense shocks this is sometimes simply not feasible.

[38]This idea was introduced to the consumer bankruptcy literature by Chatterjee et al. (2018) and used recently in Auclert and Mitman (2018).

contingent debt only.[39] Much of the quantitative consumer debt literature assumes that lenders operate in a competitive market with free entry. This implies that in equilibrium each loan contract earns zero profits. In line with Eaton and Gersovitz (1981), equilibrium interest rates reflect individual default risk. Thus, interest rates depend on loan size, age, and current income (to the degree that it is informative about future income). It should be pointed out that there is some debate on the suitability of the competitive market assumption for consumer credit markets.[40] Some authors point to a significant remaining dispersion of interest rates even after controlling for all relevant borrower characteristics, including measures of risk such as the FICO score (Stango and Zinman 2016).[41] The remaining dispersion can be interpreted as resulting from monopoly power in the credit market.[42] Another approach to identify frictions to competitive pricing is employed by Agarwal et al. (2017). The authors measure pass-through of credit expansions to borrowers and find that banks' marginal propensity to lend is low for risky lenders in order to sustain their profits.

We abstract from housing and other durable goods.[43] Further, we assume agents will either borrow or save and cannot hold unsecured debt and assets simultaneously. While this is a good description of the typical *bankrupt* (who in the data holds no notable assets when filing), it is clearly a simplification since many *borrowers* in the data do hold positive assets and unsecured debt at the same time. This is sometimes referred to as the *credit card debt puzzle* in the empirical literature.[44]

Consumers are allowed to file for bankruptcy. Here we try to capture Chapter 7 bankruptcy as described in Section 2. In the model, upon declaring bankruptcy, all debts are forgiven immediately, i.e. the consumer enters the next period with zero debt.

[39]Several recent papers model the credit market differently: banks offer longer-term credit contracts and agents search for these credit contracts, see Drozd and Nosal (2008), Herkenhoff (2019), Raveendranathan (2018) or Galenianos and Gavazza (2019) for example. Mateos-Planas and Ríos-Rull (2012) also depart from the one period debt assumption by modeling credit lines explicitly.

[40]Ausubel (1991) was the first to argue that market power might be important in credit card markets.

[41]Bhutta, Fuster, and Hizmo (2019) make a similar point about mortgage rates.

[42]One way of capturing such interest rate dispersion is through search models as mentioned in footnote 39.Herkenhoff and Raveendranathan (2020) embed oligopolistic lenders in a standard debt and default model and can explain 20 to 50 percent of the observed spread over the competitive interest rate.

[43]Mitman (2016) models housing and mortgage debt and analyzes the interaction of foreclosure and Chapter 7 decisions.

[44]Telyukova (2013) reports that 27% of US households hold credit card debt and low-return liquid assets simultaneously. Her paper can account for about half of the puzzle in a quantitative model with cash goods where some liquid assets are held for precautionary purposes.

While the focus here on Chapter 7 – the most common form of bankruptcy in reality – a few papers analyze Chapter 13 or other forms of repayment plans common in other countries.[45] Similarly, a few recent papers model informal delinquency in addition to formal bankruptcy.[46] Delinquency and informal default have substantially increased after the 2005 BAPCPA reform raised the cost of filing for bankruptcy. Hence, going forward, modeling informal default explicitly becomes more important.

Denote the value function of staying solvent by $V_j(\cdot)$. Then the value for a consumer of age j with current debt d, current income y, and current expense shock κ to stay solvent is

$$\begin{aligned} V_j(d, y, \kappa) &= \max_{c,d'} \left[u(c) + \beta \mathbb{E}_y \max\left\{ V_{j+1}(d', y', \kappa'), B_{j+1}(y') \right\} \right] \\ \text{s.t. } & c + d + \kappa \leqslant y + q_j(d', y) d'. \end{aligned} \tag{1}$$

The consumer optimally chooses consumption c and next period debt (or savings) d' to maximize the sum of current utility and the discounted expected value next period. We follow the convention that $d < 0$ denotes savings. The continuation value is the maximum between staying solvent $V_{j+1}(d', y', \kappa')$ or declaring bankruptcy $B_{j+1}(y')$ after learning the income and expenditure shock realizations y' and κ'. In bankruptcy, debts and expense shocks do not have to be repaid, hence B_{j+1} only depends on next period income y'. The budget constraint simply states that consumption c, debt repayment d and expense shocks κ are financed out of income y plus new borrowing $q_j(d', y)d'$, where q denotes the endogenous bond price function and will be further discussed below. Note that the consumer problem does not include a labor-leisure choice. Since there are no claims towards post-filing income under Chapter 7, direct effects of bankruptcy on post-filing work effort are small (see Dobbie and Song (2015, Section V.E.) for empirical evidence). This would be quite different though in the context of Chapter 13, or other long-term repayment plans, where clearly the repayment plan should lower the incentive to work, possibly severely.[47]

Clearly some form of punishment for declaring bankruptcy is needed, otherwise borrowing could not be sustained in equilibrium. One punishment that is present in essentially all papers in this literature is the inability for the bankrupt debtor to take out

[45] See Li and Sarte (2006), Livshits, MacGee, and Tertilt (2007), and Exler (2019).
[46] C.f. Mateos-Planas and Benjamin (2014), Exler (2017) and Athreya et al. (2018)
[47] This is analyzed in Chen and Zhao (2017) and Exler (2019).

new loans in the filing period. In addition, one can think of several other punishments for bankrupt debtors. To keep the framework general, we consider four types of filing costs:

1. A utility cost χ to capture non-monetary effects of default such as stigma.

2. A fraction γ of the bankrupt's income is garnished and used to repay the lenders. This cost captures the *good faith requirement*. Debtors have to show significant effort of having repaid some of their debts before filing for bankruptcy, otherwise the court can deny the discharge.

3. A fixed cost of filing, ϕ, to capture court filing fees and lawyer fees.

4. Bankrupts face a proportional consumption cost λ, which captures the idea that some consumption goods (e.g. cell phone contracts or rental contracts) become more costly with a negative bankruptcy flag.

Incorporating all four costs, the value of filing for bankruptcy B is given by

$$\begin{aligned} B_j(y) &= u(c) - \chi + \beta \mathbb{E}_y V_{j+1}(0, y', \kappa') \\ \text{s.t. } c(1+\lambda) &= (1-\gamma)(y-\phi). \end{aligned} \tag{2}$$

As mentioned before, bankrupts cannot borrow in the period they declare bankruptcy. Thus, there is no decision left to take and bankrupts simply consume their income net of all default cost as defined by the budget constraint in Equation 2. After the period of bankruptcy, consumers become solvent again and their debts are forgiven. Their continuation value is $V_{j+1}(0, \cdot)$.

Denote the exogenous saving interest rate by r^s and assume that there is a proportional transaction cost of lending τ. Then the risk-free borrowing bond price can be written as $\bar{q} = 1/(1 + r^s + \tau)$. Since consumers may default, most lending is risky from the intermediaries' perspective. Under the assumption of perfect competition and full information, the bond price for a consumer of age j, with current income realization y, wanting to borrow d', can be written as

$$q_j(d', y) = \Big(1 - \theta(d', y, j)\Big)\bar{q} + \theta(d', y, j)\mathbb{E}_y \left(\frac{\gamma y'}{d' + \kappa'}\right)\bar{q}, \tag{3}$$

where $\theta(d', y, j)$ denotes the conditional default probability of the consumer.[48] Equation (3) states that lenders get full repayment in all cases where borrowers do not default. Upon default, γy is repaid through the good faith requirement. That means lenders recover an expected fraction $\gamma y'/(d' + \kappa')$ of the outstanding loan, even if borrowers default.[49] The bond price in Equation 3 can be interpreted as a (conditional) weighted average between the risk-free bond price $\bar{q}$ and the expected recovery in default.

It should be noted that implicit in the set-up is the assumption of no commitment. If agents could commit to a particular default threshold (or not to default at all), then the equilibrium would look quite different. However, the model (and the entire literature) assumes such commitment is not feasible.[50] Thus, agents take their future no-commitment default decisions into account when deciding how much debt to take out. Therefore, the equilibrium could be thought of as a game with one's future self.[51]

In line with Chapter 7 bankruptcy law, many models assume that bankrupts cannot re-file for bankruptcy immediately.[52] Excluding bankrupts from re-filing for some periods imposes a technical difficulty as it can lead to empty budget sets. When agents that are excluded from filing for bankruptcy experience an expense shock, they might be unable to repay it, they might not be able to roll it over, and by assumption they cannot declare bankruptcy. Hence, most models include a form of involuntary delinquency during those periods where consumers are excluded from formal bankruptcy. For example, Livshits, MacGee, and Tertilt (2007) prevent bankrupts from re-filing immediately after bankruptcy, but allow them to roll-over the medical debt at an exogenous roll-over interest rate.

[48]Often, the income process is composed of different components of which only the persistent part is predictive of future default. In the process described in footnote 33, only z is predictive of future income (and hence default). Thus, the bond price would be written as $q_j(d', z)$.

[49]Here, we assume that $\gamma y'$ is proportionally distributed to outstanding debt d' and potential claims from the expense shock κ'. In reality some debts are prioritized, such as alimony payments.

[50]In fact, given the current law, a contract with a bank committing not to default would likely be considered void by the courts.

[51]See Mateos-Planas and Ríos-Rull (2016) for further details.

[52]Recall the current law specifies a waiting period of 8 years.

4.3 Quantitative Results

In what follows, we use the model and calibration of Livshits, MacGee, and Tertilt (2010).[53] The model is calibrated to US data in the years 1995 – 1999, before the large BAPCPA reform and the financial crisis.[54] As Table 5 shows the model matches the fraction of bankruptcies, the average borrowing interest rate, and the ratio of average unsecured debt to average earnings well.[55]

Table 5: Benchmark Model vs. Data

Target (all in %)	Data	Model
Bankruptcy Filings	0.83	0.83
Average r^b	10.93 – 12.84	11.35
Average unsecured debt-to-income	9	9.2

Figure 4 depicts the life-cycle evolution of debt, fraction of borrowers, income, and bankruptcies and is thus the model analog to the empirical Figure 2. Note that except for income, these patterns were not targeted in the calibration. Yet, the model matches the life-cycle patterns of debt and bankruptcies surprisingly well.[56] Since income is hump-shaped over the life-cycle, households want to borrow at young ages. Thus, the fraction of borrowers is as high as 45% early in life. Later in life, consumers borrow mostly to smooth income shocks, which still leads to more than 10% of 60-year olds having positive debt, but clearly this is much lower than early in life. The total amount of outstanding debt evolves accordingly. It increases during early years, when borrowers take out loans while income is low. Once income is higher on average, households start

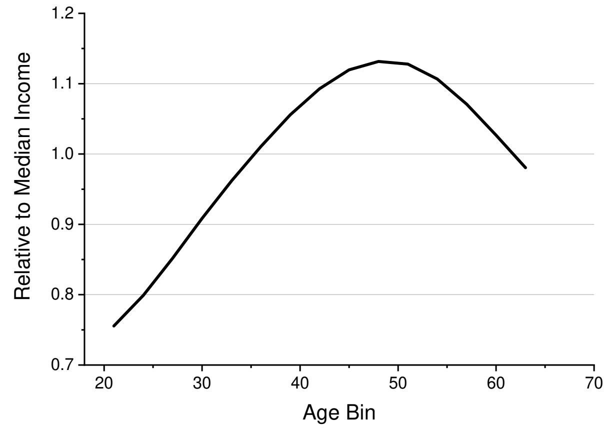
[53]The model described in Section 4.2 is basically a simplified representation of Livshits, MacGee, and Tertilt (2010). For the sake of simplicity, it abstracts from the exclusion from re-filing for bankruptcy discussed above.

[54]For details on the calibrated parameters and the income process used, please refer to Livshits, MacGee, and Tertilt (2010) Section II. B.

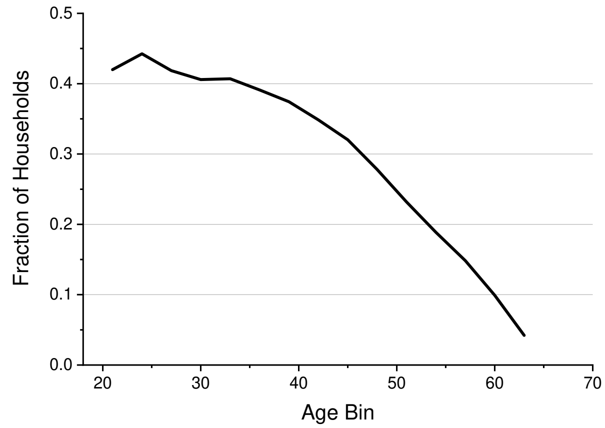
[55]There is a debate in the literature on whether to use gross unsecured debt or net worth as a target. While neither measure is ideal, we believe that gross unsecured debt is the better target for three reasons: (i) many household assets are exempt when filing, (ii) even when they are not, it is costly to seize assets, and (iii) net worth, based on the SCF, is likely an underestimate since credit card debt is underreported relative to aggregate measures by about 50%. See the online appendix of Livshits, MacGee, and Tertilt (2010), Section 1.2, for a more detailed discussion of this issue.

[56]One should not expect or even aim for a perfect fit, since the model is calibrated to the late 1990s whereas the data is from 2016.

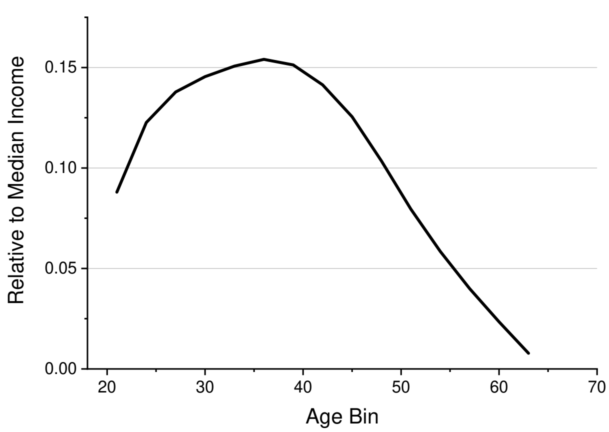
Figure 4: Debt and Default over the Life-Cycle (Benchmark model)



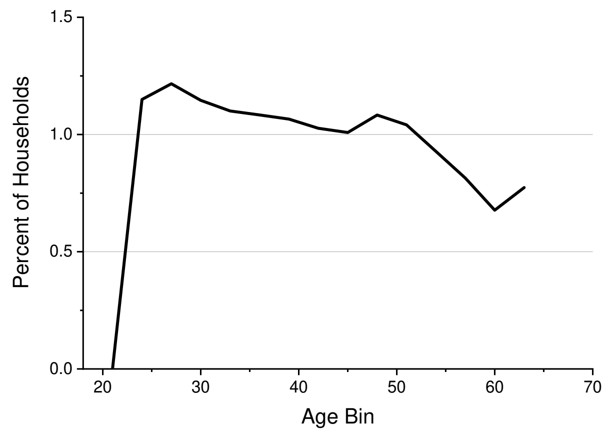
(a) Income



(b) Borrowers with Positive Debt



(c) Average Debt



(d) Bankruptcies

Table 6: Defaults by Reason, Model

	Expense Shock			
	Low	High	None	Sum
No decrease in income	48.2%	7.0%	15.7%	70.8%
Fall in persistent income only*	10.3%	2.2%	6.9%	19.4%
Negative transitory shock only**	5.3%	0.8%	1.6%	7.6%
Fall in persistent income and negative transitory shock	1.1%	0.3%	0.7%	2.1%
Sum	64.9%	10.3%	24.8%	100.0%

* Fall in persistent income: fall in persistent income shock relative to previous period.

** Negative transitory shock: lowest of the three possible realizations of the transitory income shock.

to repay and outstanding debt shrinks. Bankruptcies are decreasing over the life-cycle. After the initial period where agents enter the model with zero debt and consequently do not default by construction, bankruptcies shoot up and subsequently come down slowly as households repay their debts and receive higher incomes.

Table 6 depicts in what circumstances people file for bankruptcy in the model. The table shows that the majority of bankruptcies is caused by an expense shock. An expense shock alone is enough to drive households into bankruptcy (about 55% of all filings). Less than 10% of bankrupts file following a negative income shock only. For about one fifth of bankrupts the combination of expense shock together with an income drop leads to the filing. Interestingly, about 15% of filers experience no income shock and no expense shock in the filing period. Most likely they experienced a negative shock just prior to the filing period leading to high debt they were hoping to pay back with a positive income shock. When such a positive shock fails to materialize, they file instead.

4.4 Importance of Bankruptcy Costs

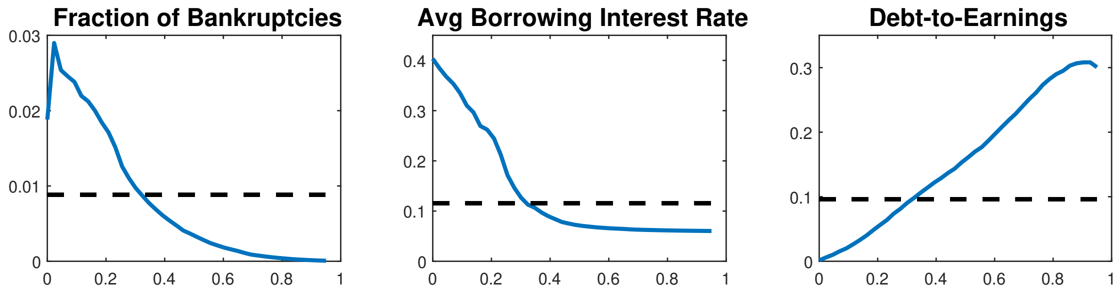
As discussed above, some cost of default is necessary to generate positive amounts of debt and filings in equilibrium. The literature has not converged yet on what type of cost to use. In this section, we explore the qualitative and quantitative effects of various types of costs. To this end, we analyze the four types of costs introduced in Equation (2). Qualitatively, all costs can sustain lending and default in equilibrium. Quantitatively, equilibrium outcomes differ significantly between introducing utility cost, garnishment, filing fees, or consumption cost of default.

Before moving to the results, it is instructive to highlight three important differences between these four costs. First, garnishment γ is the only cost considered here that does not generate a deadweight loss but rather redistributes resources from bankrupts to lenders. Thus, while it acts as a deterrent to filing like all the other costs, it also has a dampening effect on charge-offs, default premia, and hence on interest rates. None of the other costs have such a dampening effect on the quoted interest rate schedules. At debt levels where default becomes optimal, lenders in a garnishment cost economy will quote interest rate schedules that spike less quickly than with any other type of cost. This has important implications for equilibrium interest rates and debt holdings, which we present in Figure 5 below. Second, garnishment γ and consumption costs λ are both proportional costs (to income and consumption, respectively), while stigma χ and filing fees ϕ are both fixed costs (measured in units of utility and income, respectively). This distinction may not matter much in a representative agent model, but with heterogeneous agents it has distributional implications. For low-income individuals in particular, high fixed filings costs ϕ may be prohibitively expensive and filing may in fact not be possible.[57] Proportional costs on the other hand never exceed the budget by construction, making bankruptcy a viable option even for very low income realizations. We present distributional consequences in Figure 6 below. Third, stigma χ is a utility cost and as such is essentially a free parameter. All other costs could be measured in the data in principle. For example, the fixed cost could be pinned down with information on court filing fees and bankruptcy lawyer fees.

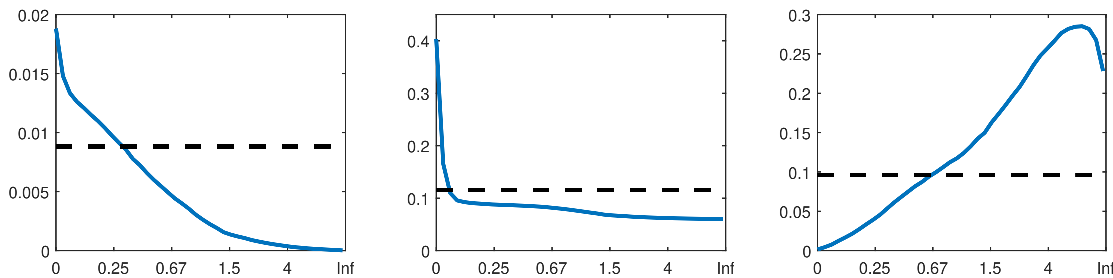
To assess the importance of different kinds of default costs, we start with the calibrated version of the model described in Section 4.3 but set all default costs to zero. Note that bankruptcy will always imply exclusion from borrowing for one period. Thus, even when setting all four types of cost to zero, bankruptcy is not completely costless so that

[57] In models with informal default or delinquency, high filing fees will instead push the poor into these alternative forms of default.

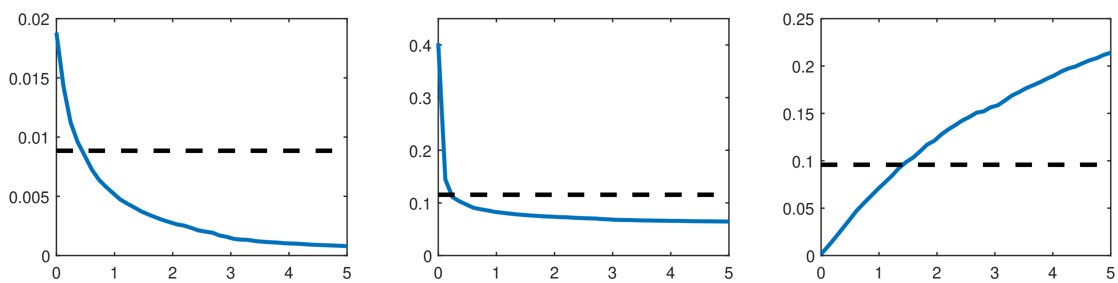
Figure 5: Evaluating Different Bankruptcy Costs in the Model



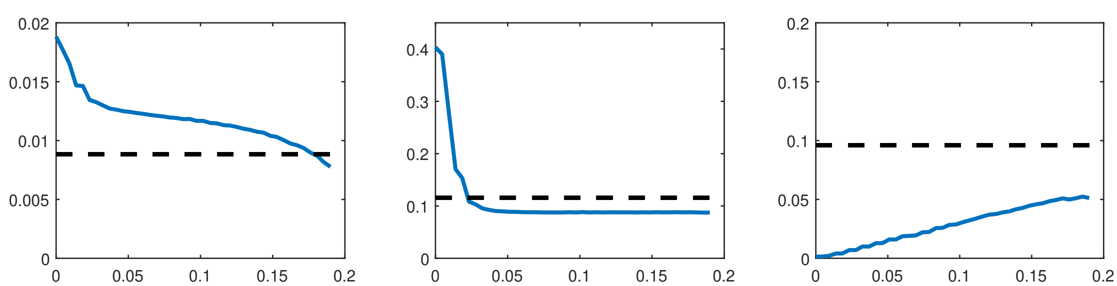
(a) Garnishment (γ)



(b) Consumption Cost (λ)



(c) Stigma (χ)



(d) Filing Fees (ϕ)

some borrowing is sustained in equilibrium.[58] We then increase *one type* of default cost at a time, solving the model repeatedly.

Figure 5 compares the model to the data along three dimensions: bankruptcy filings, average borrowing interest rate, and average debt to average earnings. The horizontal line highlights the data target in each picture (from Table 5). Qualitatively, the different types of cost look similar. Bankruptcy filings and interest rates decline with bankruptcy cost whereas debt-to-income increases with bankruptcy cost – independent of the type of the cost. Also, all types of costs can generate the targeted level of bankruptcies in equilibrium.

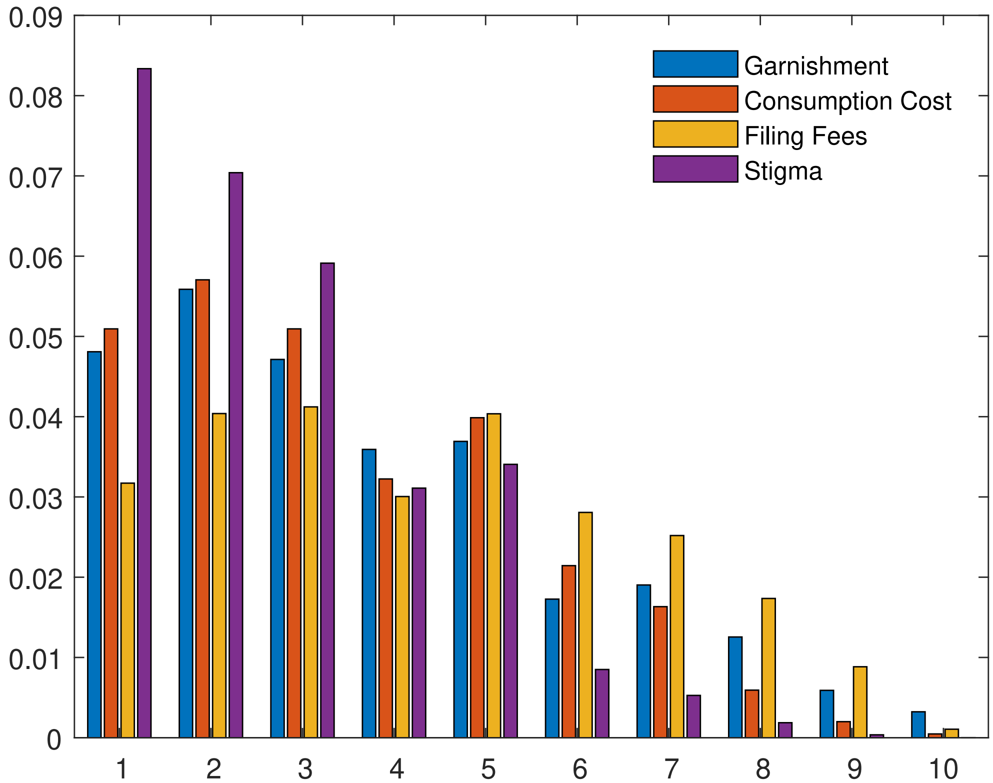
However, setting garnishment to $\gamma = 0.31$ is the only way to match all three data targets simultaneously. With any type of bankruptcy cost except garnishment, the model is not compatible with all three targets simultaneously – at least not in the current calibration. The reason for this incompatibility lies in the interest rate schedules that borrowers are quoted. As discussed above, default costs are deadweight losses except for garnishment so lenders recoup nothing once borrowers declare bankruptcy. Consequently, expected losses of default rise sharply at debt levels where default becomes optimal. For the level of bankruptcy cost that match the targeted bankruptcy rate, borrowers receive interest rate quotes that are significantly steeper at large levels of debt relative to a garnishment economy. In turn, borrowers choose to hold less debt in equilibrium (c.f. Figure 5 column 3) to stay just below the debt levels where their interest rate quotes spike. Choosing lower equilibrium debt leads to *lower* equilibrium interest rates compared to the garnishment economy (c.f. Figure 5 column 2).

To summarize, all types of costs generate commitment to repay. Qualitatively, the effects of higher default costs in Figure 5 are similar: on average, higher costs generate fewer bankruptcies which lead to lower interest rates and higher amounts of debt that are sustainable in equilibrium. Quantitatively, there are differences and only garnishment allows to replicate the fraction of bankruptcies, the average borrowing interest rate, and the debt-to-income ratio simultaneously.

The different types of costs also matter in the cross-section as they impact consumers differentially along the income distribution. This effect becomes clear in Figure 6, which

[58] This is in contrast to Bulow and Rogoff (1989) who had argued that explicit default penalties are necessary to sustain equilibrium debt in the context of sovereign debt.

Figure 6: Fraction Filing for Bankruptcy by Income Decile



depicts bankruptcy filings by income decile.[59] There a several important observations. First, note that fixed filing cost induce the lowest levels of bankruptcy at the bottom of the income distribution, but the highest levels of bankruptcy at the top half (except for decile 10). As discussed above, fixed filing fees can become prohibitively expensive for low income households but are negligible for high income households. That directly leads to the observed pattern: low income households file relatively little while high income households file relatively often. Second, stigma costs exhibit the opposite pattern: compared to fixed filing fees, the lowest income decile declares bankruptcy nearly three times as much under stigma cost. At the same time, there are virtually no bankruptcies in the top two income deciles. The reason for this pattern is the curvature of utility. Fixed stigma cost (denominated in utils) are relatively unimportant for low income households where the marginal utility of extra consumption accessible through bankruptcy is very high. The opposite is the case for high income individuals with very low marginal utility: stigma cost induce a fixed utility loss outweighing the marginal benefit of large amounts of extra consumption. Consequently, high income earners try to avoid bankruptcy at all means. Finally, note that under stigma costs the filing rate decreases (almost) monotonically with income. For all other costs, filing rates are hump-shaped. Further, filing rates under proportional costs (i.e. garnishment and consumption cost) lie between the two fixed cost extremes.

4.5 Other Types of Bankruptcy Costs

Besides the bankruptcy cost discussed above, there are many other potential costs that bankrupts can incur. As in the model discussed in Section 4.2 , most of the literature incorporates some exclusion from borrowing after bankruptcy. Besides increasing the (expected) cost of bankruptcy, exclusion from borrowing can be thought of capturing difficulties obtaining new credit when the Chapter 7 bankruptcy flag is on one's credit record. In these models, it is assumed that the bankruptcy flag leads to complete exclusion from the credit market. To keep the state space tractable, Chatterjee et al. (2007) model removal of the bankruptcy flag stochastically. Livshits, MacGee, and Tertilt (2007) (and the framework in Section 4.2) only exclude bankrupts from borrowing during the

[59]For each of the four types of costs, we choose the level of the cost to match the aggregate filing rate of 0.83% per year.

filing period. Intuitively, exclusion from credit markets lowers the expected continuation value of bankrupts, especially of those with lower income who might want to borrow. Thus, qualitative implications resemble the effects of income-dependent costs (that are not collected by lender).

In some cases, bankruptcy triggers a repayment plan that bankrupts have to adhere to. Chapter 13 bankruptcy in the U.S. features a repayment plan as does personal bankruptcy in Germany. These repayment plans are costly to defaulters because they face claims towards their future income. Since income is persistent, effects resemble garnishment discussed above. Defaults are discouraged and debt rises. Fewer defaults and lower expected write-offs lead to lower interest rates. There is an additional important effect: Repayment usually depends on future labor income, either indirectly through income exemptions to allow for basic living expenses or directly through an income-dependent garnishment schedule. Thus, repayment plans change a bankrupts optimal level of labor supply. Consequently, frameworks that include these repayment plans allow for endogenous labor adjustments (see for example Chen and Zhao (2017) for the U.S. and Exler (2019) for Germany).

Finally, bankruptcy can also reveal information about a borrower: in a framework with asymmetric information, default could indicate a riskier borrower type. In such a framework, bankruptcy would lead to an endogenous loss of reputation and deteriorated access to credit, higher costs, or tighter borrowing limits. The only paper that models these effects in the consumer credit market is Chatterjee et al. (2018). Other papers point out that default in the credit market can spill over to costs in other markets, such as insurance markets (Chatterjee, Corbae, and Ríos-Rull 2008) or labor markets (Corbae and Glover 2018).

5 Welfare Implications

This section contains two parts. We first describe the trade-offs that govern the desirability of bankruptcy compared to not allowing default at all. The second part describes the literature analyzing specific bankruptcy reforms.

5.1 The Insurance-Efficiency Trade-Off

In the model described in Section 4, default yields two opposing welfare effects. On the one hand, default acts as partial insurance for borrowers in dire situations. If income is unexpectedly low or large expense shocks materialize, indebted households can walk away from their debt. Thus, default introduces some state-contingency of debt and thereby offers partial insurance.[60] On the other hand, default in equilibrium leads to charge-offs, adding a default premium to the interest rate. The resulting higher interest rates make smoothing over time more expensive. Moreover, default costs constitute a deadweight loss. Thus, whether a stricter or more lenient bankruptcy system is better is not obvious and can only be answered within a given framework. In fact, most of the literature has evaluated this trade-off in quantitative models.[61]

The welfare implications of any specific bankruptcy law depend critically on the quantification of this trade-off between smoothing over states vs. smoothing over time. Thus, the type and amount of risk that households face is one of the most important determinants of the welfare gains from insurance. As discussed above, the types of risk considered in the literature are typically various forms of income risk, expense shocks, and sometimes also preference shocks. Below, we first describe how income and expense risk can have different implications for the welfare effects of bankruptcy laws and then review the findings in the literature.

Income Risk: It is important to note that independent of how exactly income risk is modeled, income is always assumed to be strictly positive. Hence, in the extreme case where no default is allowed (or equivalently, bankruptcy filing costs are infinite), agents would never encounter a situation where their budget set is empty. By banning default in a world with only income risk, full commitment can be induced and the deadweight loss of default can be eliminated completely. Consequently, borrowers face low (risk-free) borrowing interest rates which leads to widespread welfare gains. However, insurance is reduced. The negative effects of losing insurance through the bankruptcy

[60]Partial insurance through bankruptcy seems quantitatively important: Mahoney (2015) documents that households that can easily insure through bankruptcy are less likely to obtain health insurance.

[61]Gordon (2017) follows a more theoretical approach. He derives two implications for optimal bankruptcy law. First, under the assumption that the social planner can decide exactly which debtors are allowed to default, discharging debts should always be free of cost. Second, there exists a (high) level of debt, above which bankruptcy should always be granted.

system are not too large, though. When agents only face income risk, they can self-insure through borrowing and saving. Hence, the utility loss from not being able to default is relatively small.

Expenditure Risk: Many papers feature an additional source of risk: unforeseen expenditures such as hospital bills or expenditures from marital disruptions. These shocks are usually modeled as i.i.d.-shocks to the budget constraint and might lead to very high debts. Thus, even when default costs are extremely high (and approach infinity), default is sometimes unavoidable. In extreme cases, discounted lifetime earnings might not suffice to repay expense shocks and full commitment cannot be enforced. Thus, self-insuring against expense shocks is difficult (or even impossible). Consequently, consumers value insurance through the bankruptcy system much more compared to a world without expense risk. Banning default thus induces high welfare losses in the presence of expense shocks (if it is even feasible). These welfare losses can easily outweigh the gains from lower interest rates.

To quantify this trade-off, the literature typically compares an economy with a bankruptcy law similar to the US with an hypothetical economy that does not allow default at all. Clearly, an economy without any form of default is only a theoretical benchmark. As discussed above, welfare implications of abolishing a system similar to the current US Chapter 7 bankruptcy law and banning default altogether critically hinge on the type and amount of risk households face. Given the discussion above, it is then not surprising that papers that allow only for income risk find positive welfare effects of moving to the full commitment no default equilibrium (Athreya (2002), Athreya, Tam, and Young (2009), and Chatterjee and Gordon (2012)). Li and Sarte (2006) are an exception: their model features only income risk yet they find that abolishing default lowers welfare. Their finding is due to powerful general equilibrium effects. Abolishing default lowers borrowing interest rates. As a consequence, debt levels rise dramatically which crowd out the aggregate capital stock. This lowers wages, labor supply, output, and ultimately welfare. Furthermore, the authors abstract from transition dynamics, which are important when aggregates change as substantially as above.

Papers that include both income and expenditure risk typically find that abolishing default leads to welfare losses (e.g. Livshits, MacGee, and Tertilt (2007)). Gordon (2015) also finds negative welfare effects but only in the face of business cycles and aggregate risk. Without those, welfare implications are flipped.

In sum, with severe expense shocks, a lenient bankruptcy system is preferable, while with small or no expense risk, a stricter system is preferable. This insight also has important cross-country implications. Social security and welfare systems differ substantially across countries. More generous welfare states that provide comprehensive social insurance imply lower expense risks. In countries with a generous social security system, a stricter bankruptcy code should be preferable. This insight might explain why the US (with comparatively less social insurance) has always had a lenient bankruptcy code, while most European countries (with comparatively more social insurance), traditionally had no route to personal bankruptcy. Consistent with these hypotheses, Exler (2019) finds that introducing Chapter-7-style bankruptcy into the German economy (with German income and expense risk) lowers welfare substantially.

Finally, it should be noted that several other features of the economy will also impact the trade-off between smoothing across states versus over time. In particular, a steep life-cycle earnings profile increases desired consumption smoothing over the life-cycle and hence makes a stricter bankruptcy code, all else equal, preferred. Also, even when households face income risk only, details can still lead to a departure from the results discussed above. In particular, when the volatility of persistent shocks is large, consumers cannot easily smooth consumption through borrowing and saving. In such a case, a lenient system may be better. See Livshits, MacGee, and Tertilt (2007) for further details.

5.2 Evaluation of Bankruptcy Laws

Several papers in the literature evaluate concrete reforms of the US bankruptcy code. Perhaps the reform that has received the most attention is the 2005 Bankruptcy Abuse Prevention and Consumer Protection Act which made filing more costly. Gross et al. (2019) use a variety of novel data sources to study the effect empirically. They find that the reform reduced filings as intended and decreased interest rates by a sizeable amount, especially for subprime borrowers. Albanesi and Nosal (2018) argue that the reduction in filings came at the expense of an increase in informal delinquencies. As described in Section 2, another important aspect of BAPCPA is the introduction of income means-testing Several papers evaluate the effects of means-testing. Intuitively, means-testing excludes high-income individuals from filing for bankruptcy and thus increases their commitment to repay. This lowers quoted interest rates and allows them to borrow more or to borrow at lower cost. Consistent with finding that higher commitment increases welfare, Athreya (2002) finds (small) positive effects of means-testing.[62] Chatterjee et al. (2007) find larger positive welfare gains from means-testing. In a framework that includes both unsecured and secured debt as well as housing, Mitman (2016) finds small positive effects of BAPCPA. However, fewer defaults on unsecured credit lead to more defaults in secured debt. On the other hand, setups in which insurance is more valuable because borrowers face expense risk typically find negative effects of means-testing (Gordon (2015) and Li and Sarte (2006)).

Several other pieces of bankruptcy legislation have been studied. Exler (2017) focuses on a yet another aspect of BAPCPA. More stringent legal requirements led to higher out-of-pocket expenses to file for bankruptcy after 2005. These higher costs prevent very low income individuals from debt relief through Chapter 7 bankruptcy. Consequently, low income borrowers resort to more expensive forms of credit such as payday loans and default through informal delinquency. Since informal default is very costly (both monetarily and psychologically), granting low income households access to Chapter 7 bankruptcy would produce welfare gains. Corbae and Glover (2018) study the link between labor and credit markets. They argue in a quantitative model that employer credit checks may lead to poverty traps for unemployed workers since unemployment makes it hard to improve credit scores which in turn makes it hard to find a job. Banning employer credit checks lowers the efficiency of the labor market but abolishes the poverty trap. While theoretically intriguing, the quantitative significance is less clear. Dobbie et al. (2020) find only limited empirical evidence that the removal of bankruptcy flags increases employment prospects and Bartik and Nelson (2019) find that banning employer credit checks hurts black job seekers by decreasing their job finding by about three percentage points.

Chen and Corbae (2011) study the welfare implications of the removal of bankruptcy flags in a quantitative endowment economy.[63] In their set-up, a consumer with a bank-

[62] BABPCA became effective only in 2005, but had been proposed many years before that. Thus, Athreya (2002), even though published prior to the actual reform, analyzes some of the proposed changes.

[63] The experiment was inspired by the Fair Credit Reporting Act of 1970 that dictates that Chapter 7 bankruptcies be removed from credit records after 10 years, c.f. Section 2.

ruptcy flag is excluded from credit markets. Removing the bankruptcy flag earlier yields a trade-off: on the one hand, consumers gain access to credit sooner. On the other hand, bankruptcy becomes less costly, leading to more defaults and higher interest rates. The authors find small welfare gains of deleting the bankruptcy flag after one year. Mateos-Planas and Seccia (2006), on the other hand, find that reducing the duration of exclusion after bankruptcy yields small welfare losses in a setting where all consumers face the same interest rate. Elul and Gottardi (2015) provide a theoretical rational for the removal of bankruptcy flags. In their model with private information, the bankruptcy flag is a signal about a borrower's type. The paper provides theoretical conditions under which information deletion can be beneficial to provide ex-post incentives. Complete forgetting is only optimal under extreme circumstances, which rationalizes the existence of Credit Bureaus.

Nelson (2019) studies the 2009 CARD Act which limited lenders' ability to raise interest rates based on information learned during a lending relationship. He finds important distributional effects: prime borrowers benefit through lower interest rates ex-ante while some subprime borrowers lose by being denied access to credit. Agarwal et al. (2015b) study a different aspect of the CARD Act, namely the limits imposed on credit card fees and its impact on interest rates. Surprisingly, they find no evidence of an offsetting increase in interest charges or a reduction in the volume of credit.

Another common form of regulation in consumer credit markets is price regulation in the form of interest rate caps. In the set-up laid out in Section 4 price caps will always be welfare reducing as they will simply exclude people with high default risk from access to credit. If market power leads to excessively high interest rates this conclusion does not necessarily hold up, which is a fruitful avenue for future research. Empirically, Cuesta and Sepúlveda (2019) investigate interest rate caps in Chile and find a sizeable reduction in transacted interest rates and an even larger decline in credit.[64]

Besides affecting consumers and their ability to borrow and self-insure, bankruptcy law also impacts entrepreneurship. Especially for small self-employed entrepreneurs, personal bankruptcy provides valuable insurance against business failures. Akyol and Athreya (2011) evaluate the importance of bankruptcy asset exemptions for credit access of the self-employed. The authors find that laxer bankruptcy laws (in particular,

[64]Price caps have also been extensively studied in the context of payday loans, see for example Zinman (2010).

increasing asset exemption levels) indeed provide more insurance but also lead to more default risk and thus higher interest rates. Quantitatively, these effects cancel and entrepreneurship remains unchanged. When analyzing harsher bankruptcy law (i.e. lower asset exemptions), improved refinancing conditions for entrepreneurs outweigh the loss of insurance and entrepreneurship increases. Mankart and Rodano (2015) argue that this finding hinges on the absence of secured credit. Compared to a case with only unsecured credit, agents prefer laxer bankruptcy laws if they have access to secured credit. The reason is that even though laxer laws make unsecured credit more expensive and harder to obtain, entrepreneurs can refinance through secured credit.

6 What caused the rise in filings?

The dramatic growth in filings during the second half of the 20th century (see Figure 1a) has sparked a heated debate about its causes. On the one hand, it has been argued that the main driver is increased uncertainty (due to higher earnings volatility or an increased likelihood of "unexpected expenses," related to medical bills for example). On the other hand it has been argued that changes in morals and culture lowered the stigma attached to declaring bankruptcy. Consequently, consumers facing the same debt and expenses are simply more likely to file. As Alan Greenspan famously said in his 1999 testimony before Congress "Americans have lost their sense of shame." A third class of explanations emphasizes changes in credit markets caused by technological change. Financial innovation may have expanded access to a new, riskier class of borrowers and/or led to more borrowing of existing borrowers. This section evaluates these different explanations drawing heavily on Livshits, MacGee, and Tertilt (2010, 2016). In particular Livshits, MacGee, and Tertilt (2010) use a quantitative model along the lines described in Section 4, feed in various potential driving forces to derive quantitative implications of each potential story, and then evaluate (most of) the stories discussed below by comparing the implications to the data.

Figure 1a shows a pretty steady increase in filings from 1980 until 2005 (when BAPCPA became effective). Filings also move with the business cycle, but the dramatic increase in filings is the most significant phenomenon over this time horizon. This section focuses on the trend growth between the early 1980s and the early 2000s. As previously discussed, there are three main additional observations over this period: charge-off rates on credit cards increase in lock-step with the filing rate (Figure 1c). Secondly, unsecured credit expands significantly over this period as well: Figure 1b shows that credit card borrowing was negligible in the late 1970s and increases to about 10% of disposable personal income by 2005.[65] Thirdly, real interest rates for consumer loans do not display much of a trend over this time period, if at all, they decrease slightly (see Figure 1d). In what follows, we present four potential explanations for these observed patterns; we discuss their mechanism, the related literature, and the plausibility of each story.

6.1 More Uncertainty

Several authors have argued that consumers face more uncertainty today than in the past and that this is the main reason for today's high bankruptcy rates (e.g., Barron, Elliehausen, and Staten (2000), Sullivan, Warren, and Westbrook (2000), Warren and Warren Tyagi (2003), Hacker (2006)).

Clearly, income inequality has increased over the course of the 20th century (see, for example, Piketty and Saez (2006) and Saez and Zucman (2016)). However, much of this is due to the widening of the income distribution. A rise in inequality should only lead to more bankruptcies if it also involved more uncertainty. If people are unsure about their income next period, they may borrow betting on high income, and, if it does not materialize, declare bankruptcy. If such uncertainty goes up, then clearly it can cause an increase in filings. However, whether income uncertainty has increased during this time period is less clear. If it did, Livshits, MacGee, and Tertilt (2010) show that even a relatively large increase in earnings uncertainty can only explain a modest increase in filings. At the same time, more filings would lead to a large interest rate increase, which is counterfactual. Further, increased uncertainty would lead to an increased precautionary savings motive and thereby to a large decrease in debt, which is also counterfactual. Thus, increased earnings uncertainty seems unlikely to be the main driver behind the rise in bankruptcies.

[65] These figures might exaggerate the increase in debt to a certain extend as consumers may have moved to credit cards at the expense of other forms of unsecured credit. Livshits, MacGee, and Tertilt (2010, Figure 3) construct a time series of total unsecured lending thereby controlling for substitution between different forms of credit. They find that unsecured credit increased from 5 to 9% over the 1983-1998 time period.

Warren and Warren Tyagi (2003) argue that households today face more uncertainty through unexpected expenses and that this is the main driver behind the increase in filings. Indeed, average out-of-pocket medical spending has increased by a third, from about $1,500 in 1980 to almost $2,000 in 1998.[66] However, this rise was partially offset by an increase in income, so that as a fraction of income, out-of-pocket spending increased by a mere 15% over this time horizon. Within their quantitative framework, Livshits, MacGee, and Tertilt (2010) show that increased expense uncertainty can account for at most 20 percent of the increase in filings. A comparison with other countries makes this hypothesis even less plausible. Many countries with universal health care (such as Canada) also saw substantial increases in bankruptcy filings over time.

6.2 Legal Changes

In Section 2 we documented several legal changes related to consumer bankruptcy. Could such changes have caused the rise? Several authors argue that the Bankruptcy Reform Act of 1978 was critical in the rise as it made bankruptcy more attractive by permitting joint filings by spouses and increasing the exemption value (Shepard (1984), Boyes and Faith (1986) and McKinley (1997)). The reform act coincided with a Supreme Court decision that removed advertising restrictions by bankruptcy lawyers. All of these changes probably lowered the cost of filings, and thereby may have contributed to the rise. Livshits, MacGee, and Tertilt (2010) find in their quantitative model, that lowering the cost of filings can indeed cause an increase in filings of the observed order of magnitude. However, it would also imply a large increase in the interest rate and a sizeable decline in consumer borrowing – both strongly counterfactual. So without other offsetting effects on interest rates and debt, the proposed legal changes cannot explain the rise alone.

There are several other arguments that cast doubt on the importance of legal changes. First, the rise in filings occurred in many countries, yet the legal changes were specific to the U.S. In particular, Canada also experienced a dramatic rise in bankruptcies, yet, there was no corresponding legal change in Canada.[67] Second, Moss and Johnson (1999)

[66] These numbers are taken from Livshits, MacGee, and Tertilt (2010).

[67] MacGee (2012) provides data and an extensive discussion about consumer debt and default in Canada.

argue that the U.S. reforms were relatively minor and hence an unlikely driver behind the massive increase in filings. Third, a legal change that lowered the cost of filings, should change the type of borrowers who file. In particular, borrowers with less debt should want to file relative to a world with higher filing costs. However, Domowitz and Eovaldi (1993) analyze data on precisely this question and find that the characteristics of bankrupts before and after the reform are quite similar.

Another relevant legal change was the 1978 Marquette decision which effectively removed state usury laws. Removing interest rate ceilings can of course give access of credit to previously excluded consumers. These would naturally be particularly risky consumers, and hence giving them access should also lead to more filings. While this seems a plausible hypothesis, several arguments speak against it. First, again, the comparison with Canada is useful here. As argued before, Canada experienced a comparable rise in filings, yet there was no analog deregulation of credit markets (c.f. Ellis (1998)). Second, it is unclear to what extent interest rate ceilings were binding even before the Marquette decision (see Peterson (1983)). Third, Livshits, MacGee, and Tertilt (2010) show in their quantitative model, that a removal of interest rate ceilings implies counter-factually large increases in interest rates.

In summary, while deregulation in credit markets and a more lenient bankruptcy law probably contributed some to the rise in filings, they are unlikely to be the main drivers.

6.3 Cultural Change

Perhaps, as Alan Greenspan argued, "Americans have lost their sense of shame." In our framework, cultural change making bankruptcies less shameful can be represented by lower utility cost associated with bankruptcy (χ in the model in Section 4). This idea has been extensively analyzed and discussed in the literature (e.g. Fay, Hurst, and White (2002), Gross and Souleles (2002b) and Buckley and Brinig (1998)).[68] While it is hard to completely rule out this possibility, Livshits, MacGee, and Tertilt (2010) find that to quantitatively explain the rise in filings through a decline in stigma alone, the value of stigma required for the 1980s needs to be implausibly large (equivalent to the utility loss from a reduction in the life-time consumption stream of more than 10%).

[68] Bursztyn et al. (2019) document the importance of morals for debt repayment in a field experiment in Indonesia.

Moreover, as already argued in the context of legal changes above, a decline in the cost of filing (whether in monetary or utility units) implies a large decline in borrowing and an increase in the interest rate – both are counter-factual.

6.4 Financial Innovation

In Sections 6.1 – 6.3, we have argued that higher earnings and higher expense risk, legal changes, and cultural change are all unlikely to be the main driver behind the increase in bankruptcy filings. Furthermore, many different countries have seen a parallel increase in filings.[69] This observation hints at a more fundamental explanation. In fact, there is a consensus in the literature by now, that technological progress in the credit sector (such as credit scoring and the IT revolution) played an important role.[70]

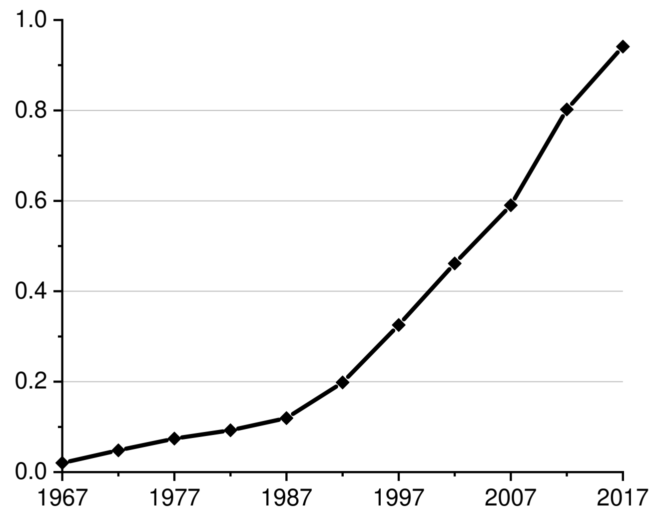
Technological progress, in particular advances in computing technology, changed the credit industry. One can imagine various potential mechanisms here. More data and better ways to store and analyze data may have made it easier to evaluate potential borrowers. Securitization made it possible to pool risks and hence diversify more. Further, more differentiated credit products were invented that made it easier to target different segments of the population. All of these innovations may have both increased debt of existing borrowers (the intensive margin) and also increased the number of borrowers (the extensive margin).

The fact that there was significant technological progress related to computing technology is widely documented. For example, Nordhaus (2007) documents a dramatic decline in the cost of computing between 1935 and 2010. Similarly, Jorgenson (2001) documents a sharp decline in IT prices during the second half of the 20th Century. How these IT changes have led to innovations in the credit card industry is extensively discussed in Livshits, MacGee, and Tertilt (2016, Section 2). One important ingredient was the diffusion of credit scoring technology. One piece of supporting evidence is presented in Figure 7. It plots the increased usage of the terms "credit scoring" relative to "consumer credit" in print media measured through GoogleScholar Keyword counts. While

[69] Besides the Canadian evidence, Creditreform Wirtschaftsprüfung (2009) provides data for seven European countries showing an increase in filings between 2005 and 2008 for all of them.

[70] Early papers that pushed the idea of credit market innovation include Barron and Staten (2003) and Baird (2007).

Figure 7: Diffusion of Credit Scoring Technology: Google Scholar Keyword Counts



Source: Constructed by the authors, see Data Appendix A for details.

credit scoring technology was quite negligible before the 1980s, it rapidly took off starting in the mid-80s. Between 1980-84 and 2015-19, mentions of the term "credit scoring" relative to "consumer credit" in print media increased tenfold.

Recently, a sizable economic literature developed that models this phenomenon and tries to quantitatively assess its importance (Athreya, Tam, and Young (2012), Narajabad (2012), Sánchez (2017), Livshits, MacGee, and Tertilt (2016) and Drozd and Serrano-Padial (2017)). The basic idea is similar in all these papers, yet the details of the mechanism are quite different. In particular, the mechanism in many papers works along the *intensive margin*, where existing (good) borrowers borrow more and hence default more often (see Narajabad (2012) and Sánchez (2017)). However, the data show large changes in the *extensive margin* as well, i.e. more and different people borrow.

As discussed in Section 3 (see Table 2) the fraction of people that had any credit card steadily increases over time (from 43% in 1983 to 71% in 2016). Obviously not everyone who has a credit card also borrows on it. However, the fraction of credit card borrowers also increased substantially from 22% in 1983 to 39% in 2016 – see Table 3. There is also strong evidence that these new borrowers are different, and in particular riskier. The data show that it was mostly the lowest income groups that gained additional access to credit. Card ownership among the bottom quintile increased from 11% in 1983 to 41% in 2016, while borrowing on a card increased more than six-fold over the same time period – from 4% to 25% for the poorest income quintile. For the top quintile, on the other hand, card ownership and borrowing were already quite high in 1983, and accordingly increased only slightly.

Livshits, MacGee, and Tertilt (2016) theoretically investigate the idea that financial innovation made lending to riskier households more profitable, thereby increasing overall debt but also bankruptcies. The paper employs a simple tractable framework to shed light on the details of the possible mechanisms at work. In contrast to the framework described in Section 4, their model has two periods and only two possible income realizations. People only differ in their probability of receiving high vs. low income in period 2. There are no expense shocks. The only default cost is garnishment of income. This simple set-up immediately implies that there will be only two possible loan sizes: a large loan that is only repaid if the high income realizes and a smaller loan that is always repaid. The model introduces a fixed cost of designing lending contracts, where a contract specifies a loan amount, an interest rate, and who is eligible for the contract. The fixed cost leads to some pooling across types even with perfect information. With a sufficiently high fixed cost, it is not profitable to design a low-interest rate lending contract for the least risky consumers alone, because the fixed cost are better borne by all borrowers. In this set-up, a decline in the fixed cost over time (caused by technological progress) can lead to more contracts being added which implies more risk-based pricing. In other words, both the maximum and the minimum interest rates will become more extreme. Consequently, risky borrowers gain more access to credit which increases bankruptcy filings in equilibrium.

The data presented in Section 3 is consistent with this mechanism: there is strong evidence that credit products became more differentiated over time. For example, the number of different interest rates has increased substantially over time (see Table 4). Specifically, in 1983, only 78 different interest rates can be observed in the SCF, which steadily increases to 318 in 2016. Figure 3 plots a histogram of interest rates at different points in time. It is quite striking how spiked the distribution was in 1983 relative to today. Accordingly, between 1983 and 2004, the coefficient of variation of interest rates for cards that carry a balance almost tripled from 0.19 to 0.56 and remained rather stable afterwards (see Table 4).

There are other ways of modeling technological progress in the financial sector. Livshits, MacGee, and Tertilt (2016) also explore a version of the model with asymmetric information and show that more accurate signals can also lead to more access of credit to riskier people, leading to both more debt and default in equilibrium.[71] Narajabad (2012) also analyzes an increase in the informativeness of the signal about a consumer's type – in his case leading to a switch from a pooling to a separating equilibrium. Sánchez (2017) introduces a screening cost that is proportional to loan size and analyzes what happens if it decreases. All of these models are motivated by the idea that credit rating technologies improved.[72] Athreya, Tam, and Young (2012), on the other hand, analyze an enlargement in the information set, i.e. they compare equilibria where loan contracts can be based only on a subset of all relevant information with one where all information can be used. The idea is that data collection, data storage, and data analysis have all improved and hence essentially led to more data being used when loans are priced. Finally, Drozd and Serrano-Padial (2017) focus on improved signal precision in the context of debt collection. They show that more precise signals in debt collection allow a better targeting of collection efforts to those more likely to pay back. A higher successful collection rate decreases the charge-off rate and ultimately makes credit cheaper.

To sum up, the literature proposes that credit expanded along the extensive and the intensive margins. Both margins could theoretically explain the rise in default. The data presented in this survey strongly supports the extensive margin expansion. The number of different types of credit contracts increased over time, the fraction of people with credit card debt has increased, and these new borrowers are to a large extent (but not exclusively) people at the bottom of the income distribution. However, these data cannot speak to the intensive margin. Livshits, MacGee, and Tertilt (2016) try to empirically assess the relative importance of both margins. Along the extensive margin, they find that new cardholders accounted for roughly a quarter of the total *rise of credit card debt*. Since new cardholders are more likely to be of lower income, the authors document that

[71] Models with asymmetric information can be theoretically challenging. In particular, there are well-known issues related to existence of competitive equilibrium with adverse selection (Rothshild and Stiglitz 1976). To get around the issue, papers in this literature typically make a variety of assumptions on timing, and information structure or employ particular equilibrium concepts. Livshits, MacGee, and Tertilt (2016) for example follow the timing suggested by Hellwig (1987) to guarantee the existence of pooling equilibria. The key idea is that "cream-skimming" deviations are not profitable if pooling contracts are allowed to exit the market in response to such deviations.

[72] Modeling credit scoring explicitly is theoretically challenging. See Chatterjee, Corbae, and Ríos-Rull (2008) and Chatterjee et al. (2018) for some recent progress on it.

between a fifth and a third of the *rise in defaults* is driven by the extensive margin. Along the intensive margin, 75% of the rise in debt was driven by existing cardholders whose average balance rose by roughly 60%. More than half of the increase in defaults can be attributed to these existing borrowers holding larger debts. Therefore, the data suggests that multiple of the mechanisms discussed above operated simultaneously.

7 Conclusion and Directions for Future Research

As this survey shows, studying consumer bankruptcy using quantitative macroeconomic models has been a very active field over the last two decades. Incomplete market models of unsecured debt with competitive lenders and default have become the workhorse model for analyzing many household finance questions. Much progress has been made in understanding the causes of consumer bankruptcy and on how to regulate it. In particular, there is a broad consensus now that the dramatic increase in bankruptcies in the United States was related to technological progress in the financial sector caused by such innovations as credit scoring and securitization. Regarding the welfare implications, the current "Fresh Start" bankruptcy seems a useful system in the US, but this conclusion is quite sensitive to the details of the environment. Small changes make more commitment, for example in the form of higher punishment, welfare superior. Other countries with lower idiosyncratic risk seem to fare better with a stricter bankruptcy law.

This survey focuses on the most central contributions discussing the welfare effects of past and potential bankruptcy reforms and explaining the rise in defaults over time, but many topics were left off the table. These provide fruitful avenues for future research. In some cases, there have been recent contributions addressing these topics. For example, most models incorporate only unsecured debt, when in reality people often hold multiple types of debt (in particular mortgages and unsecured debt) simultaneously or assets and debt simultaneously. Mitman (2016) builds a model with mortgages and unsecured debt, which allows him to analyze the interaction between filing for bankruptcy and foreclosing on a house. Previously, Li, White, and Zhu (2011) established this relationship empirically.

Further, very little research to date analyzes bankruptcy in other countries. Exler

(2019) is a notable exception by studying insolvency in Germany. Studying other countries will be quite interesting since the legal settings differ substantially across countries. An important obstacle to the systematic cross-country analysis is the lack of comparable international data. A notable exception is the *Household and Finance Consumption Survey* (HFCS) which collects information on assets, liabilities, income, and consumption of households in 18 Euro-area countries. It is set up as a repeated cross-section and was largely modeled after the US Survey of Consumer Finance. Unfortunately, no default information is currently collected. Moreover, the HFCS is a young survey with the first wave being conducted mainly in 2010. Since data is collected triennially, there is no meaningful time series dimension yet.

Moreover, several empirical observations remain quite puzzling from a standard consumer debt model's perspective. A prominent example is consumers holding high interest rate debt and liquid assets simultaneously (c.f. Gross and Souleles (2002a) and Gorbachev and Luengo-Prado (2019) among others). Similarly, Gathergood et al. (2019) document that consumers do not repay their highest interest rate debt first. A substantial number of consumers also hold payday loans with extremely high interest rates even though they have not maxed out their credit cards (Agarwal, Skiba, and Tobacman 2009). Agarwal et al. (2015a) document errors in the choice of credit contracts but that these decline in the dollar value of the potential error. Zinman (2015) provides an excellent overview of empirical findings that stand yet to be explained theoretically and/or quantitatively. A few authors have tried to explain such puzzles quantitatively, most notably Telyukova (2013) who argues that certain goods can be purchased with cash only leading to a precautionary demand for cash. However, quantitatively, the model can account for less than fifty percent of households holding liquid assets and credit card debt simultaneously. Bertaut, Haliassos, and Reiter (2009) rationalize the co-existence of high interest rate debt with liquid assets in a model with self-control problems. The importance of present bias is also emphasized in Kuchler and Pagel (2020).

This survey has largely focused on credit card lending as a proxy for unsecured lending. In recent years other forms of lending have emerged and hence credit cards may not remain the most important component of unsecured debt. In particular, peer-to-peer lending and other fintech lending have grown in importance. Further, payday loans have been prominent for a while, but have been analyzed little mostly for the lack of good data. Yet, much regulatory interest has focused on payday lending, partly because of the headline grabbing extreme interest rates, amounting easily to annual rates of 400 percent or more. Thus, more quantitative research on payday loans would be highly desirable.[73]

The policy discussion on payday loans and other high interest rate loans often starts from the idea that borrowers make mistakes and need to be protected from a predatory industry. If some people truly over-borrow and default excessively and lenders exploit such mistakes, then regulation could in principle protect such consumers. But what exactly is the reason for the mistakes? And how to judge whether mistakes are truly mistakes or simply bad luck? A theoretical framework departing from rationality would be needed to shed light on such arguments. There is a small theoretical literature that analyzes mistakes of behavioral consumers in borrowing and the resulting high interest rates, but this literature abstracts from defaults (Eliaz and Spiegler 2006; Heidhues and Kőszegi 2010; Heidhues and Kőszegi 2015). The quantitative consumer default literature, on the other hand, has largely assumed perfectly rational agents. A few recent notably exceptions exist. Laibson, Repetto, and Tobacman (2003) were the first to rationalize high rates of credit card borrowing with life-cycle wealth accumulation by assuming consumers have dynamically inconsistent preferences. Nakajima (2012, 2017) adds consumers with temptation preferences into a quantitative model with consumer bankruptcy and finds that regulation affects people with and without temptation preferences differently. Schlafmann (2016) analyzes consumers with self control problems in the context of mortgage debt and default. We currently pursue the idea that some people are over-optimistic about future income realizations leading to over-borrowing in ongoing work (Exler et al. 2019). This is – to the best of our knowledge – the first framework with a meaningful interaction between rational and behavioral agents.

Finally, it should also be pointed out that consumer finance has been a very active empirical research area with researchers exploring new data sets over the last decade. For example, Agarwal et al. (2015b) and Nelson (2019) use credit card account data.[74] Other researchers use individual bankruptcy records: Gross, Notowidigdo, and Wang (2014) compile their own data set from court filings and combine it with social security data and Dobbie and Song (2015) combine court filings with tax data from the Social Security Administration and real estate records. Some researchers use data from credit reports.

[73] Exler (2017) is one exception.

[74] Gross and Souleles (2002a) was probably the first paper that used credit account data.

Some researchers use data from credit reports. For example, Herkenhoff, Phillips, and Cohen-Cole (2018) use credit reports provided by Transunion and Schuh and Fulford (2015) use the Equifax – New York Fed Consumer Credit Panel. Baker (2018) and Olafsson and Pagel (2018) both use transaction level data from two different personal finance management software providers. It would be highly desirable to better integrate the empirical research and the quantitative macroeconomic research on consumer finance. Research based on quantitative models would benefit tremendously by obtaining more detailed micro-data (beyond the SCF, which remains the main data source in most of the literature, and accordingly also in this survey). New data sources from credit bureaus or detailed credit card accounts would allow for a much more detailed analysis of consumer borrowing and could also shed new light on previously unanswered questions about information aggregation, the degree of market power in the lending industry, the importance of pooling versus separating credit contracts, the (in)accuracy of individual expectations, financial literacy, and many more. One obstacle of using account data in models is the discrepancy in units of observation. Models are typically based on individuals or households, while the data is based on accounts. Clearly an individual can have many accounts with multiple banks, thus some creativity will be needed to bring such data to models.

A Data Appendix

Figure 1: Figure 1 uses aggregate data from a variety of sources. It is largely an update of several figures in Livshits, MacGee, and Tertilt (2010) with more recent data.

Panel (a) plots the number of total bankruptcy filings and Chapter 7 filings per household in the U.S. The numbers for both bankruptcy filing series from 1980 onwards are taken from the website of the American Bankruptcy Institute (ABI), accessed on August 15, 2019. We use the series on quarterly non-business filings by chapter and aggregate it to annual frequency by summation. The data for the years 1980-1994 is no longer available through the ABI website, but was previously collected by Livshits, MacGee, and Tertilt (2010). For the early years (1940-1979), we follow the strategy of Livshits, MacGee, and Tertilt (2010) and use data on total bankruptcy filings from Table 1 in McKinley (1997). The data on the number of U.S. households is taken from the U.S.

Census Bureau's Current Population Survey (CPS).

Panel (b) plots total consumer credit (revolving plus non-revolving) and revolving outstanding consumer credit (as a proxy for unsecured debt) in the U.S. as a percentage of personal disposable income. The data on outstanding consumer credit is taken from the Fed Board of Governors G.19 series, aggregated from monthly to yearly frequency by averaging. Personal disposable income is taken from Table 2.1 in the National Income and Product Accounts (NIPA) on the U.S. Bureau of Economic Analysis' website.

Panel (c) shows the evolution of credit card charge-off rates over time and how it closely resembles the dynamics of bankruptcy filings. Quarterly credit card charge-off rates are available starting from the year 1985 in the series "chgallsa" from the Fed Board of Governors. They are defined as the "value of loans removed from books and charged against loss reserves, [...] measured net of recoveries as a percentage of average loans." We aggregate this data to yearly frequency by averaging. To extend this series back in time, we follow Livshits, MacGee, and Tertilt (2010) and splice it with a series reported by Ausubel (1991). "Filings per 1000 Adults (18+)" are based on the same filings data as in panel (a). The number of U.S. adults is taken from the intercensal estimates on U.S. Census Bureau's website.

Panel (d) plots real interest rates on 24 month personal loans and credit cards. There is a break in the credit card interest rate series in 1995 after which assessed interest become available. Only accounts that carried a balance were used to calculate the average interest rates. Before 1995, we use stated APR that includes all accounts. While the 1995+ method is more appropriate for understanding consumer debt and default, the difference between both methods is negligible. For those years in which data according to both definitions exists, the two series display similar trends. Not surprisingly, the "all accounts" rate is slightly below the "assessed interest rate." The data on both nominal interest rates are taken from the Fed Board of Governors G.19 series. We convert the data to yearly frequency by averaging. To compute real rates we use 1-year ahead CPI inflation. Thus, we adjust nominal interest rates by the inflation rate in the following year. Inflation rates are taken from the CPI of all urban consumers on the website of the U.S. Bureau of Labor Statistics.

Figure 2: The life-cycle graphs in Figure 2 use data from the 2016 wave of the Survey of Consumer Finances (SCF). To construct the four panels we divide the households (or rather PEUs, refer to the SCF documentation for more details) in the survey into five-year bins, except for the very oldest, (20-24, 25-29, . . . , 70-74, and 75+) based on the age of the household head. The relevant variable is then computed for each age bin using the appropriate household weights. The ages on the x-axis in each plot refer to the median age in each bin, e.g. the label 22 refers to the 20-24 age group. The only exception is the last bin, where 77 refers to the last group including all households aged 75 and older.

For Panel (a) we computed the level of credit card debt for each household by summing over all types of credit cards (i.e. bank-type, store, gasoline, charge, or other types of credit cards) and then averaging in each age bin. In panel (b) we computed the fraction of credit card holders with a positive balance in each age group using the same debt variable as in panel (a). For panel (c) we used the total income before taxes and other deductions in the previous year as reported by the respondent. Panel (d) is constructed using the questions on whether the respondent was ever behind in debt payments (for any debt, not just credit cards) by two months or more (i.e. delinquent by more than 60 days) and whether the respondent (or his/her wife/husband/partner) filed for bankruptcy within the last five years.

Figure 3: In Figure 3 we plot the histogram of credit card interest rates using data from the SCF in three different years (1983, 2001, and 2016). In contrast to Tables 2 and 3, this may include interest paid on non-bank credit cards. The reason is that the SCF interest rate question is not related to a specific card and hence excluding non-bank cards is not possible. We use the question on credit card interest rates of respondents in the SCF to compute the frequency of every rate using the appropriate household weights. Note that the 2001 and 2016 surveys ask for the interest rate on the card with the largest balance, whereas the 1983 wave asks for the best guess of the average annualized interest rate on the most frequently used card if the account is not repaid in full. Each bin covers one percentage point (except for the first one which extends over the interval [0; 0.5) and aggregates all rates within this range.

Figure 7: Figure 7 plots the normalized credit scoring keyword count using Google Scholar. The data was collected on October 11th, 2019. We used the advanced search

option of Google Scholar and searched for the exact word group "credit scoring" anywhere in an article for the time period from 1965 to 2019. We counted the hits separately for every five-year group, i.e. 1965-1969, 1970-1974, ... Each five-year bin is labeled with the median year. To normalize the series, we additionally searched for the word group "consumer credit" using the same options as previously and divided the number of hits for "credit scoring" by those for "consumer credit" in each group.

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