Online Appendix for “Consumption Smoothing and Debtor Protections”

Nathaniel Pattison

Southern Methodist University

Supplemental Online Appendix: For Online Publication Only

Contents

List of Figures

List of Tables

A Additional Tables and Figures

Table A1: Sensitivity to Demographic and Economic Controls

Dependent variable:	Change in log consumption between $t-3$ and t				
	(1)	(2)	(3)	(4)	(5)
Default	-0.0552***	-0.0525***	-0.0531***	-0.0548***	-0.0517***
	(0.0147)	(0.0148)	(0.0148)	(0.0148)	(0.0149)
Observations	19,535	19,535	19,535	19,535	19,535
Households	6,478	6,478	6,478	6,478	6,478
Defaults	938	938	938	938	938
Δ family size	X	X	X	X	X
Demographics		X	X		X
Economic controls			X		
State-by-year FE				X	X

This table reports estimates of the changes in consumption in the years surrounding default from specification (5) with additional controls for demographic variables. The sample consists of household heads that report no defaults in $t-1$ and $t-2$. I also drop observations missing any demographic variables. All specifications include year fixed effects and a cubic in age of the household head. Standard errors are clustered by household. Column 1 is the baseline specification. Column 2 adds demographic controls for having a female head, having a white household head, years of education, marital status, and homeownership. Column 3 adds annual state-level controls for the log of median income (Current Population Survey) and the unemployment rate (Bureau of Labor Statistics). Column 4 includes state-by-year fixed effects, and column 5 includes both the demographic controls and state-by-year fixed effects.

Table A2: Significance of Difference across Types of Default

Dependent variable:	Change in log consumption between $t-3$ and t				Change between $t-1$ and t		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Default	-0.0556***	-0.0756***	-0.0600***	-0.0610***	-0.0694***	-0.0342	-0.0499***
	(0.0145)	(0.0204)	(0.0182)	(0.0148)	(0.0231)	(0.0209)	(0.0166)
Default×homeowner		0.0436			0.0627**		
		(0.0276)			(0.0301)		
Strict default			0.0111			-0.0190	
			(0.0285)			(0.0310)	
Bankruptcy				0.0975			0.146**
				(0.0645)			(0.0668)
Observations	20,002	20,002	20,002	20,002	26,111	26,111	26,111

This table reports regression results from specification (5) for different definitions of default. All regressions include year fixed effects, changes in household size, and a cubic in age of the household head. Standard errors are clustered by household. The sample in columns 1-4 consists of household heads that report no instances of financial distress of any type in $t-1$ and $t-2$ and drops observations with a consumption change over 300%. The dependent variable in columns 1-4 is the change in log of food consumption from $t-3$ to t. Column 1 reports estimates using the baseline definition of "Default", which includes any instance of financial distress including severe defaults and bankruptcies. Column 2 adds the interaction of "Default" with an indicator for homeownership. Column 3 adds an indicator for more severe defaults (i.e. repossessions, liens, garnishments, or collection calls). Column 4 adds an indicator for bankruptcy. Columns 5-7 repeat the regressions in columns 2-4, but use the sample definition of Filer and Fisher (2005), which includes respondents that are not household heads, consumption changes over 300%, and those with reported financial distress in earlier years. Additionally, following Filer and Fisher (2005), the dependent variable in columns 5-7 is the change in log consumption from $t-1$ to t.

Table A3: Heterogeneity in the Consumption Drop

Dependent variable	Change in log consumption between $t-3$ and t						
	All	Renters	Homeowners	Homeowners, non-exempt equity	Default, no bank.	Severe default	Bankruptcy
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Default	-0.0556***	-0.0750***	-0.0314	-0.0521*	-0.0608***	-0.0481**	0.0369
	(0.0132)	(0.0177)	(0.0191)	(0.0289)	(0.0136)	(0.0204)	(0.0630)
Observations	20,002	19,560	19,473	19,220	19,949	19,419	19,084
Households	6664	3092	4266	2529	6655	6519	6445
Defaults	971	529	442	189	918	388	53

This table reports regression results from specification (5) for different subsets of defaulters. All regressions include year fixed effects, changes in household size, and a cubic in age of the household head. Standard errors are clustered by household. The sample consists of household heads that report no instances of financial distress of any type in $t-1$ and $t-2$. The dependent variable is the change in log of food consumption from $t-3$ to t. Column 1 reports estimates using the baseline definition of default, which includes any instance of financial distress. Columns 2-4 restrict the sample to renters, homeowners, and homeowners with non-exempt home equity, respectively. Column 5 drops observations that default with a formal bankruptcy. Column 6 further restricts the sample by dropping observations that default without reporting a more severe collection activity (i.e. repossessions, liens, garnishments, or collection calls). Column 7 drops any defaulters without a formal bankruptcy.

Table A4: Changes in Food Consumption upon Bankruptcy

Dependent variable:	Change in log consumption between $t-3$ and t				
	Baseline (1)	Family size (2)	With outliers (3)	No food stamps (4)	Change between $t-1$ and t (5)
Bankruptcy	0.0396	0.0362	-0.0143	0.0595	0.0699*
	(0.0533)	(0.0501)	(0.0674)	(0.0549)	(0.0395)
Observations	20,534	20,534	21,799	19,344	22,817
Households	6865	6865	7013	6611	7601
Defaults	83	83	94	78	105
Control for Δ family size		X	X	X	X
Include changes > 300%			X	X	

This table reports estimates of the changes in consumption in the years surrounding bankruptcy from specification (5). The sample consists of household heads that report no bankruptcies in $t-1$ and $t-2$. All specification include year fixed effects and a cubic in age of the household head. Standard errors are clustered by household. The dependent variable in columns 1-4 is the change in log of food consumption from $t-3$ to t. Column 1 presents the baseline specification. Column 2 adds controls for changes in family size. Column 3 adds the outliers with consumption changes greater than 300%. Column 4 replaces the dependent variable with changes on log food consumption excluding food stamps. Column 5 replaces the dependent variable with the change between $t-1$ and t, as in Filer and Fisher (2005).

Table A5: Decomposing the Difference between Default and Bankruptcy

Dependent variable	Change in log consumption between $t-3$ and t			
Sample:	Default and bankruptcy		Bankruptcy	Default
	(1)	(2)	(3)	(4)
Bankruptcy	0.109**	0.0617		
	(0.0504)	(0.0522)		
Δ family size	0.107***	0.0985***	0.101**	0.0959***
	(0.0107)	(0.0122)	(0.0490)	(0.0127)
Female		-0.0323	-0.0394	-0.0353
		(0.0419)	(0.180)	(0.0432)
Years of education		-0.000768	0.0185	0.000392
		(0.00668)	(0.0359)	(0.00684)
White		-0.00365	0.212	-0.0226
		(0.0305)	(0.137)	(0.0317)
Number of children		-0.00955	-0.0617	-0.00561
		(0.0125)	(0.0557)	(0.0129)
Married		0.0642	0.0562	0.0527
		(0.0428)	(0.164)	(0.0447)
Unsecured debt (2010$)		-5.66e-07	8.62e-07	-7.15e-07
		(9.89e-07)	(5.10e-06)	(1.01e-06)
Mortgage debt (2010$)		9.94e-08	1.03e-06	1.55e-07
		(4.93e-07)	(1.87e-06)	(5.16e-07)
Log(median income)		-0.0375	-0.351	-0.00806
		(0.108)	(0.466)	(0.112)
Unemp. rate		-0.0145	0.00762	-0.0137
		(0.0136)	(0.0509)	(0.0143)
Observations	1,001	956	78	878
	1,001	955	78	877
Year FE	X	X	X	X
Cubic in Age	X	X		X
Oaxaca-Blinder decomposition (using estimates from columns 3 and 4)				
Difference: $\Delta C_D - \Delta C_B$		-0.101		
Due to difference in Xs: Δ_X^μ		-0.069		
Due to difference in βs: Δ_β^μ		-0.064		
Due to interaction: Δ_I^μ		0.033		

The dependent variable is the change in log food consumption between $t-3$ and t. The sample in columns 1 and 2 contains households that informally default or file for bankruptcy in year t. The regression in column 1 controls only for changes in family size and year fixed effects. Column 2 adds controls for demographic variables and state economic conditions. Columns 3 and 4 estimate these specifications separately for bankruptcy filers and informal defaulters.

Using the Oaxaca-Blinder decomposition, one can rewrite the difference in mean consumption changes between informal defaulters (D) and bankruptcy filers (B) as

$$\Delta C_D - \Delta C_B = \underbrace{\left(\overline{X}_D - \overline{X}_B\right)\beta_B}_{\Delta_X^\mu} + \underbrace{\left(\beta_D - \beta_B\right)\overline{X}_B}_{\Delta_\beta^\mu} + \underbrace{\left(\overline{X}_D - \overline{X}_B\right)\left(\beta_D - \beta_B\right)}_{\Delta_I^\mu},$$

where $\overline{X}_D, \overline{X}_B$ are the means of the X variables for defaulters and bankruptcy filers. The bottom panel reports these components of the mean difference using the coefficient from columns 3 and 4. In Figure A2, I show the reweighted densities of the consumption changes following DiNardo, Fortin, and Lemieux (1996).

Table A6: Changes in Food Consumption upon Default (Debt-weighted)

Dependent variable:	Change in log consumption between $t-3$ and t				Alt. Timing: Change in log consumption between			
	Baseline	Family size	With outliers	No food stamps	$t-3$ and $t+1$	$t-3$ $t+2$	$t-3$ $t+4$	Lag to period 0
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Default	-0.0461	-0.0439	-0.0752**	-0.0463	-0.0462	-0.0690**	-0.0886	-0.0625
	(0.0314)	(0.0304)	(0.0341)	(0.0337)	(0.0313)	(0.0322)	(0.0556)	(0.0656)
Observations	9,645	9,645	10,155	9,379	8,951	6,493	3,323	3,602
R-squared	0.026	0.125	0.160	0.110	0.126	0.141	0.171	0.025
Households	3984	3984	4104	3875	3873	3572	2468	1567
Defaults	552	552	609	501	528	428	249	229
Control for Δfamily size		X	X	X	X	X	X	X
Include changes > 300%			X	X				

This table repeats the specifications in Table 2, weighting observations by outstanding unsecured debt. To reduce the influence of outliers when weighting, unsecured debt is truncated at the 99^{th} percentile ($110,345 2010$).

Table A7: Exemptions and Bankruptcy Filings

Dependent variable:	Bankruptcy filings per 1,000 residents					
	Chapter 7			Chapter 13		
	(1)	(2)	(3)	(4)	(5)	(6)
Log(exemption)	-0.216	0.492**	0.594***	-0.120	0.0373	0.0476
	(0.283)	(0.215)	(0.211)	(0.105)	(0.0965)	(0.120)
Log(median income)		0.136	0.00136		0.135	-0.0654
		(0.530)	(0.590)		(0.339)	(0.382)
Unemp. rate		0.153**	0.115		0.0732	0.0715
		(0.0703)	(0.0881)		(0.0450)	(0.0502)
Log(house price index)		-5.155***	-5.079***		-1.025***	-1.011***
		(0.421)	(0.445)		(0.348)	(0.347)
Observations	550	550	550	550	550	550
Year FE	X	X	X	X	X	X
State FE	X	X	X	X	X	X
Region-by-year FE			X			X

This table shows the effect of exemptions on Chapter 7 and Chapter 13 bankruptcy filing rates per 1,000 people. Standard errors clustered at the state-level are in parentheses.
Source: 1994-2004 Bankruptcy Filings from the Administrative Office of the U.S. Courts

Table A8: Linear Exemptions

Dependent variable:	Recovery rates on non-real estate debt (%)			Credit card interest rates (%)		
	(1)	(2)	(3)	(4)	(5)	(6)
Exemption ($1,000s)	-0.00641	-0.0188***	-0.0188***	0.00196***	0.00225***	0.00128*
	(0.00531)	(0.00382)	(0.00423)	(0.000393)	(0.000407)	(0.000711)
Log(median income)		1.287	2.424		-0.514	-0.259
		(4.942)	(5.083)		(0.519)	(0.548)
Unemp. rate		-1.756***	-1.311*		-0.0158	0.0112
		(0.631)	(0.682)		(0.0471)	(0.0553)
Log(house price index)		11.91***	10.14***		-0.236	-0.0871
		(3.087)	(2.475)		(0.281)	(0.409)
Observations	550	550	550	550	550	550
State and year FE	X	X	X	X	X	X
Region-by-year FE			X			X

Estimates are from specification (8), but including *exemption* linearly instead of as $log(exemption)$. Observations are at the state-year level and weighted by credit union membership. Standard errors clustered at the state-level are in parentheses.
Source: 1994-2004 NCUA Call Reports

Table A9: Linear Exemptions - Heterogeneity by Exemption Level

Dependent variable:	Recovery rates on non-real estate debt (%)			Credit card interest rates (%)		
	(1)	(2)	(3)	(4)	(5)	(6)
Exemption ($1,000s)	-0.00638	-0.0180***	-0.0193***	0.00195***	0.00218***	0.00132**
	(0.00643)	(0.00419)	(0.00344)	(0.000332)	(0.000328)	(0.000618)
Low×Exemption	-0.356*	-0.339***	-0.325**	0.0322***	0.0308***	0.0281***
	(0.178)	(0.104)	(0.125)	(0.0102)	(0.0103)	(0.00998)
Log(median income)		-0.583	0.383		-0.344	-0.0830
		(4.618)	(4.836)		(0.513)	(0.544)
Unemp. rate		-1.854***	-1.405**		-0.00681	0.0193
		(0.567)	(0.592)		(0.0420)	(0.0509)
Log(house price index)		11.32***	9.555***		-0.183	-0.0361
		(2.751)	(2.419)		(0.284)	(0.407)
Observations	550	550	550	550	550	550
State and year FE	X	X	X	X	X	X
Region-by-year FE			X			X

Estimates are from specification (8), but including *exemption* linearly instead of as $log(exemption)$. *Low* is an indicator that is constant within each state and equals 1 if the state's average exemption level from 1994-2004 is below the median average exemption level. Observations are at the state-year level and weighted by credit union membership. Standard errors clustered at the state-level are in parentheses.
Source: 1994-2004 NCUA Call Reports

Table A10: Estimates using Homestead Exemptions Only

Dependent variable:	Recovery rates on non-real estate debt (%)			Credit card interest rates (%)		
	(1)	(2)	(3)	(4)	(5)	(6)
Log(home exemptions)	-2.877	-3.774***	-4.134***	0.376***	0.393***	0.305*
	(1.936)	(1.257)	(1.460)	(0.130)	(0.130)	(0.159)
Log(median income)		0.508	2.101		-0.514	-0.292
		(4.851)	(4.886)		(0.524)	(0.543)
Unemp. rate		-1.688***	-1.152*		-0.0225	-0.00373
		(0.604)	(0.595)		(0.0454)	(0.0538)
Log(house price index)		11.87***	9.289***		-0.182	-0.0428
		(2.900)	(2.389)		(0.283)	(0.412)
Observations	528	528	528	528	528	528
State and year FE	X	X	X	X	X	X
Region-by-year FE			X			X

*** p<0.01, ** p<0.05, * p<0.1

Estimates are from specification (8) with the (log) homestead exemption used as the main independent variable. Observations are weighted by credit union membership. Maryland and Delaware, which had no homestead exemption from 1994-2004, are excluded from the sample. Standard errors clustered at the state-level are in parentheses.
Source: 1994-2004 NCUA Call Reports

Table A11: Estimates from Sample of One-State Credit Unions

Dependent variable:	Recovery rates on non-real estate debt (%)			Credit card interest rates (%)		
	(1)	(2)	(3)	(4)	(5)	(6)
Log(exemption)	-0.278	-2.584**	-2.809**	0.466**	0.467***	0.366*
	(1.363)	(1.190)	(1.282)	(0.175)	(0.163)	(0.184)
Log(median income)		2.374	3.870		-0.451	-0.183
		(5.796)	(5.591)		(0.494)	(0.512)
Unemp. rate		-1.632***	-1.119**		0.0566	0.0737
		(0.530)	(0.534)		(0.0485)	(0.0552)
Log(house price index)		14.20***	13.31***		0.0872	0.257
		(3.457)	(3.070)		(0.364)	(0.536)
Observations	550	550	550	550	550	550
State and year FE	X	X	X	X	X	X
Region-by-year FE			X			X

Estimates are from specification (8), but the sample of credit unions is restricted to those with branches in only one state. Credit union call reports available from the NCUA begin including branch locations in 2010. I use the 2013 data, which include branch locations for 99.97% of credit unions (compared with 95.29% in the 2010 data). 92.9% of credit unions have branches in only one state, and 98.2% have branches in two or fewer states. Observations are weighted by credit union membership. Standard errors clustered at the state-level are in parentheses.
Source: 1994-2004 NCUA Call Reports

Table A12: Impact of Exemptions on Interest Rates for Consumer Loans

Dependent variable:	Interest rate (%)							
	Unsecured personal loans		New auto loans		Used auto loans		Mortgage	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log(exemption)	0.273**	0.354**	0.145	0.174*	0.172*	0.191**	-0.0638	-0.0943
	(0.126)	(0.159)	(0.0918)	(0.102)	(0.0862)	(0.0835)	(0.136)	(0.128)
Log(median income)		-0.637		0.0540		-0.0692		-0.198
		(0.617)		(0.330)		(0.309)		(0.289)
Unemp. rate		0.00324		-0.0693**		-0.0960***		-0.0840**
		(0.0449)		(0.0278)		(0.0297)		(0.0361)
Log(house price index)		-0.623		-0.285		-0.200		0.216
		(0.480)		(0.207)		(0.212)		(0.188)
Observations	550	550	550	550	550	550	550	550
State and year FE	X	X	X	X	X	X	X	X

This table reports regression results from estimating equation (8) with state-level interest rate data. Observations are weighted by credit union membership. Standard errors clustered at the state-level are in parentheses.
Source: 1994-2004 NCUA Call Reports

Table A13: Estimates from Commercial Bank Call Reports

Dependent variable:	Recovery Rate on Charged-Off Consumer Debt (%)						
	State Aggregate Data			Individual Bank Data			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log(exemption)	-3.634*	-4.792***	-5.824**	-0.794	-3.295*	-1.625	-2.306*
	(2.069)	(1.728)	(2.397)	(1.994)	(1.709)	(1.198)	(1.159)
Log(median income)		2.935	-2.557		-5.816	-3.062	-2.368
		(7.544)	(7.599)		(6.237)	(6.061)	(4.576)
Unemp. rate		-2.228	-2.658**		-2.798*	-1.488	-1.107
		(1.539)	(1.080)		(1.430)	(1.043)	(0.778)
Log(house price index)		9.738**	4.859		13.00***	6.924**	9.325***
		(4.782)	(5.518)		(3.408)	(3.379)	(3.301)
Observations	550	550	550	73,373	73,373	73,373	66,927
Year FE	X	X	X	X	X	X	X
State FE	X	X	X	X	X		
Region-by-year FE			X				
Bank FE						X	X
Drop if rec. rate > 100%							X

This table replicates Table 6 using data from commercial bank call reports. The sample of commercial banks included is restricted to those with branches in only one state. I also drop banks with holding companies that have branches in multiple states. To match the credit union analysis, I define consumer debt as the sum of credit cards and other household loans (single payment, installment, student, and revolving plans other than credit cards). Observations are weighted by the average amount of consumer debt outstanding per state (columns 1-3) or per bank (columns 4-7). Standard errors clustered at the state-level are in parentheses.
Source: 1994-2004 FFIEC Call Reports

Table A14: Impact on Interest and Recovery Rates - Quarterly Credit Union Data from 2005-2017

	CU Rec. Rate		Bank Rec. Rate		CU Interest Rate	
	1994-2004	2007-2017	1994-2004	2007-2017	1994-2004	2007-2017
	(1)	(2)	(3)	(4)	(5)	(6)
Log(exemption)	-3.568***	-0.423	-3.953**	-4.477	0.448***	-0.109
	(1.262)	(1.193)	(1.846)	(3.617)	(0.125)	(0.145)
Log(median income)	0.678	-6.187	-1.550	-22.23	-0.439	-0.0297
	(4.735)	(7.283)	(8.294)	(20.39)	(0.511)	(0.544)
Unemp. rate	-1.774***	0.259	-3.150*	-3.444**	-0.0140	0.105**
	(0.608)	(0.678)	(1.754)	(1.613)	(0.0448)	(0.0442)
Log(house price index)	11.95***	9.890	7.852	5.986	-0.252	-0.475
	(2.897)	(6.528)	(5.711)	(16.79)	(0.278)	(0.661)
Observations	550	550	550	550	550	550
State & year FE	X	X	X	X	X	X

This table compares estimates from specification (8) for the pre-BAPCPA period 1994-2004 and the post-BAPCPA period 2007-2017. Credit Union observations are weighted by credit union membership. Standard errors clustered at the state-level are in parentheses. *Source:* Quarterly Credit Union Call Reports

Table A15: Impact on Interest and Recovery Rates - Quarterly Credit Union Data from 2014-2017

Dependent variable:	Recovery rates on non-real estate debt (%)				Credit card interest rates (%)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
log(homestead exempt.)	-3.533***	-2.983**	-3.168***	-2.809***	0.0621	0.157	0.194	0.307*
	(0.963)	(1.176)	(0.710)	(0.766)	(0.120)	(0.138)	(0.157)	(0.163)
Observations	784	784	784	784	784	784	784	784
State FE	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X
Economic controls		X	X	X		X	X	X
Region-by-year FE			X				X	
Division-by-year FE				X				X

This table reports regression coefficients from estimating different-in-differences regressions using quarterly, state-level observations of average recovery rates for non-real estate debt or average credit card interest rates. The sample period is from 2014-2017, and there are 14 exemption changes during this period. The sample excludes Maryland, which had no homestead exemption for some of the sample period. Column 1 includes state fixed effects and year fixed effects. Column 2 adds state economic controls for the log of median income, unemployment rate, and log of the FHFA home price index. Column 3 adds region-by-year fixed effects for the four Census regions and column 4 adds division-by-year fixed effects for the nine Census divisions. Columns 5-8 repeat these specifications, replacing the dependent variable with the average interest credit card interest rate. Observations are weighted by credit union membership. Standard errors clustered at the state-level are in parentheses. Figure A9 presents coefficients from the event study version of columns 2 and 6. *Source:* 2014-2017 Quarterly Credit Union Call Reports

Table A16: Impact of Exemptions on Bankruptcy and Non-bankruptcy Charge-offs

Dependent variable:	(1) Charge-off rate (bank. or default)	(2) Charge-off rate (from bank.)	(3) Charge-off rate (non-bank.)	(4) Share of charge-offs from bankruptcy
Log(exemption)	0.0878**	0.0477*	0.0401**	-1.655
	(0.0407)	(0.0262)	(0.0192)	(1.879)
Log(median income)	0.165	-0.00735	0.173*	-13.45*
	(0.152)	(0.0753)	(0.101)	(6.903)
Unemp. rate	0.0438***	0.0263***	0.0175*	0.928
	(0.0158)	(0.00808)	(0.00965)	(0.572)
Log(home price index)	-0.311***	-0.348***	0.0366	-32.35***
	(0.109)	(0.0554)	(0.0693)	(4.408)
Observations	350	350	350	350
Mean of dep. var. (%)	0.581	0.232	0.348	40
Year FE	X	X	X	X
State FE	X	X	X	X
Region-by-year FE	X	X	X	X

This table reports regression results from estimating equation (8). Observations are weighted by credit union membership. Standard errors clustered at the state-level are in parentheses. Starting in 1998, Credit Union Call Reports separately report charge-offs from bankruptcy and charge-offs from non-bankruptcy default. I estimate the difference-in-difference specification (8), replacing the dependent variable with the total (all loan) charge-off rate, the share of loans charged-off in bankruptcy rate, the share of loans charged-off without bankruptcy, and the share of charge-offs from bankruptcy as dependent variables. *Source:* 1998-2004 Credit Union Call Reports

Table A17: Impact of Exemptions on Average Debt per Credit Card

	(1)	(2)	(3)
Dependent variable	Average debt per credit card		
Log(exemption)	-137.2***	-111.7**	-88.37**
	(48.08)	(46.00)	(42.58)
Log(median income)		83.29	45.48
		(138.5)	(152.8)
Unemp. rate		6.560	7.762
		(13.96)	(12.50)
Log(house price index)		-210.6	-42.81
		(145.4)	(159.0)
Observations	550	550	550
Mean of dep. var	$1,485	$1,485	$1,485
State and year FE	X	X	X
Region-by-year FE			X

This table reports regression results from estimating equation (8) with state-level interest rate data. The dependent variable is each states' average credit card debt per card. Observations are weighted by credit union membership. Standard errors clustered at the state-level are in parentheses.
Source: 1994-2004 NCUA Call Reports

Table A18: The Effect on Recoveries by Type of Default (Log)

Panel A Dependent variable: Average amount recovered by unsecured creditors per default

	All Charge-offs (1994-2004) (1)	Chapter 7 (2000-2004) (2)	Chapter 13 (1994-2004) (3)
log(exemption)	-175.2**	-75.64*	-271.7*
	(80.91)	(39.73)	(145.3)
Observations	550	238	528
Mean of dep. var	833.1	247.1	1,111
State FEs	X	X	X
Year FEs	X	X	X
Economic controls	X	X	X

Panel B: Accounting for the change in average recoveries

	All states		
	Overall	Chapter 7	Chapter 13
(i) Estimated share of Credit Union charge-offs	100%	30.5%	9.5%
(ii) Change in recoveries per default from 100 log point exemption increase	-175.2	-75.64	-271.7
(iii) Share of overall change accounted for by default type	100%	13%	15%

Observations are at the state-year level and the dependent variable in the average recoveries by unsecured creditors for different types of default. Observations are weighted by credit union membership and standard errors are clustered at the state level. Columns 1,2, and 3 report the effect of exemptions on average recoveries from non-real estate charge-offs (including bankruptcy and informal default), and average recoveries by unsecured creditors in Chapter 7 and Chapter 13 bankruptcies, respectively. Data for Chapter 7 and Chapter 13 recoveries do not contain AL and NC, which are not under the jurisdiction of the United States Trustee Program. Chapter 7 data is available for 2000-2004. Panel B reports the share of charge-offs from each type of default, and uses these shares and the estimates to calculate the share of the total change in recoveries that is explained by each type of default. See the corresponding text in subsection 7 for details of the calculations.

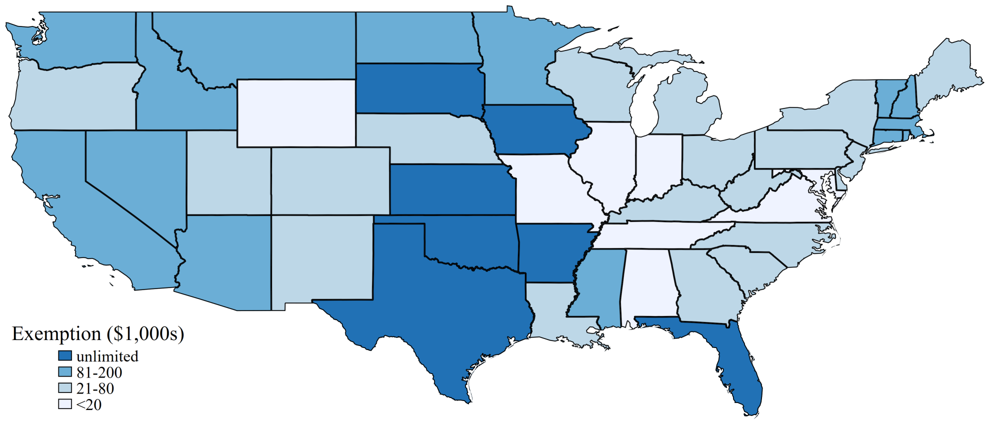
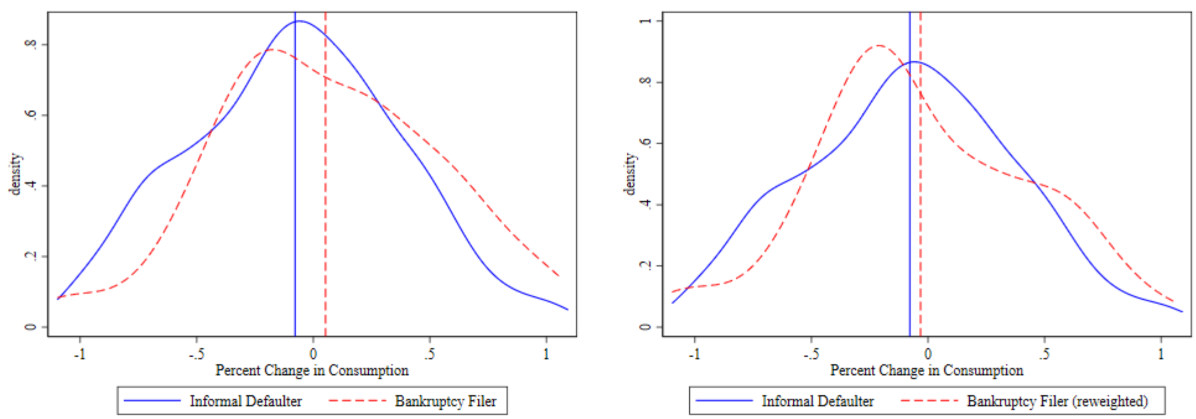


Figure A1: **State Exemption Levels** The map shows states' average exemption level (sum of home and non-home exemptions) between 1994-2017 in 2010$. Source: Historical state statutes and Elias, Renauer, and Leonard (1989-2013).



(a) Actual densities

(b) Counterfactual densities

Figure A2: **Densities of changes in consumption between $t-3$ and t**

Panel (a) plots the densities for the change in consumption between $t-3$ and t for those informally defaulting or filing for bankruptcy in year t. Panel (b) reweights the observations of bankruptcy filers so that the distribution of observables is that of informal defaulters following DiNardo, Fortin, and Lemieux (1996). The vertical lines show the means for informal defaulters and bankruptcy filers. *Source: 1991-1996 PSID*

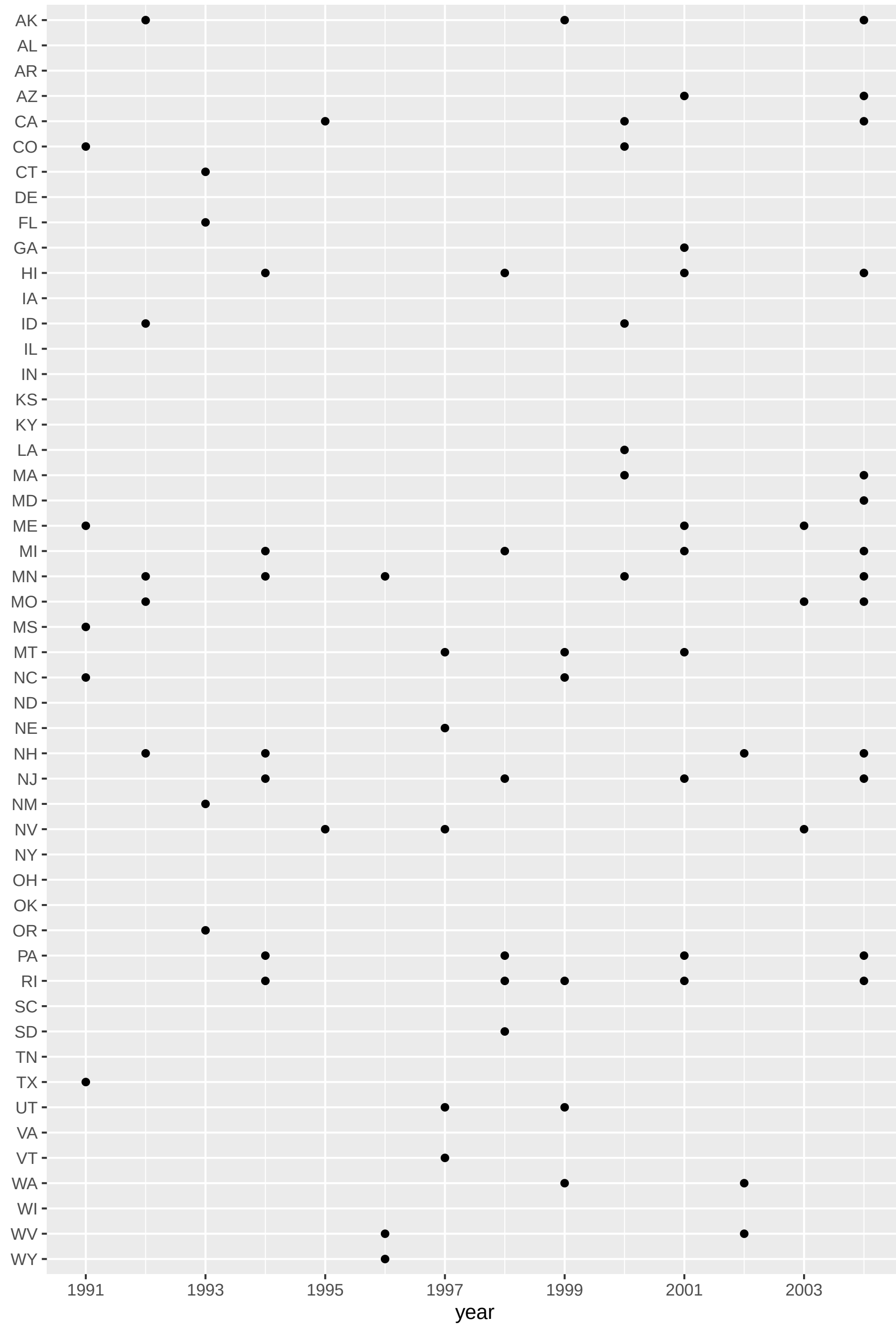
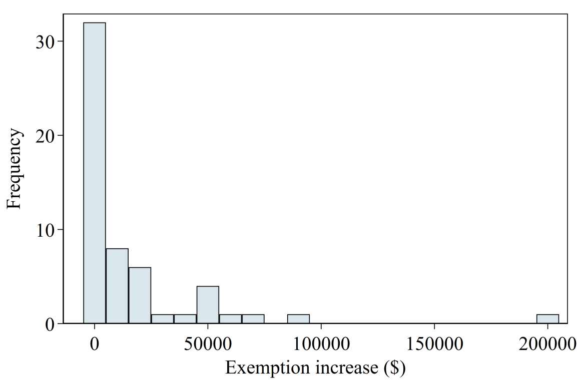
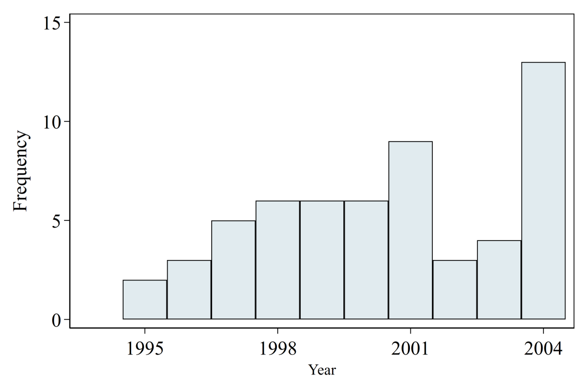


Figure A3: **Changes in States Exemptions (1991-2004)** Each dot reflects a change in the homestead or personal property exemptions in that state and year. *Source:* Exemptions are from Elias, Renauer, and Leonard (1989-2013) and state statutes.

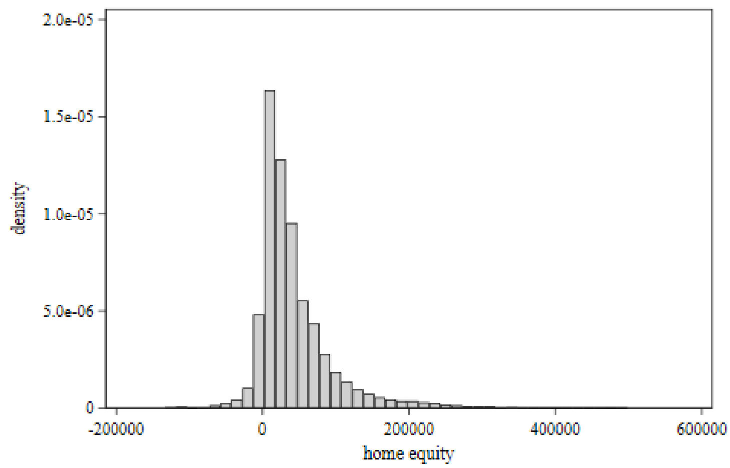


(a) Size of Exemption Changes



(b) Number of Exemption Changes

Figure A4: **Distributions of the size and number of changes in homestead exemptions from 1994-2004.** *Source:* Exemptions are from Elias, Renauer, and Leonard (1989-2013) and state statutes.



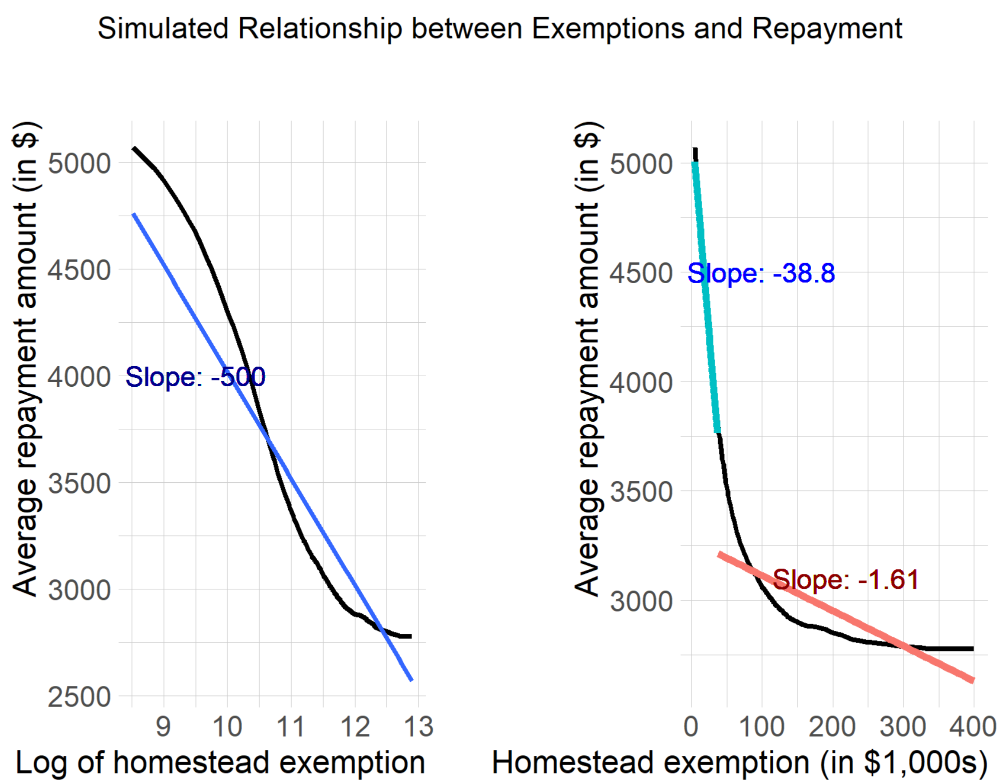


Figure A5: **Simulated Relationship between Exemptions and Repayment**
The top figure plots the home equity distribution (conditional on ownership) from the combined 1996 and 2001 SIPP. The bottom figures use the national distribution of households' home equity, vehicle equity, and financial assets from the combined 1996 and 2001 SIPP to simulate the impact of homestead exemptions on repayment amounts. For each household i in state s in this sample, I calculate the repayment amount

$$\text{Repayment Amount}(\mathbf{w}_{is}, \mathbf{e}_n(h)) = \min\left\{\text{Seizable Assets}(\mathbf{w}_{is}, \mathbf{e}(s,h)), \text{Unsecured Debt}_i\right\},$$

where the exemptions $\mathbf{e}(s,h)$ consist of the vehicle and financial exemptions (including wildcard) from 2001 in state s, but the homestead exemption h varying from \$5,000 to \$400,000. The figures plot the average repayment amount for each h. The left figure plots the slope, and the right figure plots the slopes for high- (homestead above \$36,000) and low-exemption states separately.
Source: 1996 and 2001 SIPP

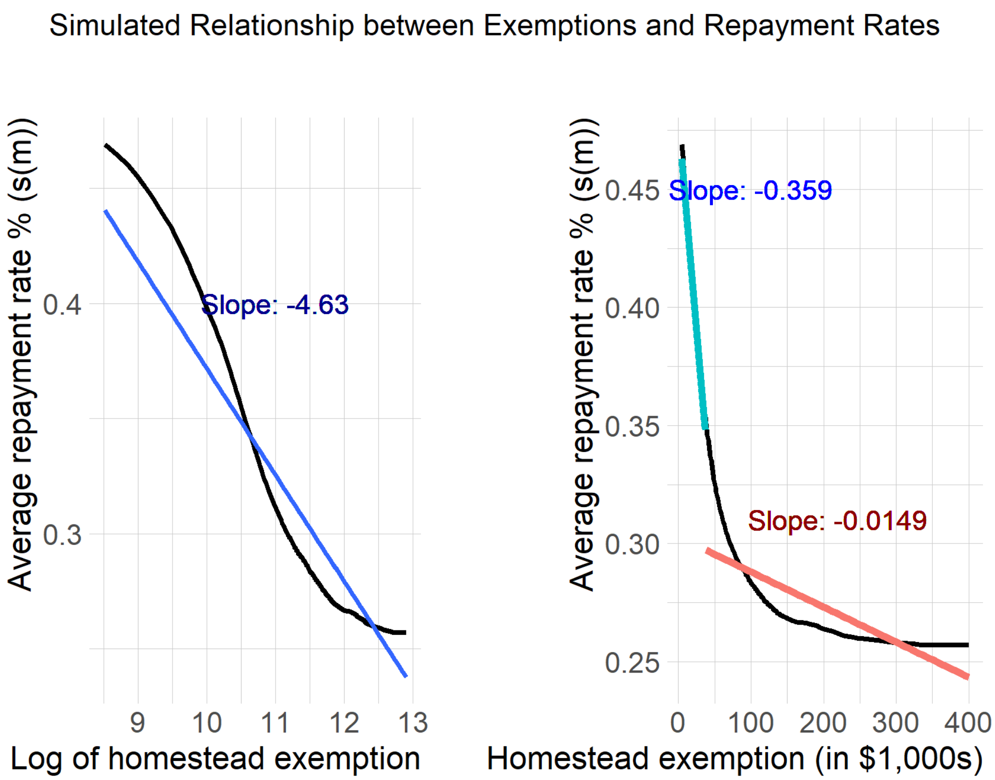
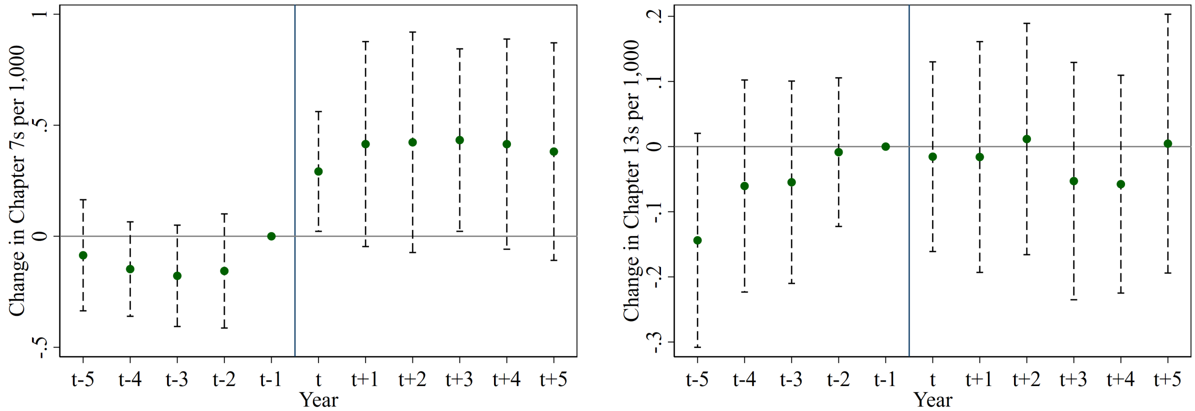


Figure A6: **Simulated Relationship between Exemptions and Repayment Rates**
This figure repeats Figure A5, replacing the vertical axis with the recovery rate, i.e. the average repayment rate divided by the average debt. See notes in Figure A5 for details on the construction of repayment.
Source: 1996 and 2001 SIPP



(a) Chapter 7 per 1,000

(b) Chapter 13 per 1,000

Figure A7: **Effects of Exemption Increases in Year t on Bankruptcy Rates** The cumulative effect of a 100 log point increase in asset exemptions in period t, estimated from the distributed lag model in equation (9). The sample period is 1994-2004, with exemption data used from 1989-2015 to allow for 5 leads and lags for each observation. Observations are weighted by credit union membership. The dotted lines show 95% confidence intervals for standard errors clustered at the state level.
Source: 1994-2004 Annual Bankruptcies from the Administrative Office of the U.S. Courts

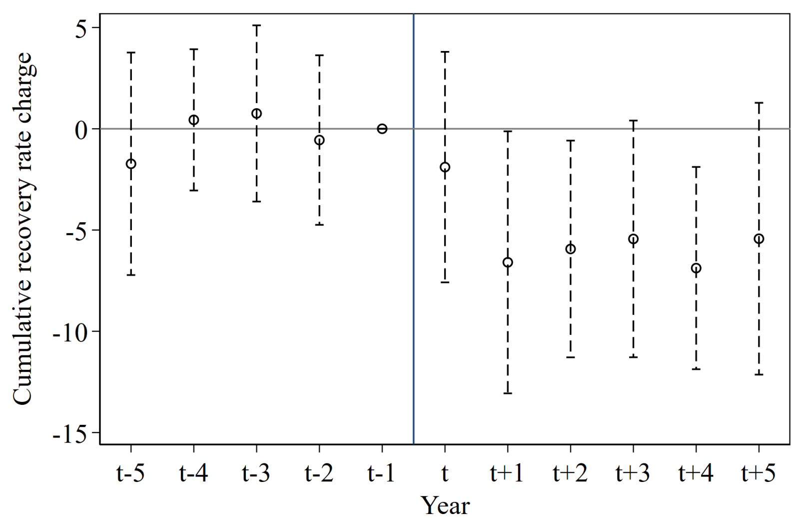
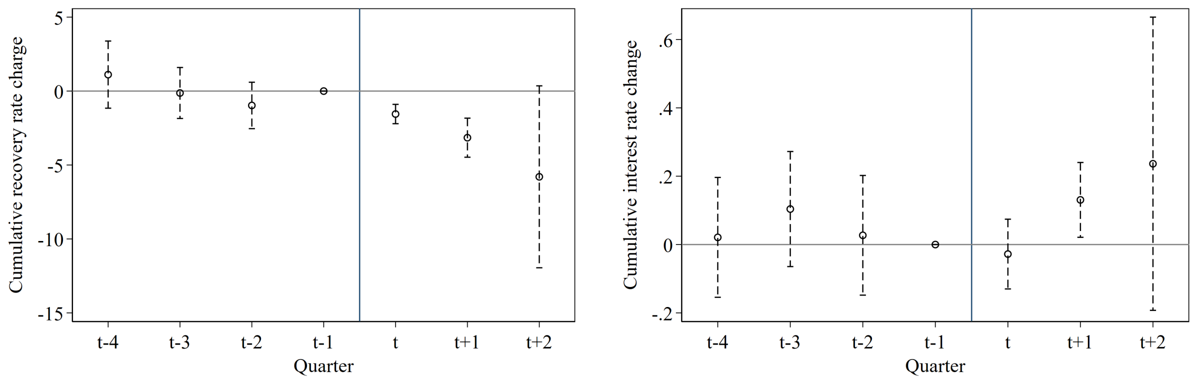


Figure A8: **Commercial Banks: Effect of Exemption Increases in Year t on the Recovery Rate** The cumulative effect of a 100 log point increase in asset exemptions in period t on the recovery rate of charged-off consumer debt, estimated from the distributed lag model in equation (9). The sample of commercial banks included is restricted to those with branches in only one state. I also drop banks with holding companies that have branches in multiple states. To match the credit union analysis, I define consumer debt as the sum of credit cards and other household loans (single payment, installment, student, and revolving plans other than credit cards). Observations are weighted by the average amount of consumer debt outstanding per state. The dotted lines show 95% confidence intervals for standard errors clustered at the state level.
Source: 1994-2004 FFIEC Call Reports



(a) Recovery Rates on Charged-Off Loans (%)

(b) Credit Card Interest Rates (%)

Figure A9: **Effects of Exemption Increases 2014-2016**

The cumulative effect of a 100 log point increase in asset exemptions in quarter t, estimated from the distributed lag model

$$y_{st} = \alpha + \sum_{k=-4,k\neq-1}^{2} \eta_k \Delta ln(E_{s,t-k}) + X_{st}\beta + \delta_s + \tau_t + u_{st}.$$

The specification omits one-year lead term, so the coefficients capture differences in the outcome relative to differences that exist one year before an exemption increase. As suggested in Sandler and Sandler (2014), the 2-quarter lead difference is inclusive, in that the difference operator is between 2017Q4 and quarter $t+2$. Similarly, the 4-quarter lag difference is the difference in log(exemption) between quarter $t-4$ and 2008Q1. The specification also includes state and year fixed effects and economic controls for the state unemployment rate, log of median income, and the log of the home price index.

The sample consists of quarterly, state-level observations from 2014-2016. Observations are weighted by credit union membership. Standard errors clustered at the state-level are in parentheses.

Source: 2014-2016 Quarterly Credit Union Call Reports

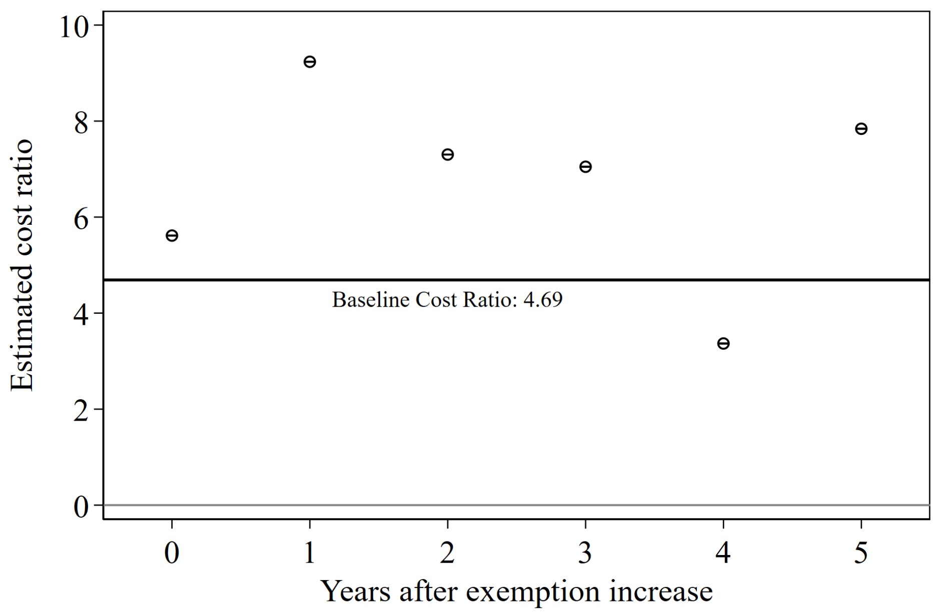


Figure A10: **Dynamic Cost-Benefit Ratio** This figure computes the cost-benefit ratio $-\frac{(1-\pi)}{\pi}\frac{r'(m)}{s'(m)} - 1$ from equation (2) using the lagged treatment effect estimates on interest rates (r') and recovery rates (s') from Figure 3. The probability of default $\pi = 0.022$, as in the main text, and the horizontal line shows the Baseline Cost-Benefit Ratio of 4.69.

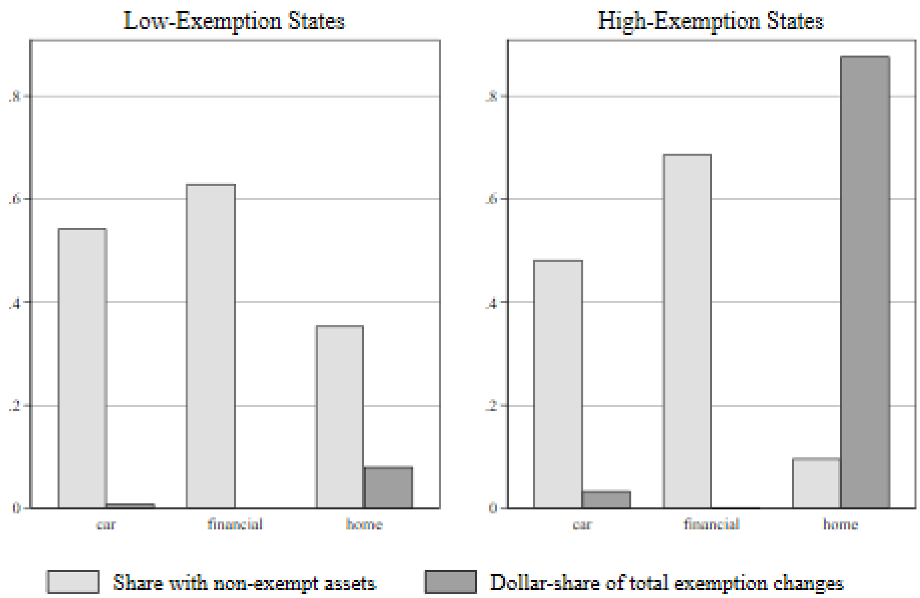


Figure A11: **Distribution of Non-Exempt Assets and Exemption Changes by Asset Type**
For car, financial, and wildcard exemptions and across low- and high-exemption states, this figure plots the share of households with non-exempt assets in each category (calculated in the 1996 and 2001 SIPP) and the share of total exemption changes that are in each category and state-group. The asset is non-exempt if the equity exceeds the exemption level. Low-exemption states are those with below-median average total exemptions between 1994 and 2001.
Source: 1996 and 2001 Survey of Income and Program Participation

B Theory

B.1 Proof of Proposition 1 and Corollary 1

Proof of Proposition 1

The optimal default rule is to default if $\omega < \omega^*$, where ω^* satisfies $c_1^N(\omega^*) = c_1^D(\omega^*)$. The borrower's indirect utility as a function of the exemption level m is

$$V(m) = \max_{b_0} u(c_0) + \int_{\underline{\omega}}^{\omega^*} u(c_1^D(\omega))dF(\omega) + \int_{\omega^*}^{\overline{\omega}} u(c_1^N(\omega))dF(\omega)$$

where

$$\begin{aligned} c_0 &= y_0 + b_0, \\ c_1^N(\omega) &= y_1(\omega) - (1 + R(m, b_0))b_0 \\ c_1^D(\omega) &= y_1(\omega) - S(m, b_0, y_1). \end{aligned}$$

The first-order condition for borrowing is

$$u'(c_0) = \int_{\underline{\omega}}^{\omega^*} u'(c_1^D(\omega))\frac{\partial S}{\partial b_0}dF(\omega) + \int_{\omega^*}^{\overline{\omega}} u'(c_1^N(\omega))\left(\frac{\partial R}{\partial b_0}b_0 + (1 + R)\right)dF(\omega),$$

where the optimal default rule eliminates the terms related to $\frac{d\omega^*}{db_0}$.

From the borrower's problem,

$$\begin{aligned} \frac{dV}{dm} = &- \int_{\underline{\omega}}^{\omega^*} u'(c_1^D(\omega))\frac{\partial S(m, b_0, y_1)}{\partial m}dF(\omega) - \int_{\omega^*}^{\overline{\omega}} u'(c_1^N(\omega))\frac{\partial R(m, b_0)}{\partial m}b_0dF(\omega) \\ &+ \underbrace{\left[u'(c_0) - \int_{\underline{\omega}}^{\omega^*} u'(c_1^D(\omega))\frac{\partial S}{\partial b_0}dF(\omega) - \int_{\omega^*}^{\overline{\omega}} u'(c_1^N(\omega))\left(\frac{\partial R}{\partial b_0}b_0 + (1 + R)\right)dF(\omega)\right]}_{=0}\frac{db_0}{dm} \\ &+ \underbrace{\left[u(c_1^D(\omega^*))f(\omega^*) - u(c_1^N(\omega^*))f(\omega^*)\right]}_{=0}\frac{d\omega^*}{dm} \end{aligned}$$

The second and third lines are zero due to the first-order condition for borrowing and the optimal default rule. Thus, the equation simplifies to

$$\frac{dV}{dm} = -\int_{\underline{\omega}}^{\omega^*} u'(c_1^D(\omega))\frac{\partial S(m, b_0, y_1)}{\partial m}dF(\omega) - \int_{\omega^*}^{\overline{\omega}} u'(c_1^N(\omega))\frac{\partial R(m, b_0)}{\partial m}b_0dF(\omega) \tag{B.1}$$

This is an application of the envelope theorem. If individuals optimize, then endogenous changes in borrowing decisions (line 2) or default decisions (line 3) in response to a marginal exemption change have no first-order impact on welfare.

The interest rate and recovery rate responses are $R(m, b_0) = r(m)$ and $S(m, b_0, y_1) = \phi y_1 + s(m)b_0$. Therefore, $\frac{\partial R}{\partial b_0} = r'(m)$ and

$$\frac{\partial S(m, b_0, y_1)}{\partial m} = s'(m)b_0.$$

Let the average marginal utility of consumption while in default and repayment be

$$E\{u'(c^D)\} = \frac{\int_{\underline{\omega}}^{\omega^*} u'(c_1^D(\omega))dF(\omega)}{\int_{\underline{\omega}}^{\omega^*} dF(\omega)}$$
$$E\{u'(c^N)\} = \frac{\int_{\omega^*}^{\overline{\omega}} u'(c_1^N(\omega))dF(\omega)}{\int_{\omega^*}^{\overline{\omega}} dF(\omega)}.$$

Substituting these into equation (B.1) gives

$$\frac{dV}{dm} = -\pi E\{u'(c^D)\}s'(m)b_0 - (1-\pi)E\{u'(c^N)\}r'(m)b_0,$$

where $\pi = F(\omega^*)$ is the probability of default. Dividing both sides by $E\{u'(c^N)\}\pi s'(m)b_0$ gives the money-metric welfare gains formula

$$\frac{dW}{dm} = \frac{dV/dm}{E\{u'(c^N)\}\pi s'(m)b_0} = \left(\frac{E\{u'(c^D)\}}{E\{u'(c^N)\}} - 1\right) - \left(-\frac{(1-\pi)}{\pi}\frac{r'(m)b_0}{s'(m)b_0} - 1\right) \quad \square$$

Proof of Corollary 1

The approximations follow from Proposition 1 and Lemma 2 of Chetty (2006). If the third- and higher-order terms of u are small ($u''' \approx 0$), Taylor expansions of u' around $\bar{c}^D$ and $\bar{c}^N$, respectively, reveal that the average marginal utility of consumption in default (or repayment) is approximately equal to the marginal utility of consumption at the average consumption in default (or repayment):

$$E\{u'(c^D)\} \approx u'(\bar{c}_D)$$
$$E\{u'(c^N)\} \approx u'(\bar{c}_N).$$

Therefore, the first term in the welfare gains formula is approximately $\left(\frac{u'(\bar{c}_D)}{u'(\bar{c}_N)} - 1\right)$.

Additionally, taking a first-order Taylor expansion of u' around $\bar{c}_N$ yields the approximation $\frac{u'(\bar{c}_D)}{u'(\bar{c}_N)} - 1 \approx \gamma\frac{\Delta C}{C}$, where $\gamma = -\frac{u''(\bar{c}_N)}{u'(\bar{c}_N)}\bar{c}_N$ is the coefficient of relative risk aversion evaluated at $\bar{c}_N$ and $\frac{\Delta C}{C} = \frac{\bar{c}_N - \bar{c}_D}{\bar{c}_N}$. Therefore, $\frac{u'(\bar{c}_D)}{u'(\bar{c}_N)} - 1 \approx \gamma\frac{\Delta C}{C}$, where $\gamma = -\frac{u''(\bar{c}_N)}{u'(\bar{c}_N)}\bar{c}_N$ and $\frac{\Delta C}{C} = \frac{\bar{c}_N - \bar{c}_D}{\bar{c}_N}$ gives the following approximation

$$\frac{dW}{dm} \approx \gamma\frac{\Delta C}{C} - \left(\frac{(1-\pi)}{\pi}\frac{r'(m)}{s'(m)} - 1\right). \quad \square$$

B.2 Dynamic Model

In this appendix, I apply the general model of social insurance in Chetty (2006) to the case of asset exemptions. The key assumptions and arguments are taken directly from Chetty (2006) and adapted to the asset exemption setting. The primary difference is that Chetty's model includes a lump-sum benefit b and tax t, whereas exemptions impact through interest rates and recovery rates is proportional to the amount of debt held.

Setup

Consider a discrete-time dynamic model where an agent lives for $T+1$ periods $t \in \{0, \ldots, T\}$. Let ω_t be the state variable, which includes the borrower's outstanding debt, denoted $b(t-1, \omega_t)$, and all other information up to time t necessary to determine the borrower's behavior at that time. Let $F_t(\omega_t)$ denote the unconditional distribution function of ω_t given information available at $t = 0$. F_t is a smooth function with support Ω. The borrower chooses consumption $c(t, \omega_t)$, debt $b(t, \omega_t)$ and a general vector of other choices $x(t, \omega_t)$. Utility is time-separable and the flow utility in period t is $U(c(t, \omega_t), x(t, \omega_t)) = u(c(t, \omega_t)) + \tilde{u}(x(t, \omega_t))$ so that the marginal utility of consumption is determined only by the level of consumption. Let $c = \{c(t, \omega_t)\}_{t \in \{0, \ldots, T\}, \omega_t \in \Omega}$, $b = \{b(t, \omega_t)\}_{t \in \{0, \ldots, T\}, \omega_t \in \Omega}$, and $x = \{x(t, \omega_t)\}_{t \in \{0, \ldots, T\}, \omega_t \in \Omega}$ denote the full plan of state-contingent consumption, debt, and other choices for the agent. Throughout, I restrict $b(t, \omega_t) \geq 0$, with saving implicitly allowed through $x(t, \omega_t)$.

Let $\pi(t, \omega_t, c, b, x)$ denote the borrower's repayment status at time t in state ω_t. $\pi = 1$ when the borrower defaults on his debts and pays $s(m)b(t-1, \omega_t)$ and $\pi = 0$ when he repays $(1 + r(m))b(t-1, \omega_t)$ or holds no debt ($b(t-1, \omega_t) = 0$). Here, $r(m)$ is the interest rate and $s(m)$ is the recovery rate on defaulted debt, both of which are functions of only the exemption level m. To reduce notation, I suppress (c, b, x) in $\pi(t, \omega_t, c, b, x)$. Additionally, I assume the discount factor is one.[1]

[1] The welfare gain formula could incorporate alternative discount factor, though the approximation would require differences in the present value of consumption between default and repayment.

For each period t, the borrower faces the budget constraint

$$f(x(t,\omega_t)) - c(t,\omega_t) + b(t,\omega_t) - (1-\pi(t,\omega_t))[(1+r)b(t-1,\omega_t)] - \pi(t,\omega_t)sb(t-1,\omega_t) = 0.$$

The function $f(x(t,\omega_t))$ captures the influence of choices other than consumption and borrowing on the budget constraint. For example, labor income and investment income can enter through $f(x(t,\omega_t))$. The terminal condition is that the individual cannot borrow in the final period:

$$b(T,\omega_T) = 0 \qquad \forall\ \omega_T.$$

There are N additional constraints in each state ω_t at time t

$$g_{i\omega t}(c,b,x;r,s) \geq \overline{k}_{i\omega t} \qquad i = 1,\ldots,N.$$

Let $\lambda_{\omega,t}$ be the multiplier on the budget constraint in state ω_t at time t, $\lambda_{w_T,T}$ be the multipliers on the terminal conditions, and $\lambda_{g_i,\omega,t}$ be the multipliers on the additional constraints.

The borrower chooses a plan (c,b,x) to

$$\begin{aligned}\max \sum_{t=0}^{T} \int_{\omega_t} & U(c(t,\omega_t),x(t,\omega_t))dF_t(\omega_t) + \int_{\omega_T} \lambda_{\omega_T,T}(-b(T,\omega_T))dF_T(\omega_T) \\ & + \sum_{t=0}^{T} \int_{\omega_t} \lambda_{\omega,t}\Big\{ f(x(t,\omega_t)) - c(t,\omega_t) + b(t,\omega_t) - [1-\pi(t,\omega_t)](1+r)b(t-1,\omega_t) \\ & \quad - \pi(t,\omega_t)sb(t-1,\omega_t)\Big\} dF_t(\omega_t) + \sum_{i=1}^{N}\sum_{t=0}^{T} \int_{\omega_t} \lambda_{g_i,\omega,t}\left\{ g_{i\omega t}(c,b,x;r,s) - \overline{k}_{i\omega t}\right\} dF_t(\omega_t).\end{aligned}$$

Let $V(r(m),s(m))$ be the value of the maximum for a given $(r(m),s(m))$, where m is the asset exemption level. The planner solves

$$\max_m V\left(r(m),s(m)\right),$$

taking into account the endogenous responses of the borrowers through (c,b,x). Instead of the balanced budget requirement that typically constrains the government provision of social insurance, they are constrained by how creditors respond to changes in exemption levels through $r(m)$ and $s(m)$.

The following assumptions, taken directly from Chetty (2006), ensure that the borrower's problem has a unique global maximum and the Envelope Theorem applies.

Assumption 1. *Total lifetime utility* $\sum_{t=0}^{T}\int_{\omega_t} U(c(t,\omega_t), x(t,\omega_t))dF(\omega_t)$ *is smooth, increasing, and strictly quasi-concave in* (c, x).

Assumption 2. *The set of choices* $\{c, b, x\}$ *that satisfy all the constraints is convex.*

Assumption 3. *At the borrower's optimum, the binding set of constraints does not change in response to a small perturbation in* m.

The following assumption guarantees that the value of reducing $s(m)$ and increasing $r(m)$ can be determined from the marginal utilities of consumption in the two states.

Assumption 4. *The feasible set of choices can be defined using a set of constraints such that:*

$$\begin{aligned}
&i)\frac{\partial g_{i\omega t}}{\partial r} = [1-\pi(t,\omega_t)]b(t-1,\omega_t)\frac{\partial g_{i\omega t}}{\partial c(t,\omega_t)}\\
&ii)\frac{\partial g_{i\omega t}}{\partial s} = \pi(t,\omega_t)b(t-1,\omega_t)\frac{\partial g_{i\omega t}}{\partial c(t,\omega_t)}\\
&iii)\frac{\partial g_{i\omega t}}{\partial c(t',\omega_{t'})} = 0 \qquad \text{if } t \neq t'
\end{aligned}$$

This assumption is satisfied, for example, if there is a borrowing constraint when in default:

$$g_{1\omega t} = \pi(t,\omega_t)\left(f(x(t,\omega_t)) - c(t,\omega_t) - sb(t-1,\omega_t)\right) \geq 0.$$

Welfare Gains Formula

Let $\bar{\pi}$ be the expected share of time in default

$$\bar{\pi} = \frac{\sum_{t=0}^{T}\int_{\omega_t}\pi(t,\omega_t)dF_t(\omega_t)}{T+1}$$

and $E\{u'(c^N)b\}$ and $E\{u'(c^D)b\}$ be the expectation of the debt-weighted marginal utility in the repayment and default states:

$$\begin{aligned}
E\{u'(c^N)b\} &= \frac{\sum_{t=0}^{T}\int_{\omega_t}[1-\pi(t,\omega_t)]u'(c(t,\omega_t))b(t-1,\omega_t)dF_t(\omega_t)}{\sum_{t=0}^{T}\int_{\omega_t}[1-\pi(t,\omega_t)]dF_t(\omega_t)}\\
E\{u'(c^D)b\} &= \frac{\sum_{t=0}^{T}\int_{\omega_t}\pi(t,\omega_t)u'(c(t,\omega_t))b(t-1,\omega_t)dF_t(\omega_t)}{\sum_{t=0}^{T}\int_{\omega_t}\pi(t,\omega_t)dF_t(\omega_t)}.
\end{aligned}$$

Proposition The marginal value of increasing the exemption level is

$$\frac{dV}{dm} = (T+1)\left\{-r'(m)(1-\bar{\pi})E\{u'(c^N)b\} - s'(m)\bar{\pi}E\{u'(c^D)b\}\right\}. \tag{B.2}$$

Proof: Assumptions 1-3 guarantee that the Envelope Theorem can be applied to $V(m)$. Without loss in generality, assume that all N of the constraints bind. Using the envelope conditions associated with individual optimization and differentiating $V(r(m), s(m))$ with respect to m gives

$$\begin{aligned}\frac{dV}{dm} = -r'(m)\sum_{t=0}^{T}\int_{\omega_t}&\left[\lambda_{\omega,t}[1-\pi(t,\omega_t)]b(t-1,\omega_t) - \sum_{i=1}^{N}\lambda_{g_i,\omega,t}\frac{\partial g_{i\omega t}}{\partial r}\right]dF_t(\omega_t)\\ &- s'(m)\sum_{t=0}^{T}\int_{\omega_t}\left[\lambda_{\omega,t}\pi(t,\omega_t)b(t-1,\omega_t) - \sum_{i=1}^{N}\lambda_{g_i,\omega,t}\frac{\partial g_{i\omega t}}{\partial s}\right]dF_t(\omega_t)\end{aligned} \tag{B.3}$$

Applying the third part of Assumption 4 to the borrower's optimal consumption choice,

$$\frac{\partial u\left(c(t,\omega_t)\right)}{\partial c(t,\omega_t)} = \lambda_{\omega,t} - \sum_{i=1}^{N}\lambda_{g_i,\omega_t,t}\frac{\partial g_{i\omega t}}{c(t,\omega_t)} \qquad \forall\ t,\omega_t.$$

Also, the first two parts of Assumption 4 imply that $\forall\ t,\omega_t$,

$$\begin{aligned}\sum_{i=1}^{N}\lambda_{g_i,\omega,t}\frac{\partial g_{i\omega t}}{\partial r} &= \sum_{i=1}^{N}\lambda_{g_i,\omega,t}[1-\pi(t,\omega_t)]b(t-1,\omega_t)\frac{\partial g_{i\omega t}}{\partial c(t,\omega_t)} \text{ and}\\ \sum_{i=1}^{N}\lambda_{g_i,\omega,t}\frac{\partial g_{i\omega t}}{\partial s} &= \sum_{i=1}^{N}\lambda_{g_i,\omega,t}\pi(t,\omega_t)b(t-1,\omega_t)\frac{\partial g_{i\omega t}}{\partial c(t,\omega_t)}.\end{aligned}$$

Substituting these conditions into equation (B.3) gives

$$\begin{aligned}\frac{dV}{dm} = -r'(m)\sum_{t=0}^{T}\int_{\omega_t}&[1-\pi(t,\omega_t)]b(t-1,\omega_t)u'(c(t,\omega_t))dF_t(\omega_t)\\ - s'(m)\sum_{t=0}^{T}\int_{\omega_t}&\pi(t,\omega_t)b(t-1,\omega_t)u'(c(t,\omega_t))dF_t(\omega_t)\end{aligned}$$

and using the definitions of $\bar{\pi}$, $E\{u'(c^N)b\}$, and $E\{u'(c^D)b\}$ gives

$$\frac{dV}{dm} = (T+1)\left\{-r'(m)(1-\bar{\pi})E\{u'(c^N)b\} - s'(m)\bar{\pi}E\{u'(c^D)b\}\right\}.$$

$\square$

Approximation Using the Consumption Drop

This section shows that, as in the two-period model, it is possible to approximate the dynamic welfare gains formula as a function of the average percentage difference in consumption between repayment and default states. Since, through interest rates and recovery rates, the impact of exemptions is proportional to outstanding debt, the borrower's willingness to pay will be a debt-weighted average of the percentage difference in consumption.

Define $E(x) = \sum_{t=0}^{T} \int_{\omega_t} x dF(\omega_t) \frac{1}{T+1}$ as the expectation over time and states. The state ω_t includes the amount of debt owed, so we can write $\omega_t = (\tilde{\omega}_t, b_{t-1})$ with the joint distribution $F_t(\tilde{\omega}_t, b_{t-1})$ and a joint distribution $\tilde{F}(t, \tilde{\omega}_t, b_{t-1})$ over time and states. Let E_b be the expectation over the marginal distribution of b_{t-1}. We can write equation (B.2) as

$$\begin{aligned}
\frac{dV}{dm} &= (T+1)E\Big\{ - r'(m)[1-\pi(t,\omega_t)]b(t-1,\omega_t)u'(c(t,\omega_t)) - s'(m)\pi(t,\omega_t)b(t-1,\omega_t)u'(c(t,\omega_t))\Big\} \\
&= (T+1)E_b\Big\{ bE\Big\{ - r'(m)[1-\pi(t,\omega_t)]u'(c(t,\omega_t)) - s'(m)\pi(t,\omega_t)u'(c(t,\omega_t))\Big| b\Big\}\Big\} \\
&= (T+1)E_b\Big\{ \underbrace{b\left\{-r'(m)(1-\bar{\pi}^b)E\{u'(c^{N,b})\} - s'(m)\bar{\pi}^b E\{u'(c^{D,b})\}\right\}}_{\equiv dV^b/dm} \Big\}
\end{aligned}$$

where $\bar{\pi}^b = E\left\{\pi(t,\omega_t)\middle| b\right\}$ is the probability of default given debt b and

$$\begin{aligned}
E\{u'(c^{N,b})\} &= E\left\{u'(c)\middle|\pi(\omega_t)=0, b\right\} \\
E\{u'(c^{D,b})\} &= E\left\{u'(c)\middle|\pi(\omega_t)=1, b\right\}
\end{aligned}$$

are the average marginal utility in repayment or default given outstanding debt $b(t-1,\omega_t) = b$, respectively.

We can write a money-metric welfare gain for each debt level $b_{t-1} = b$

$$\frac{dW^b}{dm} \equiv \frac{dV^b/dm}{E\{u'(c^{N,b})\}(-s'(m)\bar{\pi}^b)b} = \left(\frac{E\{u'(c^{D,b})\}}{E\{u'(c^{N,b})\}} - 1\right) - \left(-\frac{(1-\bar{\pi}^b)}{\bar{\pi}^b}\frac{r'(m)}{s'(m)} - 1\right),$$

which equals the value of an exemption increase for those with outstanding debt b relative to transferring $-s'(m)\bar{\pi}^b b$ dollars to those in repayment and owing debt b.

Following the arguments of Chetty (2006), if third-order and above utility terms (e.g., u''') are small relative to the lower order terms are small,

$$E\{u'(c^{N,b})\} = u'(\bar{c}^{N,b})$$
$$E\{u'(c^{D,b})\} = u'(\bar{c}^{N,d})$$

where $\bar{c}^{N,b}$ and $\bar{c}^{D,b}$ equal the mean consumption (over time and states) among those with debt b in repayment states and default states, respectively. Then, as in the two-period model, $\frac{dW^b}{dm}$ approximately equals

$$\gamma\frac{\Delta C^b}{C} - \left(-\frac{(1-\bar{\pi}^b)}{\bar{\pi}^b}\frac{r'(m)}{s'(m)} - 1\right)$$

where γ is the coefficient of relative risk aversion, $\frac{\Delta C^b}{C} = \frac{\bar{c}^{N,b}-\bar{c}^{D,b}}{\bar{c}^{N,b}}$.

Substituting $\frac{dW^b}{dm}$,

$$\begin{aligned}
\frac{dV}{dm} &= (T+1)(-s'(m))E_b\left\{b\bar{\pi}^b\frac{dW^b}{dm}E\{u'(c^{N,b})\}\right\} \\
&= (T+1)(-s'(m))E_b\left\{b\bar{\pi}^b\frac{dW^b}{dm}\right\}E\left\{u'(c^N)\right\} + (T+1)cov_b\left(b\bar{\pi}^b(-s'(m))\frac{dW^b}{dm}, E\{u'(c^{N,b})\}\right) \\
&= (T+1)(-s'(m))E_b\left\{b\bar{\pi}^b\frac{dW^b}{dm}\right\}E\left\{u'(c^N)\right\} + (T+1)cov_b\left(\frac{dV^b/dm}{E\{u'(c^{N,b})\}}, E\{u'(c^{N,b})\}\right)
\end{aligned}$$

The first term is the average money-metric welfare gain, weighted by the level of debt and probability of default, and scaled by a constant. The covariance term captures how the normalized value of raising exemptions varies with average marginal utility in the repayment state across different levels of debt.[2] This term is difficult to sign, as it depends on the covariance between $Eu'(c^{N,b})$ and the other endogenous variables $Eu'(c^{D,b}), b$, and π_b, which together determine the value of exemption protection. If $Eu'(c^{N,b})$ is uncorrelated with these other variables, the covariance will be negative since insurance is less valuable when the marginal utility in repayment is high. However, this could be offset by the other endogenous terms, which depends, among other things, on the distribution of shocks that individuals face.

To derive the approximation, I assume that the average marginal utility during repayment is constant across levels of debt $Eu'(c^{N,b}) = Eu'(c^N)$, which causes the covariance term to equal zero.

[2]The weighted average covariance term does not appear in most sufficient statistic models of unemployment insurance because most models feature lump sum, rather than proportional, taxation and benefits. Alternatively, if taxes are proportional, it is assumed that consumption during times of employment is constant (Lawson, 2017, Baily, 1978). The analogous assumptions in this setting would be to a level effect of exemptions on interest and recovery payments (e.g. $r'(m)\bar{b}$) or to assume that consumption in repayment states is constant. Most similar to this derivation is Andrews and Miller (2013), which derives a sufficient statistic for UI with proportional taxation and benefits with heterogeneous agents within a two-period model.

This assumption is justified if, for example, individuals borrow to smooth over the lifecycle and set their consumption during repayment equal to their permanent income. This is a common simplification in the sufficient statistics literature, which often assumes two possible levels of consumption (employed and unemployed) and either a two-period model or consumption paths that are flat upon reemployment (e.g. Chetty (2008)).

With the covariance term equal to zero, this leads to the following welfare impact

$$\frac{dV}{dm} = E\left\{u'(c^N)\right\}(T+1)(-s'(m))\overline{b\pi}\left[\gamma E^{b,\pi}\left\{\frac{\Delta C^b}{C}\right\} - \left(-\frac{(\bar{b}-\overline{b\pi})}{\overline{b\pi}}\frac{r'(m)}{s'(m)} - 1\right)\right]$$

where $\bar{b} = E\{b\}$, $\overline{b\pi} = E\{b\pi\}$, and $E^{b,\pi}\{x\} = E_b\left\{\frac{b\bar{\pi}^b}{\overline{b\pi}}\right\}$. The term $E^{b,\pi}\left\{\frac{\Delta C^b}{C}\right\}$ equals the average debt-weighted consumption change for a sample of defaulters.

A marginal exemption increase, in expectation, generates a transfer of size $\widetilde{T} = (T+1)(-s'(m))\overline{b\pi}$. Thus, as in the two-period case, the value of exemptions relative to an equally sized transfer to the repayment state is

$$\frac{dV/dm}{E\left\{u'(c^N)\right\}\widetilde{T}} \approx \underbrace{\gamma E^{b,\pi}\left\{\frac{\Delta C^b}{C}\right\}}_{WTP} - \underbrace{\left(-\frac{(\bar{b}-\overline{b\pi})}{\overline{b\pi}}\frac{r'(m)}{s'(m)} - 1\right)}_{Cost}. \tag{B.4}$$

Thus, in the dynamic model, a household's willingness to pay for debtor protection is equal to a weighted average of consumption changes, with the weights equal to $b\bar{\pi}^b$. This is the average one would obtain from a sample of defaulters weighted by outstanding debts.

If b, $\bar{\pi}^b$, and $\frac{\Delta C^b}{C}$ are independent, the expression in (B.4) simplifies to the two-period formula

$$\frac{dW}{dm} \approx \underbrace{\gamma\frac{\Delta C}{C}}_{WTP} - \underbrace{\left(-\frac{(1-\pi)}{\pi}\frac{r'(m)}{s'(m)} - 1\right)}_{\text{Cost}},$$

where $\frac{\Delta C}{C}$ is the (unweighted) average change in consumption.

Exemptions Impact on Borrowing Limits

In this section, I extend the dynamic model to allow exemptions to affect borrowing limits. Assume that each period, borrowers face the borrowing limit

$$b(t, \omega_t) \leq \bar{b}(m).$$

For simplicity, I include only this borrowing limit and the budget constraint, though additional constraints can be incorporated, as shown above.

The borrower problem is then to choose a plan (c, b, x) to

$$\begin{aligned}
\max \quad & \sum_{t=0}^{T} \int_{\omega_t} U(c(t,\omega_t), x(t,\omega_t)) dF_t(\omega_t) \\
& + \sum_{t=0}^{T} \int_{\omega_t} \lambda_{\omega,t} \Big\{ f(x(t,\omega_t)) - c(t,\omega_t) + b(t,\omega_t) - [1-\pi(t,\omega_t)](1+r)b(t-1,\omega_t) \\
& \quad - \pi(t,\omega_t) s b(t-1,\omega_t) \Big\} dF_t(\omega_t) + \sum_{t=0}^{T} \int_{\omega_t} \lambda_{g_1,\omega,t} \left\{ \bar{b}(m) - b(t,\omega_t) \right\} dF_t(\omega_t).
\end{aligned}$$

Applying the envelope conditions, differentiating indirect utility with respect to m gives

$$\begin{aligned}
\frac{dV}{dm} = & - r'(m) \sum_{t=0}^{T} \int_{\omega_t} \lambda_{\omega,t} [1-\pi(t,\omega_t)] b(t-1,\omega_t) dF_t(\omega_t) \\
& - s'(m) \sum_{t=0}^{T} \int_{\omega_t} \lambda_{\omega,t} \pi(t,\omega_t) b(t-1,\omega_t) dF_t(\omega_t) \\
& - \bar{b}'(m) \sum_{t=0}^{T} \int_{\omega_t} \lambda_{g_1,\omega,t} dF_t(\omega_t)
\end{aligned}$$

In addition to the impact in repayment and default, the changes in borrowing limits have a first-order effect on utility in all states when the borrowing limit is binding, i.e., when $\lambda_{g_1,\omega,t} \neq 0$.

To write $\frac{dV}{dm}$ in terms of marginal utilities, we can use the first-order conditions for consumption and borrowing:[3]

$$\begin{aligned}
c: & \qquad \frac{\partial u\left(c(t,\omega_t)\right)}{\partial c(t,\omega_t)} = \lambda_{\omega,t} \\
b: & \qquad \lambda_{\omega,t} - \lambda_{g_1,\omega,t} = \int_{\omega_{t+1}} \lambda_{\omega,t+1} dF_{t+1}(\omega_{t+1})
\end{aligned}$$

[3]Utility is still assumed to be separable in consumption.

Substituting these expressions,

$$\begin{aligned}\frac{dV}{dm} =& -r'(m)\sum_{t=0}^{T}\int_{\omega_t} u'(c(t,\omega_t))[1-\pi(t,\omega_t)]b(t-1,\omega_t)dF_t(\omega_t)\\ &- s'(m)\sum_{t=0}^{T}\int_{\omega_t} u'(c(t,\omega_t))\pi(t,\omega_t)b(t-1,\omega_t)dF_t(\omega_t)\\ &- \bar{b}'(m)\sum_{t=0}^{T}\int_{\omega_t} \lambda_{g_1,\omega,t}dF_t(\omega_t)\end{aligned}$$

where $\lambda_{g_1,\omega,t}$ is the shadow price of the borrowing constraint[4]

$$\lambda_{g_1,\omega,t} = u'(c_t) - E\left[u'(c_{t+1})[(1-\pi_{t+1})(1+r)+\pi_{t+1}s]|\omega_t\right].$$

Thus, the welfare gain contains an additional term which equals a gap in (expected) marginal utilities caused by borrowing limits, multiplied by the change in borrowing limits induced by exemptions.

B.3 An Equivalent Formula from an Effort Choice Model

In this section, I show that the same welfare formula can be obtained from an alternative model where individuals choose effort to avoid default. This is one example of the formula being a sufficient statistic; there are multiple underlying models that generate the same formula. There are two periods, $t = 0, 1$, and a single consumption good. In the first period, income is certain and borrowers choose how much to borrow, b_0. Borrowers also exert costly effort, e, that determines the probability that they will repay their debts in the second period. This effort choice reflects actions that borrowers can take to increase their ability to repay debt, such as purchasing insurance against shocks or adjusting work effort. The units of effort, e, are normalized so that e is equal to the probability of repayment in the second period. The cost of effort is given by a convex function $f(e)$.

In the second period, borrowers enter one of two states: the default (low state) or repayment (high state). Assignment to the default state can be viewed as an income or expense shock that makes repayment infeasible. If borrowers enter the default state, they earn income y_1^D and repay some share of their debt at the rate $s < 1$. This recovery rate s reflects that creditors collect some portion of what is owed even when borrowers are unwilling or unable to repay the full amount. If

[4] To reduce notation, I suppress the dependence of c_{t+1} and π_{t+1} on ω_{t+1}.

borrowers enter the repayment state, they earn income y_1^N and repay their full debt plus interest at the rate $r > 0$. Through the response of creditors, exemptions also influence the interest rate $r(m)$.

Borrowers take the interest rate $r(m)$ and the recovery rate $s(m)$ as exogenous and choose their effort and debt to maximize state-independent utility. Indirect utility, $V(m)$, written as a function of the exemption level m, is equal to the utility from consumption in period 0 plus the expected utility in period 1, minus the cost of effort.

$$V(m) = \max_{e,b_0} \quad u(c_0) + \left\{eu(c_1^N) + (1-e)u(c_1^D)\right\} - f(e)$$

where

$$\begin{aligned} c_0 &= y_0 + b_0, \\ c_1^N &= y_1^N - (1 + r(m))b_0 \\ c_1^D &= y_1^D - s(m)b_0. \end{aligned}$$

In period 0, borrowers consume the income endowment, y_0, plus the amount borrowed, b_0. In period 1, borrowers enter the repayment state with probability e and consume income y_1^N less the amount it takes to repay the debt plus interest $(1 + r(m))b_0$. Alternatively, borrowers default with probability $(1 - e)$ and consume income y_1^D less the portion of the debt repaid in default $s(m)b_0$. I assume the regularity conditions that generate an interior solution with borrowers holding a positive level of debt.

The change in expected utility from increasing the exemption level is obtained by differentiating $V(m)$ with respect to m. Using the envelope conditions,

$$\frac{dV(m)}{dm} = \{-er'(m)u'(c_1^N)b_0 - (1-e)s'(m)u'(c_1^D)b_0\}.$$

This welfare change is in units of utility. To obtain a money-metric measure of the welfare gain, I normalize the effect of exemptions by the marginal utility of an additional dollar in the repayment state $u'(c_1^N)$, so that $\frac{dW(m)}{dm} = \frac{dV(m)/dm}{u'(c_1^N)T}$, where $T = -(1-e)s'(m)b_0$ equals the amount transferred to defaulters from a small increase in exemptions. This yields the following welfare equation

$$\frac{dW(m)}{dm} = \left[\left(\frac{u'(c_1^D)}{u'(c_1^N)} - 1\right) - \left(-\frac{e}{1-e}\frac{r'(m)}{s'(m)} - 1\right)\right],$$

Denoting the probability of repayment e as $(1-\pi)$ produces the welfare formula of equation (1).

B.4 Exemptions in Bankruptcy

Exemptions within Formal Default

I also consider the case where exemption changes only affect repayment by the subset of defaulters with non-exempt assets, as in the legal application of exemptions within bankruptcy. This setting can also apply to bargaining outcomes outside of bankruptcy if lenders have full bargaining power, engage in Nash bargaining with individual borrowers, and borrowers outside option is the forfeiture of non-exempt assets in bankruptcy. In this case, since lenders have full bargaining power, informal defaulters will repay their outside option, i.e. their non-exempt assets. In bankruptcy, defaulting borrowers pay a fixed cost F (e.g. a legal fee or reputation cost) and also forfeit non-exempt assets, so repayment in default is

$$S(m, b_0, y_1) = \min\left\{(1 + r(m))b_0, \max\{y_1 - m, 0\}\right\} + F.$$

When exemptions increase, it only affects repayment by the subset of defaulters with non-exempt assets

$$\frac{\partial S(m, b_0, y_1)}{\partial m} = \begin{cases} -1 & \text{if } 0 < y_1 - m \leq (1 + r(m))b_0 \\ 0 & \text{otherwise} \end{cases}$$

In this setting, the corresponding welfare formula is

$$\frac{dW}{dm} \approx \underbrace{\gamma \frac{\Delta C^m}{C}}_{\text{WTP}} - \underbrace{\left(\frac{(1-\pi)}{\pi} \frac{r'(m)b_0}{\pi_{m|D}} - 1\right)}_{\text{Cost}}$$

where $\pi_{m|D}$ is the probability of defaulting with non-exempt assets $y_1(\omega) > m$ conditional on defaulting, and $\frac{\Delta C^m}{C} = \frac{\bar{c}_N - \bar{c}_D^m}{\bar{c}_N}$ is the percentage consumption difference between repayment and states of default with non-exempt assets.

Derivation of Welfare Gains Formula

To derive this formula, $R(m, b_0) = r(m)$, so $\frac{\partial R}{\partial b_0} = r'(m)$. Suppose exemptions only affect defaulters with non-exempt assets so that $S(m, b_0, y_1) = \min\left\{(1 + r(m))b_0, \max\{y_1 - m, 0\}\right\} + F$

where F represents the fixed cost of default. Then

$$\frac{\partial S(m, b_0, y_1)}{\partial m} = \begin{cases} -1 & \text{if } 0 < y_1 - m \leq (1 + r(m))b_0 \\ 0 & \text{otherwise.} \end{cases}$$

Let $\omega_m = y_1^{-1}(m)$. The fixed costs of default ensure that $y(\omega^*) - m < (1 + r(m))b_0$, so the defaulters with non-exempt assets are those with $\omega \in [\omega_m, \omega^*]$. Define the average marginal utility of defaulters with non-exempt assets as

$$E\{u'(c_m^D)\} = \frac{\int_{\omega_m}^{\omega^*} u'(c_1^D(\omega))dF(\omega)}{\int_{\omega_m}^{\omega^*} dF(\omega)}$$

and $\pi_{m|D} = \int_{\omega_m}^{\omega^*} dF(\omega)/\pi$ is the probability of having non-exempt assets, conditional on defaulting. Equation (B.1) can be rewritten as

$$\frac{dV}{dm} = \pi\pi_{m|D} E\{u'(c_m^D)\} - (1 - \pi)r'(m)b_0 E\{u'(c^N)\}$$

As above, $Eu'(c_m^D) \approx u'(\bar{c}_D^m)$, where $\bar{c}_D^m$ is the average consumption among defaulters with non-exempt assets.

Using the approximations, the money-metric welfare formula is

$$\frac{dW}{dm} = \frac{dV(m)/dm}{u'(\bar{c}_N)\pi\pi_{m|D}} \approx \left[\left(\frac{u'(\bar{c}_D^m)}{u'(\bar{c}_N)} - 1 \right) - \left(- \frac{(1 - \pi)}{\pi} \frac{r'(m)b_0}{\pi_{m|D}} - 1 \right) \right],$$

Taking a Taylor expansion of u' yields

$$\frac{dW}{dm} \approx \gamma \frac{\Delta C^m}{C} - \left(\frac{(1 - \pi)}{\pi} \frac{r'(m)b_0}{\pi_{m|D}} - 1 \right)$$

with $\frac{\Delta C^m}{C} = \frac{\bar{c}_N - \bar{c}_D^m}{\bar{c}_N}$, i.e. the percentage consumption decline among those with non-exempt assets.

B.5 Bankruptcy and Informal Default

In this section, I derive the sufficient statistic for a model that allows both formal and informal default. For simplicity, I extend the effort choice model of Section B.3. I first extend the model to allow formal and informal default then extend it to allow additional types of default and consider dynamics.

Discussion of Effort Choice Model vs. Baseline Model

Within the effort choice model, the combination of the optimal default rule and states of the world that determine the probability of default the baseline model of Section 3 is subsumed by the effort variable e, which determines the probability of repayment. The advantage of this for the case of multiple default options is that by using other summary variables (e.g., the probability of defaulting informally), I can abstract from the specific determinants of a borrower's decision to default formally vs. informally. A second difference is that the effort choice model has only one income level in repayment and each type of default (e.g. y_1^N) whereas the baseline allows for multiple possible income levels (e.g., $y_1^N(\omega)$). However, the assumption that $E(u'(c)) \approx u'(E(c))$ implies that we can view y_1^N in the effort choice model as the average income in repayment, and likewise for each type of default.

Bankruptcy and Informal Default

The model is the same as that in Section B.3, except there is an additional endogenous variable, δ_I, which determines the probability that, conditional on defaulting, the borrower defaults informally. This variable can be viewed as summarizing actions that determine the states of the world where it would optimal to default informally. Let $\delta_B = 1 - \delta_I$ be the probability of filing for bankruptcy conditional on defaulting. The indirect utility, $V(m)$, written as a function of the exemption level m, is equal to the utility from consumption in period 0 plus the expected utility in period 1, which is now a weighted combination of utility in repayment, bankruptcy, and informal default, minus the disutility of effort $f(e, \delta_I)$.

$$V(m) = \max_{e, b_0, \delta_I} \quad u(c_0) + \left\{ eu(c_1^N) + (1-e)\delta_I u(c_1^I) + (1-e)\delta_B u(c_1^B) \right\} - f(e, \delta_I)$$

where

$$\begin{aligned} c_0 &= y_0 + b_0, \\ c_1^N &= y_1^N - (1 + r(m))b_0 \\ c_1^I &= y_1^I - s_I(m)b_0 \\ c_1^B &= y_1^B - s_B(m)b_0 \end{aligned}$$

In period 0, the borrower consumes the income endowment, y_0, plus the amount borrowed, b_0. In period 1, the borrower enters the repayment state with probability e and consumes income y_1^N less the amount it takes to repay the debt plus interest $(1+r(m))b_0$. With probability $(1-e)\delta_I$, the borrower defaults informally and consumes income y_1^I less the portion of the debt repaid in default $s_I(m)b_0$. Finally, with probability $(1-e)\delta_B$, the borrower defaults with a bankruptcy and consumes income y_1^B less the portion of the debt repaid in default $s_B(m)b_0$. The functions $s_I(m)$ and $s_B(m)$ capture the differential effect of exemptions on repayment by formal and informal defaulters.

The change in expected utility from increasing the exemption level is obtained by differentiating $V(m)$ with respect to m. Using the envelope conditions,

$$\frac{dV(m)}{dm} = -er'(m)u'(c_1^N)b_0 - (1-e)\delta_I s_I'(m)u'(c_1^I)b_0 - (1-e)\delta_B s_B'(m)u'(c_1^B)b_0.$$

The money-metric measure of the welfare gain is defined by $\frac{dW(m)}{dm} = \frac{dV(m)/dm}{u'(c_1^N)T}$, where $T = -(1-e)s'(m)b_0$ and $s'(m) = \delta_I s_I' + \delta_B s_B'$ is the change in average recoveries. The money-metric welfare change is

$$\frac{dW(m)}{dm} = \left[\frac{\delta_I s_I'}{s'}\left(\frac{u'(c_1^I)}{u'(c_1^N)} - 1\right) + \frac{\delta_B s_B'}{s'}\left(\frac{u'(c_1^B)}{u'(c_1^N)} - 1\right) - \left(-\frac{e}{1-e}\frac{r'(m)}{s'(m)} - 1\right)\right],$$

Using the Baily-Chetty approximation $\frac{u'(c_1^i)}{u'(c_1^N)} - 1 \approx \gamma\frac{\Delta C^i}{C}$ for $i = I, B$ yields the equation

$$\frac{dW(m)}{dm} = \left[\underbrace{\gamma\left(\mu_I\frac{\Delta C^I}{C} + \mu_B\frac{\Delta C^B}{C}\right)}_{WTP} - \underbrace{\left(-\frac{e}{1-e}\frac{r'(m)}{s'(m)} - 1\right)}_{\text{Cost-Benefit Ratio}}\right],$$

where $\mu_i = \frac{\delta_i s_i'}{s'}$ for $i = I, B$ represents the share of the change in average recoveries due to informal defaulters and bankruptcy filers, respectively. $\frac{\Delta C^i}{C}$ for $i = I, B$ is the change in consumption between repayment and informal default or repayment and bankruptcy. Denoting the probability of repayment e as $(1-\pi)$ produces the welfare formula in the main text.

Additional Default Types and Dynamics

The model above treats bankruptcy and informal default as two alternative terminal outcomes, but does not incorporate transitions between types of default. This is somewhat realistic, as more than half of charge-offs occur without a formal bankruptcy filing, so informal default can be a terminal state. Thus, informal default in the model best corresponds to a charge-off and debt settlement, where the defaulting borrower no longer owes any debt.

But there can be additional types of non-payment, such as minor delinquency (30 days past due), mild delinquency (60-120 days past due), and severe delinquency (120+ days past due, prior to charge-off). Borrowers transition through these on their way to terminal bankruptcy and informal default, and exemptions may have different effects on these various stages of collections.

The effort choice model can be easily extended to incorporate additional types of default. Let $j = 1, \ldots, J$ index the various types of default. In period 0, borrowers decide on the amount to borrow b_0, an effort choice e which determines the probability of repayment, and another set of actions a. The set of actions a influence the optimal choice about how to default, determining the probability of defaulting through type j, denoted $\delta_j(a)$. The disutility of effort and the choices a is captured by $f(e, a)$.

$$V(m) = \max_{e, b_0, \delta_I} \quad u(c_0) + eu(c_1^N) + (1-e)\sum_{j=1}^{J} \delta_j(a)u(c_1^j) - f(e, a)$$

where

$$\begin{aligned} c_0 &= y_0 + b_0, \\ c_1^N &= y_1^N - (1 + r(m))b_0 \\ c_1^j &= y_1^j - s_j(m)b_0 \end{aligned}$$

The change in expected utility from increasing the exemption level is obtained by differentiating $V(m)$ with respect to m. Since individuals are choosing optimally, the envelope theorem applies and behavioral changes have no first-order effect on the change in welfare. Using the envelope conditions,

$$\frac{dV(m)}{dm} = -er'(m)u'(c_1^N)b_0 - (1-e)\sum_{j=1}^{J} \delta_j s_j'(m)u'(c_1^j)b_0. \tag{B.5}$$

The average change in the recovery rate $s'(m) = \sum_{j=1}^{J} \delta_j s_j'(m)$ and the (money-metric) marginal welfare gain is $\frac{dW(m)}{dm} = \frac{dV(m)/dm}{u'(c_1^N)T}$, where $T = -(1-e)s'(m)b_0$. Following the steps for the two-default-type model, this welfare gain can be written as

$$\frac{dW(m)}{dm} = \underbrace{\gamma\left(\sum_{j=1}^{J} \mu_j \frac{\Delta C^j}{C}\right)}_{WTP} - \underbrace{\left(-\frac{e}{1-e}\frac{r'(m)}{s'(m)} - 1\right)}_{\text{Cost-Benefit Ratio}}, \tag{B.6}$$

where $\mu_j = \frac{\delta_j s'_j}{s'}$ and $\frac{\Delta C^j}{C} = \frac{c_1^N - c_1^j}{c_1^N}$. Again, the willingness to pay can be written as a weighted average over the consumption drops (relative to repayment) across the types of default, where the weights equal the share of total dollars that are transferred to that state.

To incorporate dynamics and transitions across states, the probabilities of default δ_j from the two-period model can be interpreted as the expected share of total periods that a borrower will spend in default type j. To see this, compare equation (B.5) with the change in indirect utility from the dynamic model of Section B.2, updated to allow multiple default types

$$\frac{dV}{dm} = (T+1)\left\{ -(1-\bar{\pi})r'(m)E\{u'(c^N)b\} - \bar{\pi}\sum_{j=1}^{J}\bar{\delta}_j s'_j(m)E\{u'(c^j)b\} \right\},$$

where

$$\bar{\delta}_j = \frac{\sum_{t=0}^{T}\int_{\omega_t}\pi(t,\omega_t)\delta_j(t,\omega_t)dF_t(\omega_t)}{(T+1)\bar{\pi}}$$

is the expected time spent in default state j, conditional on default.

The money-metric welfare gains formula is then

$$\frac{dW}{dm} \equiv \frac{dV/dm}{-(T+1)\bar{\pi}s'(m)E\{u'(c^N)b\}} = \left(\sum_{j=1}^{J}\mu_j \frac{E\{u'(c^j)b\}}{E\{u'(c^N)b\}}\right) - 1 - \left(-\frac{(1-\bar{\pi})}{\bar{\pi}}\frac{r'(m)}{s'(m)} - 1\right).$$

The weights $\mu_j = \frac{\delta_j s'_j}{s'}$ with the average change $s'(m) = \sum_{j=1}^{J}\delta_j s'_j(m)$. Thus, if one knows the share of time in each default type and the effect of exemptions in each default type, it is not necessary to know the exact path that households follow through the various types of informal default.

This formula parallels that in Proposition 1 in Section 3, except it is a weighted average of marginal utility ratios across the different types of default. As in the dynamic model of Section B.2, the marginal utility of consumption is (i) averaged over time as well as states and (ii) weighted by the level of debt in that state. If outstanding debt is uncorrelated with marginal utility, using the Baily-Chetty approximations within the full dynamic model will simplify into equation (B.6).[5] Thus, to incorporate transitions across default states, it is sufficient to estimate the average share of time that a borrower spends in each default state (δ_j) and the impact of exemptions within each state $s'_j(m)$.

[5] If there is a correlation between debt and marginal utility, Section B.2 shows the weighting of the welfare changes becomes more complicated.

C Imputing Nondurable Consumption in the PSID

Beginning with Skinner (1987), many papers have used the Consumer Expenditure Survey (CE) to predict broader measures of consumption in the PSID using consumption variables that are present in both datasets. Using this strategy, I impute two measures of nondurable consumption using the Consumer Expenditure Survey sample from Aguiar and Hurst (2013). Nondurable consumption is defined as the sum of (deflated) expenditures on food (home and away), alcohol, tobacco, clothing and personal care, utilities, domestic services, nondurable transportation, airfare, nondurable entertainment, net gambling receipts, business services, and charitable giving.

First, following Guo (2010), I use the 1986-2003 Consumer Expenditure Survey to estimate the following regression

$$log(nondurable_{it}) = \beta_t log(food_{it}) \times \tau_t + \tau_t + \varepsilon_{it},$$

where the dependent variable is the log of nondurable consumption, and it is regressed on year fixed effects (τ_t) and the interaction of the log of food consumption with year fixed effects. Although this specification only makes use of food consumption, it explains 70% of the variation in nondurable consumption in the CE.

Second, following Meyer and Sullivan (2003), I use the 1986-2003 Consumer Expenditure Survey to estimate the following regression

$$log(nondurable_{it}) = \beta_1 log(food_{it}) + \beta_2 log(rent_{it}) + \beta_3 homeown_{it} + \tau_t + \varepsilon_{it},$$

which includes the log of housing flows (rent) and an indicator for homeownership, in addition to the log of food consumption and year fixed effects. In the Consumer Expenditure Survey, rent is calculated as either actual rent paid (for renters) or the self-reported rental equivalent of the respondent's house (for homeowners). These variables explain 75% of the variation in nondurable consumption in the CE.

The coefficients from these two regressions are then used to predict nondurable consumption in the PSID by applying them to the corresponding measures of food consumption, rent, and homeownership. To match measured food consumption in the CE, I exclude food stamps from measured food consumption in the PSID. In the PSID, rent is defined as the sum of rent, mortgage payments, and property tax payments.

D Comparison with Other Estimates in Literature

Other estimates of the interest rate effect are similar to or larger than the estimate in this paper. There are a variety of samples, specifications, and loan types used in the literature, so to make the estimates comparable, I consider the effect of moving from a state with a $5,000 exemption to one with a $50,000 exemption. The estimates in this paper predict such a change would result in a 100 basis point increase on credit card interest rates. Using a sample of 310 auto loans rates in the 1981 Survey of Consumer Finances, Gropp, Scholz, and White (1997) report that such a change would result in a 230 basis point increase for the average borrower. Berkowitz and White (2004), using a sample of non-corporate small business loans, would predict a 225 basis point increase. Berger, Cerqueiro, and Penas (2011), using a sample of corporate small business loans, predict a 23 basis point increase. The other paper using panel variation, Severino and Brown (2017), finds effects on unsecured loan (not credit card) interest rates from Ratewatch.com that are extremely close to the estimates of this paper (Online Appendix Table A12).[6] In summary, despite using different data, empirical strategies, and loan types, four of the five other papers providing estimates of the impact of exemptions on interest rates find estimates that are similar to or larger than the effect that I estimate. Using one of these larger estimates for the interest rate effect would strengthen the policy conclusion that lower exemptions would increase welfare.

E Calculating the Welfare Impact

This appendix provides additional details used to calculate the welfare gains in Section 6 and discusses the procedure used to construct the bootstrapped confidence intervals.

[6] While we find similar estimates for unsecured personal loans, Severino and Brown (2017) estimates imprecise effects on credit card interest rates. Examining the rate survey data used in that paper, the imprecise credit card rates seem to be caused by compositional changes in the survey sample and the mapping of national rates to all local branches, reducing the geographic variation. That is, for many of the large institutions (e.g. Wells Fargo, Suntrust, Bank of America, NFCU, US Bank), only a single rate is collected for the survey and this one rate is then mapped to all of the institution's branches.

E.1 Welfare Formula and Parameter Estimates

E.1.1 Credit Union Estimates

The welfare impact of using asset exemptions to provide \$1 of additional expected consumption during default is

$$\frac{dW}{dm} \approx \underbrace{\gamma \frac{\Delta C}{C}}_{WTP} - \underbrace{\left(-\frac{(1-\pi)}{\pi}\frac{r'(m)}{s'(m)} - 1\right)}_{\text{Cost}}.$$

where the policy parameter, $m = log(exemption)$.

The used to evaluate the formula are given in the following table:

Parameter		Assigned Estimates	Source
Risk aversion	γ	3.0	
Consumption drop	$\frac{\Delta c}{c}$	0.0556	Table 2 column 2
Interest rate change	$r'(m)$	0.448/100	Table 6 column 2
Recovery rate change	$s'(m)$	-3.568/100	Table 6 column 2
Probability of default	π	0.0216	Table 5

These parameters imply a cost estimate of 4.69 and a welfare impact of -4.52.

E.1.2 Credit Union Extention: Third-Order Utility Terms

Extension: Third-order utility terms

If third-order utility terms are important, the baseline calculations may understate borrowers' willingness to pay for exemption protection. The approximation can be expanded to use a second-order Taylor expansion and incorporate third-order utility terms. As shown in Chetty (2006), this leads to the approximation

$$\frac{E\{u'(c^D)\}}{E\{u'(c^N)\}} - 1 \approx \left[\frac{\Delta C}{C}\left(\gamma + \frac{1}{2}\rho\gamma\frac{\Delta C}{C}\right) + 1\right] F - 1$$

where $\rho = -\frac{u'''(\bar{c}_N)}{u''(\bar{c}_N)}\bar{c}_N$ is the coefficient of relative prudence. I set $\rho = 1 + \gamma$, as it is with a CRRA utility function. The term $F = \frac{1+\frac{1}{2}\rho\gamma s_D^2}{1+\frac{1}{2}\rho\gamma s_N^2}$, where s_D is the coefficient of variation for consumption in default

$$s_D = \frac{\left[E\left((c^D(\omega) - \bar{c}_D)^2 \mid \text{Default}\right)\right]^{\frac{1}{2}}}{\bar{c}_D}$$

and s_N is defined similarly for repayment. Thus, F adjusts for the relative volatility of consumption in default and repayment.

Implementing this requires estimates of the coefficient of variation for consumption of a given household in default and repayment. Estimating this with the PSID is difficult, since I typically observe a household in default for at most one period. Additionally, consumption is known to contain substantial measurement error, so estimates of the coefficient of variation should be treated with caution. As a rough estimate, for the sample of period t defaulters and repayers, respectively, I use the standard deviation of consumption differences $c_t - c_{t-3}$ divided by mean consumption c_t. These provide estimates of $\hat{s}_D = 45.88\%$ and $\hat{s}_N = 43.48\%$.[7]

Applying these estimates within the extended approximation gives a willingness to pay estimate of 25.7%, which is above the main estimate of 16.7%, but still far below the estimate cost of 469%. If I use the cross-sectional consumption differences of defaulters and repayers to estimate s_D and s_N, the resulting willingness to pay is 17.1%. As noted above, however, these calculations depend on rough estimates of s_D and s_N that be inflated due to measurement error in consumption.

E.1.3 Holding Borrower Behavior Constant

To incorporate the estimates holding borrower behavior constant, the corresponding welfare formula is

$$\frac{dW}{dm} \approx \underbrace{\gamma \frac{\Delta C}{C}}_{WTP} - \underbrace{\left(- \frac{(1-\pi)}{\pi} \frac{r'(m) b_0}{\partial \tilde{s}(m, b_0)/\partial m} - 1 \right)}_{\text{Cost}}.$$

The denominator, $\partial \tilde{s}(m, b_0)/\partial m$, is the change in repayments (in dollars) by those who default. The numerator, $r'(m)b_0$, is the change in interest rate payments in dollars, i.e. the interest rate change multiplied by the amount owed.

The estimates used to evaluate the formula are given in the following table:

[7] Using the lagged difference is intended to control for fixed characteristics of households. If instead, I use the cross-sectional coefficient of variation for defaulters and repayers, I get $\hat{s}_D = 55.15\%$ and $\hat{s}_N = 55.67\%$, which results in an $F \approx 1$.

Parameter		Assigned Estimates		Source
		PSID	SIPP	
Risk aversion	γ	3.0	3.0	
Consumption drop	$\frac{\Delta c}{c}$	0.0556	0.0556	Table 2 column 2
Interest rate change	$r'(m)$	0.00225/100	0.00225/100	Table A8 column 5
Recovery change	$\partial\tilde{s}(m, b_0)/\partial m$	-585.7	-777.3	Table 7 columns 1 and 2
Probability of default	π	0.0216	0.0216	Table 5
Unsecured debt	b_0	10,728	10,264	Table 7 columns 1 and 2

When using the linear estimates for low-exemption states, holding borrower behavior constant, the sufficient statistic for formal bankruptcy from Appendix B.4 applies:

$$\frac{dW}{dm} \approx \underbrace{\gamma\frac{\Delta C^m}{C}}_{\text{WTP}} - \underbrace{\left(\frac{(1-\pi)}{\pi}\frac{r'(m)b_0}{\pi_{m|D}} - 1\right)}_{\text{Cost}}$$

where $\pi_{m|D}$ is the share of defaulters with non-exempt assets. The estimates used to evaluate the formula for low-exemption states are given in the following table:

Parameter		Assigned Estimates		Source
		PSID	SIPP	
Risk aversion	γ	3.0	3.0	
Consumption drop	$\frac{\Delta c}{c}$	0.0752	0.0752	Table 4 column 2 - low states only
Interest rate change (per \$1,000 m increase)	$r'(m)$	0.0330/100	0.0330/100	Table A9 column 5
Probability of default	π	0.0201	0.0201	Charge-off rate in low-exemption states
Probability of non-exempt assets (cond. on default)	$\pi_{m\|D}$	-24.2/1000	-34.2/1000	Table 7 columns 5 and 6
Unsecured debt	b_0	11,154	10,475	Table 7 columns 3 and 4

E.1.4 Default Distortion

The welfare impact of using asset exemptions to provide \$1 of additional expected consumption during default is

$$\frac{dW}{dm} \approx \underbrace{\gamma\frac{\Delta C}{C}}_{WTP} - \underbrace{\left(-\frac{\pi'(m)[1+r-s]}{\pi s'(m)}\right)}_{\text{Cost}}.$$

The estimates used to estimate the formula are given in the following table:

Parameter		Assigned Estimates	Source
Risk aversion	γ	3.0	
Consumption drop	$\frac{\Delta c}{c}$	0.0556	Table 2 column 2
Interest rate	r	0.123	Table 5
Recovery rate	s	0.177	Table 5
Recovery rate change	$s'(m)$	-3.568/100	Table 6 column 2
Default rate change	$\pi'(m)$	0.355/100	Table 6 column 2
Probability of default	π	0.0216	Table 5

E.1.5 Linear Estimates

The welfare impact of using asset exemptions to provide $1 of additional expected consumption during default is

$$\frac{dW}{dm} \approx \underbrace{\gamma \frac{\Delta C}{C}}_{WTP} - \underbrace{\left(-\frac{(1-\pi)}{\pi} \frac{r'(m)}{s'(m)} - 1 \right)}_{\text{Cost}}.$$

The used to evaluate the formula are given in the following table:

Parameter		Assigned Estimates	Source
Risk aversion	γ	3.0	
Consumption drop	$\frac{\Delta c}{c}$	0.0556	Table 2 column 2
Interest rate change	$r'(m)$	0.00225/100	Table A8 column 5
Recovery rate change	$s'(m)$	-0.0188/100	Table A8 column 2
Probability of default	π	0.0216	Table 5

The estimates used to evaluate the formula for low-exemption states are given in the following table:

Parameter		Assigned Estimates	Source
Risk aversion	γ	3.0	
Consumption drop	$\frac{\Delta c}{c}$	0.0752	Table 4 column 2
Interest rate change	$r'(m)$	0.033/100	Table A9 column 5
Recovery rate change	$s'(m)$	-0.357/100	Table A9 column 2
Probability of default	π	0.0201	Charge-off rate in low-exemption states

E.2 Confidence Intervals

This section discusses the construction of confidence intervals for the cost and welfare impact of raising exemptions:

$$\widehat{\frac{dW}{dm}} = \widehat{WTP} - \widehat{Cost}.$$

where, using the baseline estimates,

$$\widehat{WTP} = \gamma \frac{\widehat{\Delta C}}{C}$$
$$\widehat{Cost} = -\left(-\frac{(1-\hat{\pi})}{\hat{\pi}} \frac{\hat{r}'(m)}{\hat{s}'(m)} - 1\right)$$

The confidence intervals are formed using a nonparametric bootstrap distribution of the estimates from 5,000 bootstrap samples. For the estimates of the WTP, I resample the PSID at the level of the household-year and estimate $\widehat{\frac{\Delta C}{C}}$ within each sample. For estimates from Credit Union Call Reports, the terms used to estimate the cost come from state-level difference-in-differences regressions, so I use block resampling at the level of the state to form the bootstrap samples. To allow for correlation between parameters in the credit union data, I estimate $\hat{\pi}, \hat{r}',$ and $\hat{s}'$ and calculate $\widehat{Cost}$ within each bootstrap sample. With the estimates of $s'(m)$ from the second approach, using the SIPP and PSID, I use block resampling at the level of the household. Then, with the bootstrap distributions of $\widehat{Cost}$ and $\widehat{\frac{dW}{dm}}$, I form bias-corrected percentile intervals, which correct for the fact that the bootstrap distributions may not be symmetric (Efron 1982).

Conceptual issues arise in determining the cost of a policy when the estimates of its effects differ from their expected signs (Hendren and Sprung-Keyser, 2020). In $\widehat{Cost}$, the numerator, $(1-\pi)r'(m)$, reflects the expected increase in interest payments (the insurance premium) and the denominator $-\pi s'(m)$ reflects the expected reduction in payments made in default (the insurance payout) from increasing exemptions. Thus, it is the ratio of the cost of exemption increases to the benefits, i.e.

$$\widehat{Cost} = \hat{c}/\hat{b} - 1.$$

In the actual data, the estimates of both $\hat{c}$ and $\hat{b}$ are positive, so their ratio is positive. If $\hat{c}/\hat{b} < 1$, it would indicate that the transfer to defaulters is larger in expectation than the interest rate payments, so the insurance costs less than the actuarially fair rate and $\widehat{Cost} < 0$ In some bootstrap samples, the estimated rate cost $\hat{c}$ or benefit $\hat{b}$ may not be positive. If $\hat{c} \leq 0$ and $\hat{b} > 0$, one can calculate still calculate the cost using the formula above. The calculated $\widehat{Cost} < 0$ in this scenario reflects that raising exemptions both lowers interest rates and benefits defaulting debtors, so the marginal "cost" is negative. Alternatively, if $\hat{c} > 0$ and $\hat{b} \leq 0$, I set $\widehat{Cost} = \infty$, reflecting that higher exemptions raises interest rates without benefiting defaulting debtors.

However, if $\hat{c} \leq 0$ and $\hat{b} \leq 0$, it would indicate that, opposite our expectation, higher exemptions actually lower interest rates while causing defaulting debtors to repay more. As pointed out in Hendren and Sprung-Keyser (2020), though one can still calculate $\hat{c}/\hat{b}$, the oppositely signed estimates suggest that the research has uncertainty about the fundamental incidence of the policy. For exemptions, $\hat{c} \leq 0$ and $\hat{b} \leq 0$ would suggest that one should *lower* exemptions to transfer resources to defaulting debtors. To account for this policy uncertainty, I adopt the conservative approach of Hendren and Sprung-Keyser (2020). With α^N as the fraction of bootstrap samples for which $\hat{c} \leq 0$ and $\hat{b} \leq 0$, I report $95 + \alpha^N\%$ confidence intervals. I report bias-corrected percentile intervals.

For comparison, I also construct confidence intervals from a parametric bootstrap procedure, assuming that the distributions of the estimators are normally distributed and centered around the actual estimates with a standard deviation equal to the estimated standard error. For the estimates of $r'(m)$ and $s'(m)$ using state-level data from the NCUA Call Reports, I also set the covariance between the parameters equal to the estimated covariance between $\hat{r}'(m)$ and $\hat{s}'(m)$.

Tables E1 and E2 report estimates of the welfare impact and costs, along with 95% confidence intervals calculated using the nonparameteric and parametric bootstrap procedures, respectively. Additionally, the tables report estimates and confidence intervals for

$$\frac{1 + \widehat{WTP}}{1 + \widehat{Cost}},$$

This ratio, when applied to government expenditure, is the marginal value of public funds of Hendren and Sprung-Keyser (2020).

Table E1: Non-Parametric Bootstrap Confidence Intervals

Specification	$\widehat{\frac{dW}{dm}}$	Welfare CI	$\widehat{Cost}$	Cost CI	$\frac{1+\widehat{WTP}}{1+\widehat{Cost}}$	Ratio CI
Baseline	-4.52	[-34.26, -0.97]	4.69	[1.11, 33.35]	0.21	[0.03, 0.55]
PSID	-2.55	[-36.62, -0.00]	2.72	[0.16, 36.73]	0.31	[0.03, 1.00]
SIPP	-1.51	[-3.91, 0.26]	1.68	[-0.09, 4.06]	0.44	[0.23, 1.29]
PSID (low-exempt. states)	-6.21	[$-\infty$, -0.40]	6.44	[0.64, ∞]	0.16	[0.00, 0.78]
SIPP (low-exempt. states)	-3.72	[-9.31, -0.09]	3.94	[0.29, 9.53]	0.25	[0.12, 0.93]
Default distortion	-4.18	[-83.27, -1.78]	4.35	[1.93, 78.74]	0.22	[0.01, 0.40]
NCUA (linear)	-4.25	[$-\infty$, 0.74]	4.42	[-0.60, ∞]	0.22	[0.00, 3.09]
NCUA (linear, low-exempt. states)	-3.30	[-10.73, 0.24]	3.52	[-0.02, 11.06]	0.27	[0.10, 1.46]

This table reports the estimates and confidence intervals of the welfare impact, cost, and WTP-cost ratio for each specification. Bias-corrected 95% confidence intervals are constructed from the nonparametric bootstrap procedure discussed in Section E.2.

Table E2: Parametric Bootstrap Confidence Intervals

Specification	$\widehat{\frac{dW}{dm}}$	Welfare CI	$\widehat{Cost}$	Cost CI	$\frac{1+\widehat{WTP}}{1+\widehat{Cost}}$	Ratio CI
Baseline	-4.52	[-14.16, -1.66]	4.69	[1.83, 14.35]	0.21	[0.08, 0.41]
PSID	-2.55	[-13.61, -0.26]	2.72	[0.45, 13.90]	0.31	[0.08, 0.82]
SIPP	-1.51	[-3.77, -0.08]	1.68	[0.25, 3.95]	0.44	[0.24, 0.95]
PSID (low-exempt. states)	-6.20	[$-\infty$, -1.21]	6.44	[1.47, ∞]	0.17	[0.00, 0.51]
SIPP (low-exempt. states)	-3.71	[-18.38, -0.48]	3.94	[0.71, 18.35]	0.25	[0.06, 0.72]
Default distortion	-4.18	[-13.29, -1.81]	4.35	[1.98, 13.53]	0.22	[0.08, 0.40]
NCUA (linear)	-4.25	[-8.23, -2.08]	4.42	[2.25, 8.38]	0.22	[0.12, 0.36]
NCUA (linear, low-exempt. states)	-3.29	[-10.12, -0.42]	3.52	[0.65, 10.37]	0.27	[0.11, 0.74]
Severino and Brown interest rate	-3.77	[-12.67, -0.36]	3.94	[0.51, 12.81]	0.24	[0.09, 0.77]

This table reports the estimates and confidence intervals of the welfare impact, cost, and WTP-cost ratio for each specification. Bias-corrected 95% confidence intervals are constructed from the parametric bootstrap procedure discussed in Section E.2. The final row uses the Baseline Credit Union parameters, but replaces the interest rate response with that from Severino and Brown (2017) Table 9 column 1.

F Exemptions Inside and Outside of Bankruptcy

The goal of this section is to discuss and provide more evidence on the impact of exemptions within and outside of the bankruptcy system. Section F.1 examines the impact within Chapter 7 using administrative case-level data on all Chapter 7 asset cases from 2000-2010. Section F.2 examines the impact within Chapter 13 using administrative data on disbursements to unsecured creditors within Chapter 13 cases. Finally, Section F.3 investigates exemptions outside of the bankruptcy system by estimating their impact on the payroll of debt collectors. Overall, the results support those in Section 7 of the main text, which finds that exemptions have a small impact on repayment across all three types of default.

F.1 Asset Exemptions in Chapter 7 Bankruptcy

In Chapter 7 bankruptcy, non-exempt assets are liquidated and the non-exempt proceeds are distributed to unsecured creditors. For example, if a Chapter 7 filer holds $20,000 in home equity, but his state's home equity exemption is only $5,000, then his home will be sold as a part of the bankruptcy estate. The filer would receive the $5,000 of exempt equity, and the remaining $15,000 would be distributed to creditors (after liquidation and administrative expenses). If the home equity exemption were higher, say $6,000, this filer would have received an additional $1,000 after the sale of his home. Similarly, any bankruptcy filer with non-exempt home equity would benefit from an increase in the home equity exemption. Thus, to calculate the share that would benefit from an exemption increase, one needs to know how many filers currently have non-exempt equity.

From 2000-2010, 5.4% of Chapter 7 filers held non-exempt assets that were liquidated, which provides an upper bound on the share of filers that would benefit from an exemption increase. The reason this 5.4% is an upper bound is that these non-exempt assets are often tax rebates (the most commonly seized asset), a vehicle, or personal property[8] whereas the observed exemption increases primarily protect home equity. Someone whose only non-exempt asset is a tax rebate would not benefit from a higher homestead exemption. Thus, in order to accurately determine the share of filers that would benefit from the observed exemption increases, one needs to know how many have non-exempt assets of the type protected by states' exemption increases.

To determine how many current Chapter 7 filers have non-exempt assets of the type protected

[8] In a sample of 154 asset cases, Jiménez (2009) finds that the most commonly seized asset in Chapter 7 is a tax rebate, which the author attributed to mistakes or inattentiveness in pre-bankruptcy planning. Only 11% of asset cases liquidated real estate of any kind. Even this 11% with non-exempt real estate overstates the share of asset cases with non-exempt home equity, since real estate includes both homes and unprotected non-homestead real property.

by exemption laws, I use individual-level administrative data on all closed asset cases in Chapter 7 from the United States Trustee Program (USTP), which oversees the trustees that administer Chapter 7 cases. These trustees liquidate non-exempt assets, distributing the exempt amounts to the debtor and the remainder to creditors. When an asset case is closed, the trustee must submit a final report of the collection and distribution of assets to the USTP. I use data on individual (non-corporate) cases filed between 2000 and 2010, and drop cases that were not closed within five years of the filing ($< 0.1\%$ of cases). The final sample consists of the individual 557,355 asset cases filed between 2000 and 2010. Most of these asset cases return little to unsecured creditors; the median disbursement is $1,945.

Only filers with assets of the type exemptions protect would benefit from exemption increases. The USTP data do not explicitly list the specific non-exempt assets, but they do provide information that indicates whether non-exempt assets were of the type protected by exemptions. For each case, the data list the amount disbursed to the filer from the liquidation of partially exempt assets. For example, if a debtor has $10,000 in vehicle equity but the exemption is only for $5,000, the vehicle will be sold and the filer will receive $5,000 from the liquidation of this partially exempt asset. Cases with partially exempt assets are the ones that may benefit from an increase in exemption levels, since (i) the debtor has non-exempt assets, and (ii) the non-exempt assets are of the type protected by states' current exemptions.

Whether the filer has non-exempt home equity is particularly important, since home equity exemptions drive much of the variation used in the paper. The USTP data provide two measures of whether the filer had non-exempt home equity. First, the data report whether the asset cases made any payments to "commissions and expenses paid to professionals for the sale of real property." This provides an indication of whether there was non-exempt home equity, since homes with non-exempt equity are sold. However, it may overstate the number with non-exempt home equity, since it may include the sale of property that is not a primary residence and so not covered by homestead exemptions. As a second measure of non-exempt home equity, one can check whether the filer received an exemption disbursement exceeding the homestead exemption. If a non-exempt home is sold, the bankruptcy filer will receive an exemption disbursement that is greater than or equal to the states' homestead exemption (e.g. at least $10,000 in a state with a $10,000 homestead exemption). Validating this measure, Figure F1 plots the difference between the amount of the exemption disbursement given to the filer and the state's homestead exemption level (restricting the sample to debtors receiving an exemption disbursement of at least $10,000). There is a spike in exemption disbursements exactly equal to the state's homestead exemption, indicating that some filers receive exemption disbursements exactly equal to the homestead exemption.

All three measures indicate that few filers, even among those with non-exempt assets, would benefit from the observed increase in the exemption level. Only 11.2% of asset cases disburse any amount to the debtor because of exemptions. Thus, only 11.2% of asset cases, or 0.6% of all Chapter 7 cases, have non-exempt assets of the type that exemptions protect. Fewer filers have non-exempt home equity. Only 3.8% of asset cases made any payments to "commissions and expenses paid to professionals for the sale of real property." Moreover, only 1.5% of asset cases, or 0.07% of all Chapter 7 cases, had exemption disbursements that exceeded the state's homestead exemption. Most of the variation in exemptions across states and changes within states over time are from changes in homestead exemptions, so these estimates suggest that exemption changes should have little impact on recoveries in Chapter 7. Section 7 in the main text supports this, estimating that a $1,000 increase in exemptions reduces average recoveries per Chapter 7 by only $0.47.

Finally, Table F1 shows difference-in-differences estimates the impact of changes in the exemption level on disbursements to unsecured creditors and disbursements to filers from exemptions. If exemptions are binding in the asset case, a $1,000 increase in exemptions would reduce disbursements to unsecured creditors by $1,000 and increase exemption disbursements to filers by $1,000. Instead, the estimates in Table F1 show exemptions have little effect on disbursements, and this holds overall, in low exemption states, and when restricting the sample to asset cases that have some non-exempt assets (exemption disbursements > 0). An explanation for the small effects is that few bankruptcy filers, even among those with non-exempt assets, have non-exempt assets of the type that are affected by exemption changes (e.g. changes in the homestead exemption).

F.2 Asset Exemptions in Chapter 13 Bankruptcy

While exemptions do not apply directly in Chapter 13, they may affect Chapter 13 filers through section 1325's "best interests of the creditors" test. This test requires that unsecured creditors receive at least as much as they would have received if the filer's estate were liquidated under Chapter 7. However, as discussed in Section 7, this test is not binding in most cases. The amount repaid through the Chapter 13 repayment plan also depends on several other factors that are not affected by exemption changes. Through interviews of many bankruptcy judges, court clerks, and trustees, Sullivan, Warren, and Westbrook (1994) found that debtors vary greatly in their desire and promise to repay through plans, creditors vary in how aggressively they negotiate, and courts vary in the levels of promises they approve. Given the number of factors affecting the amount repaid in Chapter 13, it is unclear whether the impact of exemptions, through the "best interests" test, plays a role in determining the amount paid to unsecured creditors. This section uses administrative data from Chapter 13 Trustee Final Reports to estimate the impact of exemptions on repayment in Chapter 13.

I estimate the impact of exemptions on Chapter 13 repayment using data from Chapter 13 Trustee Final Reports. In Chapter 13 bankruptcies, trustees administer the repayment plan by collecting payments from the filer and making disbursements to creditors. At the end of each fiscal year, each trustee submits a summary report of the characteristics of Chapter 13 plans that they oversee and totaling the disbursements to each type of creditor.

To examine the impact of exemptions, which may affect payouts to unsecured creditors through the "best interests" test, I focus on two measures. First, the average amount disbursed to unsecured creditors per open case. Each trustee reports the total amount disbursed to unsecured creditors, and I divide this by the number of Chapter 13 cases that they administer (the average of the number cases at the start and end of the year). Second, I examine the share of (unsecured and secured) disbursements going to unsecured creditors. For these first two measures, I use data from 1994-2004. For all variables, I aggregate to the state-year level.

Table 9 in the main text reports estimates of the effect of exemption changes on average disbursements to unsecured creditors per Chapter 13 case, finding that a $1,000 increase in exemptions reduces disbursements to unsecured creditors by $2.07 per year. The analysis in this section examines the robustness to using a moving average of the exemption level to account for the fact that Chapter 13 plans last 3-5 years.

Figure F2 plots the cross-sectional relationship between asset exemptions and average payouts to unsecured creditors in Chapter 13. If the "best interests" tests were binding in most cases, one would expect unsecured creditors to receive lower payouts from Chapter 13 bankruptcies. There is not, however, a clear cross-sectional pattern between exemptions a repayment to unsecured creditors, suggesting that exemptions are not a significant determinant of repayment in many cases.

As a more formal test, I estimate a difference-in-differences specification that examines the impact of changes in exemption levels on repayment to unsecured creditors:

$$y_{st} = \alpha + \beta E_{st}^{MA} + \beta E_{st}^{MA} \times Low_s + X_{st}\gamma + \delta_s + \tau_t + u_{st}$$

The dependent variables is the average unsecured recoveries per Chapter 13 in state s and year t. In separate regressions, I replace the dependent variable with the share of payments that go to unsecured creditors. Exemptions E_{st}^{MA} are measured in \$1,000s of dollars. Open Chapter 13 cases last 3-5 years, so disbursements in year t will be from cases that were filed in years $t-5$ to t. To account for this timing, I use a 6-year moving average ($t-5$ to t) of the exemption level. To account for diminishing effects as exemptions increase, some specifications include the interaction of E_{st}^{MA} with Low_s, an indicator for whether the average exemption level in state s is below the median exemption level in the sample.

These results are reported in Table F2. Column 1 indicates that a \$1,000 increase in exemptions reduces annual average disbursements to unsecured creditors in Chapter 13 by \$0.31. Column 2 reveals that disbursements fall by an additional \$24 in low-exemption states. Columns 3 and 4 repeat these specifications, but replace the dependent variable with the share of total disbursements (unsecured plus secured) going to unsecured creditors. On average, 33.39% of disbursement go to unsecured creditors. The estimates from column 4 indicate that, in low exemption states, a \$1,000 increase in exemptions raises this by 0.48 percentage points.

Overall, the results show little sensitivity of Chapter 13 payouts to exemptions. If the "best interests" test were binding, a \$1,000 increase in exemptions would raise disbursements to unsecured creditors by \$1,000 over the plan. Taking the largest estimate from Table F2 of about \$25 (column 2) annually in low exemption states, and multiplying it by 4 (since Chapter 13 plans last 3-5 years), suggest that a \$1,000 increase raises average disbursements by \$100 in low exemption states. This would imply that, in these states, exemptions and the "best interest" test are binding for around 10% of Chapter 13 filers. That a relatively small share of filers are affected is consistent with anecdotal and empirical evidence. In interviews with bankruptcy attorneys, Braucher (1993) reports that "[a]ccording to the large majority of the subject lawyers . . . most of their chapter 13 cases would be no-asset cases under chapter 7." Instead, repayment plans were driven by judicial preferences and informal practices. In a recent paper, using detailed data from 81,000 Chapter 13 cases filed in Cook County, Illinois, Morrison and Uettwiller (2017) found that 58% of filers in successful Chapter 13 cases and 77% of filers in unsuccessful (no discharge) Chapter 13 cases would have paid unsecured creditors nothing in Chapter 7. For these filers, the "best interest" test imposes no minimum repayment amount.

F.3 Asset Exemptions Outside of Bankruptcy: Third-Party Debt Collectors

This section empirically investigates the impact of exemptions on debt collection outside of the bankruptcy system. Instead of collecting "in-house," many organizations rely on third-party debt collectors to recover delinquent accounts. As discussed in Section 2 of the main text, exemptions affect collection efforts of these debt collectors in two primary ways. First, almost all exemptions still protect debtors' assets from the collection efforts of unsecured creditors in state court (Hynes and Posner, 2002, Gilles, 2006, Hynes, 2008, Dawsey, Hynes, and Ausubel, 2013). If an unsecured creditor sues in state court, he can obtain a judgment allowing additional collection actions, including the right to seize non-exempt assets as payment. These debt collection lawsuits, where the legal effect of exemptions can bind, are common. The FTC Report "Collecting Consumer Debts: The Challenges of Change" reports that the majority of cases on many state court dockets are debt collection matters. Second, asset exemptions also affect collection efforts determine the debtor's potential cost of filing for bankruptcy. This influences informal negotiations between debtors and creditors. Thus, exemptions can affect debt collection directly through asset seizure, or with asset seizure operating indirectly as a threat. This section examines the impact of exemptions on the debt collection industry.

The Census Bureau's County Business Patterns (CBP) is an annual survey that reports employment and payroll levels for industries, including third-party debt collection agencies that are hired to collect on debts (NAICS code 561140). These data have been used to examine for the impact of debt collection regulations on the debt collection industry in Fedaseyeu (2020) and Fonseca, Strair, and Zafar (2017). For each state and year, the CBP reports the total mid-march employees and the total annual payroll by industry. I drop the 14 states where the data are suppressed to avoid disclosure in at least one year. The final sample consists of a balanced panel state-year observations for 36 states from 1994-2004. For the sample, the mean annual debt collector payroll per thousand residents is \$10,340, and the mean debt collector employment per thousand residents is 0.379.

I estimate the impact of changes in homestead exemption laws on the state-level employment and payroll of third-party debt collection agencies using the following specification:

$$y_{st} = \alpha + \eta ln(E_{st}) + X_{st}\beta + \delta_s + \tau_t + u_{st}. \tag{F.1}$$

where y_{st} is the payroll or employment per 1,000 residents of 3rd-party debt collectors in state s and year t, $ln(E_{st})$ is the log of the exemption level, and δ_s and τ_t are state and year fixed effects.

Table F3 reports the impact of changes in exemptions on debt collector payroll per 1,000 residents (columns 1-3) and debt collector employment per 1,000 residents (columns 4-6). The coefficient of -2.371 (sign. at the 10%-level) on the Log(exemption) in column 1 indicates that a 10% increase in a state's exemption level reduces debt collector payroll per 1,000 residents by -0.23, a 2% decrease relative to the mean of 10.34. This reduction in payroll likely reflects a reduction in the ability to collect delinquent debts, and could be due to an increase in the number of bankruptcy filings (which halt debt collection efforts), greater bargaining power for debtors, or the direct impact of exemptions in the state courts. Columns 2-3 add controls for state economic conditions and Census region-by-year fixed effects.

Columns 4-6 repeat these regressions using debt collector employment per 1,000 residents as the dependent variable, and the pattern of coefficients is again negative, though not statistically significant. Figure F3 reports the event-study version of these specifications. The declines in debt collector payroll occur only after the exemption increases. Overall, these results show an effect of exemptions on debt collectors that operate outside of the bankruptcy system. These results are consistent with other papers that have found a role for exemptions outside of bankruptcy. Mahoney (2015), in the context of medical debt, finds that exemptions reduce payments on out-of-pocket medical debt and that this payment reduction often occurs without an actual bankruptcy filing. Instead, the exemption-determined cost of bankruptcy operates as a threat-point in negotiations.

Table F1: Impact of Exemptions on Disbursements to Unsecured Creditors in Chapter 7 Asset Cases

Dependent variable:	Disbursements to Unsecured Creditors ($)				Disbursements to Filers from Exemptions ($)			
Sample:	All asset cases		Exemption disbursements > 0		All asset cases		Exemption disbursements > 0	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exemption ($1,000s)	0.46	0.49	-9.57*	-9.53**	0.83	0.82	-1.80	-3.54
	(1.49)	(1.36)	(4.93)	(4.73)	(0.77)	(0.81)	(7.54)	(7.72)
Low×Exemption		-17.5		-2.35		8.56		98.2
		(31.2)		(49.1)		(7.87)		(59.4)
Observations	557,335	557,335	62,180	62,180	557,355	557,355	62,181	62,181
Mean of dep. var.	5,387	5,387	8,106	8,106	757	757	6,784	6,784
State FEs	X	X	X	X	X	X	X	X
Year FEs	X	X	X	X	X	X	X	X
Economic controls	X	X	X	X	X	X	X	X

The sample consists of observations of individual Chapter 7 cases with non-exempt assets from 2000-2010. The dependent variable in columns 1-4 is the amount disbursed to unsecured creditors. The dependent variable in columns 4-8 is the amount returned to debtors from exemptions. Columns 3-4 and 6-8 restrict the sample to asset cases with positive disbursements from exemptions. "Low" is an indicator for whether the state's average exemption level from 2000-2010 is above the median. Standard errors clustered at the state-level are in parentheses. *Source:* U.S. Chapter 7 Trustee Final Reports

Table F2: Impact of Exemptions on Disbursements to Unsecured Creditors in Chapter 13

Dependent variable:	Avg. unsecured payouts per case ($)		Share of disbursements to unsecured (pp)	
	(1)	(2)	(3)	(4)
Exemption ($1,000s)	-0.310	-0.252	0.0279	0.0290
(6-year moving average)	(1.004)	(0.963)	(0.0285)	(0.0276)
Low×exemption (M.A.)		-24.02**		-0.483**
		(9.094)		(0.189)
Observations	528	528	528	528
Mean of dep. var	1100	1100	33.39	33.39
State FEs	X	X	X	X
Year FEs	X	X	X	X
Economic controls	X	X	X	X

This table reports estimates from difference-in-difference regressions. Observations are at the state-year level, and exclude Alabama and North Carolina which are not under the jurisdiction of the United States Trustee Program. All specifications include state fixed effects, year fixed effects, and economic controls for the state unemployment rate, log of median income, and the log of the home price index. The sample for columns 1-4 consists of annual state observations from 1994-2004. The dependent variable in columns 1 and 2 is the average disbursements to unsecured creditors per case from open Chapter 13 cases in state s in year t. The dependent variable in columns 3 and 4 is the share of disbursements to unsecured creditors in percentage points, defined as the ratio of unsecured disbursements to unsecured plus secured disbursements. Chapter 13 cases are open will have been filed in year $t-5$ to t, so the "Exemptions" variable in columns 1-4 is measured as the 6-year moving average over these years. Columns 2 and 4 interact exemptions with "High," an indicator for whether the state's average exemption level in the sample is above the median. Standard errors clustered at the state-level are in parentheses. *Source:* U.S. Chapter 13 Trustee Final Reports

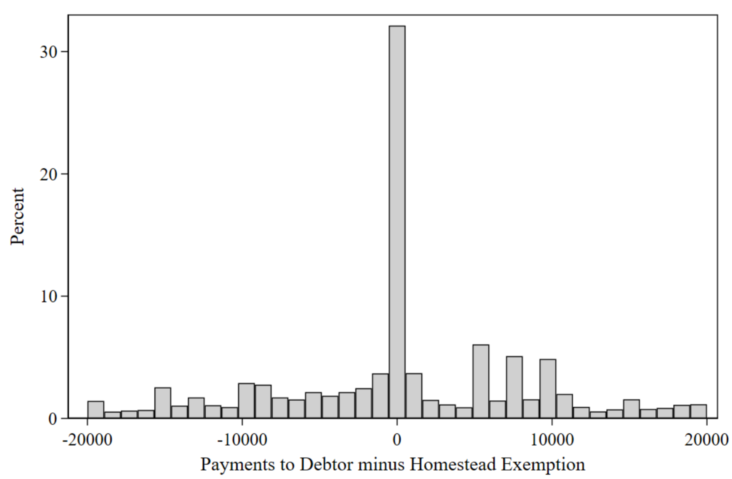


Figure F1: **Distributions to Chapter 7 Filers and Homestead Exemptions**
This figure plots the distribution of the difference between the amount of exempt proceeds given to the filer and the filer's homestead exemption level. To focus on debtors that may have liquidated a home, the sample for Figure F1 is restricted to debtors receiving at least $10,000 for exempt assets.
Source: 2000-2015 U.S. Trustee Program Final Reports

Table F3: Impact of Exemptions on Debt Collector Payroll and Employment

Dependent variable:	Collector Payroll per 1,000 residents			Collector Employment per 1,000 residents		
	(1)	(2)	(3)	(4)	(5)	(6)
Log(exemption)	-2.371*	-3.037**	-2.989*	-0.0563	-0.0675	-0.0486
	(1.245)	(1.432)	(1.485)	(0.0597)	(0.0605)	(0.0670)
Log(median income)		10.63*	12.22**		0.346*	0.387*
		(5.538)	(5.951)		(0.200)	(0.212)
Unemp. rate		0.112	-0.122		-0.0180	-0.0309*
		(0.476)	(0.452)		(0.0173)	(0.0158)
Log(home price index)		6.822	5.436		0.0484	0.0215
		(5.095)	(5.295)		(0.183)	(0.187)
Observations	396	396	396	396	396	396
Mean of dep. var.	10.34	10.34	10.34	0.379	0.379	0.379
Year FE	X	X	X	X	X	X
State FE	X	X	X	X	X	X
Region-by-year FE			X			X

This table reports regression results from estimating equation (F.1) with the state's Debt Collector Payroll per 1,000 residents (columns 1-3) or Debt Collector Employment per 1,000 residents (columns 4-6) as the dependent variable. Standard errors clustered at the state-level are in parentheses.
Source: 1994-2004 County Business Patterns

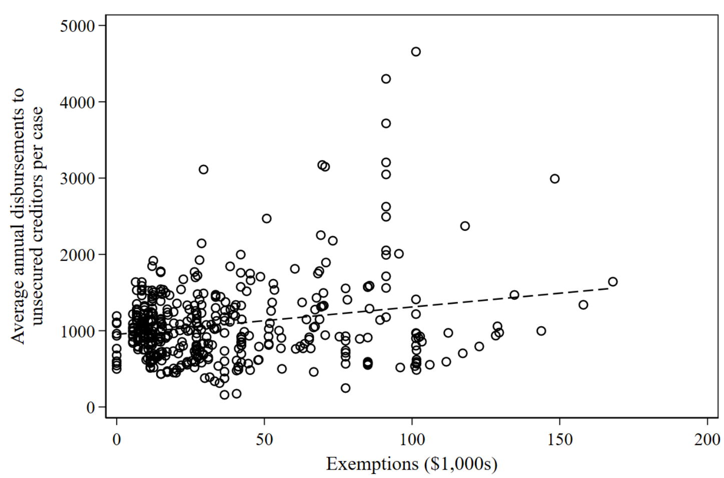
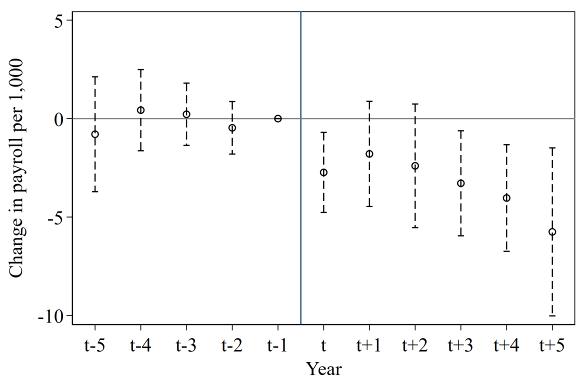
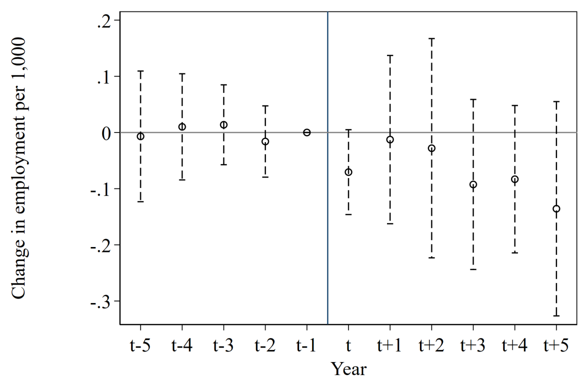


Figure F2: **Exemptions and Average Distributions to Unsecured Creditors in Chapter 13** plots the average disbursement to unsecured creditors per open Chapter 13 case against the state's exemption level, using data on open cases from 1994-2004. Each observation is a state-year, and the graph excludes observations with exemptions above $200,000.
Source: Chapter 13 Trustee Final Reports



(a) Debt Collector Payroll (per 1,000 residents)



(b) Debt Collector Emp. (per 1,000 residents)

Figure F3: **Annual Effects of Exemption Increases in Year t on Debt Collectors** The cumulative effect of a 100 log point increase in the state's general homestead exemptions in period t, estimated from the distributed lag model in equation (9). The sample period is 1994-2004, with 5 leads and lags of exemptions for each observation. Observations are weighted by population. The dotted lines show 95% confidence intervals for standard errors clustered at the state level.
Source: 1993-2004 County Business Patterns

References

Aguiar, Mark and Erik Hurst. 2013. “Deconstructing Life Cycle Expenditure.” *Journal of Political Economy* 121 (3):437–492.

Andrews, Isaiah and Conrad Miller. 2013. “Optimal Social Insurance with Heterogeneity.” *Unpublished manuscript* .

Baily, Martin Neil. 1978. “Some Aspects of Optimal Unemployment Insurance.” *Journal of Public Economics* 10 (3):379–402.

Berger, Allen N, Geraldo Cerqueiro, and María F Penas. 2011. “Does Debtor Protection Really Protect Debtors? Evidence from the Small Business Credit Market.” *Journal of Banking & Finance* 35 (7):1843–1857.

Berkowitz, Jeremy and Michelle J White. 2004. “Bankruptcy and Small Firms’ Access to Credit.” *RAND Journal of Economics* 35 (1):69–84.

Braucher, Jean. 1993. “Lawyers and Consumer Bankruptcy: One Code, Many Cultures.” *American Bankruptcy Law Journal* 67:501.

Chetty, Raj. 2006. “A General Formula for the Optimal Level of Social Insurance.” *Journal of Public Economics* 90 (10):1879–1901.

———. 2008. “Moral Hazard Versus Liquidity and Optimal Unemployment Insurance.” *Journal of Political Economy* 116 (2):173–234.

Dawsey, Amanda E, Richard M Hynes, and Lawrence M Ausubel. 2013. “The Regulation of Non-Judicial Debt Collection and the Consumer’s Choice Among Repayment, Bankruptcy and Informal Bankruptcy.” *American Bankruptcy Law Journal* .

DiNardo, John, Nicole M Fortin, and Thomas Lemieux. 1996. “Labor Market Institutions and the Distribution of Wages, 1973-1992: A Semiparametric Approach.” *Econometrica* 64 (5):1001–1044.

Elias, Stephen, Albin Renauer, and Robin Leonard. 1989-2013. *How to File for Bankruptcy*. Berkeley: Nolo Press.

Fedaseyeu, Viktar. 2020. “Debt Collection Agencies and the Supply of Consumer Credit.” *Journal of Financial Economics* .

Filer, Larry H and Jonathan D Fisher. 2005. “The Consumption Effects Associated with Filing for Personal Bankruptcy.” *Southern Economic Journal* :837–854.

Fonseca, Julia, Katherine Strair, and Basit Zafar. 2017. “Access to Credit and Financial Health: Evaluating the Impact of Debt Collection.” .

Gilles, Stephen G. 2006. “The Judgment-Proof Society.” *Washington & Lee Law Review* 63:603.

Gropp, Reint, John Karl Scholz, and Michelle J White. 1997. “Personal Bankruptcy and Credit Supply and Demand.” *The Quarterly Journal of Economics* 112 (1):217–251.

Guo, Sheng. 2010. “The Superior Measure of PSID Consumption: An Update.” *Economics Letters* 108 (3):253–256.

Hendren, Nathaniel and Ben Sprung-Keyser. 2020. "A Unified Welfare Analysis of Government Policies." *The Quarterly Journal of Economics* 135 (3):1209–1318.

Hynes, Richard M. 2008. "Broke But Not Bankrupt: Consumer Debt Collection In State Courts." *Florida Law Review* 60:1.

Hynes, Richard M and Eric A Posner. 2002. "The Law and Economics of Consumer Finance." *American Law and Economics Review* 4 (1):168–207.

Jiménez, Dalié. 2009. "The Distribution of Assets in Consumer Chapter 7 Bankruptcy Cases." *American Bankruptcy Law Journal* 83:795.

Lawson, Nicholas. 2017. "Fiscal Externalities and Optimal Unemployment Insurance." *American Economic Journal: Economic Policy* 9 (4):281–312.

Mahoney, Neale. 2015. "Bankruptcy as Implicit Health Insurance." *American Economic Review* 105 (2):710–746.

Meyer, Bruce D and James X Sullivan. 2003. "Measuring the Well-Being of the Poor Using Income and Consumption." *Journal of Human Resources* 38:1180–1180.

Morrison, Edward R and Antoine Uettwiller. 2017. "Consumer Bankruptcy Pathologies." *Journal of Institutional and Theoretical Economics* 173 (1):174–196.

Sandler, Danielle H and Ryan Sandler. 2014. "Multiple Event Studies in Public Finance: A Simulation Study with Applications." *Journal of Economic and Social Management* .

Severino, Felipe and Meta Brown. 2017. "Personal Bankruptcy Protection and Household Debt." *Unpublished manuscript* .

Skinner, Jonathan. 1987. "A Superior Measure of Consumption from the Panel Study of Income Dynamics." *Economics Letters* 23 (2):213–216.

Sullivan, Teresa A, Elizabeth Warren, and Jay Lawrence Westbrook. 1994. "Persistence of Local Legal Culture: Twenty Years of Evidence from the Federal Bankruptcy Courts." *Harvard Journal of Law and Public Policy* 17:801.