

Consumer Bankruptcy, Mortgage Default, and Labor Supply

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Introduction

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Unemployment, medical expenses, house price crash, divorce, etc.

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 - Bankruptcy provides different incentives depending on home equity and state law.
 - Must model **housing** to understand bankruptcy policy reforms.

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 - Bankruptcy provides different incentives depending on home equity and state law.
 - Must model **housing** to understand bankruptcy policy reforms.
- **Credit supply**, on the other hand, suffers from **moral hazard**.

Research Questions

- 1 How does Consumer Bankruptcy interact with Mortgage Default?
- 2 How do both interact with Labor Supply?
- 3 How to balance consumer protection against tightening credit supply?
- 4 What are the implications for welfare and labor supply of the 2005 *Bankruptcy Abuse Prevention and Consumer Protection Act*, **BAPCPA**, reform?

Contribution

- First life-cycle model with
 - ① Housing
 - ② Consumption and Saving/Borrowing
 - ③ Labor Supply
 - ④ Bankruptcy and Mortgage Default
- We model in great detail chapter 7 vs chapter 13 bankruptcies.
- We show the effects of BAPCPA on labor supply.

Related Literature

Bankruptcy:

- Mitman (2016)
- Livshits et al. (2007)
- Chatterjee et al. (2007)
- Pavan (2005)
- Li and White (2009)

Housing:

- Attanasio et al. (2012)
- Chambers et al. (2007)

Consumer Bankruptcy in the US

There are two relevant chapters in the US Bankruptcy Code for *personal* bankruptcy:

1 Chapter 7:

- Full debt discharge.
- Home equity protected from seizure up to
Homestead exemption level.
- Exemption ranges from 0 in Maryland to ∞ in Texas.

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- Full debt discharge.
- Home equity protected from seizure up to Homestead exemption level.
- Exemption ranges from 0 in Maryland to ∞ in Texas.

2 Chapter 13:

- Debt restructuring plan with scheduled repayments.
- House and other assets are not seized.

Homestead Exemption Example

	Maryland	Texas
House Value	\$300,000	\$300,000
Mortgage	\$250,000	\$250,000
Equity	\$50,000	\$50,000
Homestead Exemption	0	∞
Unsecured Debt	\$25,000	\$25,000
Result of Bankruptcy	Forced Sale	Keep House

BAPCPA 2005

Bankruptcy Abuse Prevention and Consumer Protection Act 2005

- Based on banking sector's presumption of widespread fraud, BAPCPA aims at decreasing generosity of bankruptcy.
- Introduces a Means Test: Can only file for chapter 7 if income below state median.
- Increases chapter 7 financial filing costs.
- Homestead exemption cap: Regardless of state level, can exempt max. \$ 125k.
- The definition of abuse is extended.

The Link between Bankruptcy and Default

- Li and White (2009) measure the occurrence of bankruptcy after default (and vice versa).
- Both choices alleviate pressure on budget constraint.
- Legal provisions allow to convert undischarged mortgage debt into unsecured debt (precisely a lender's **recourse**).

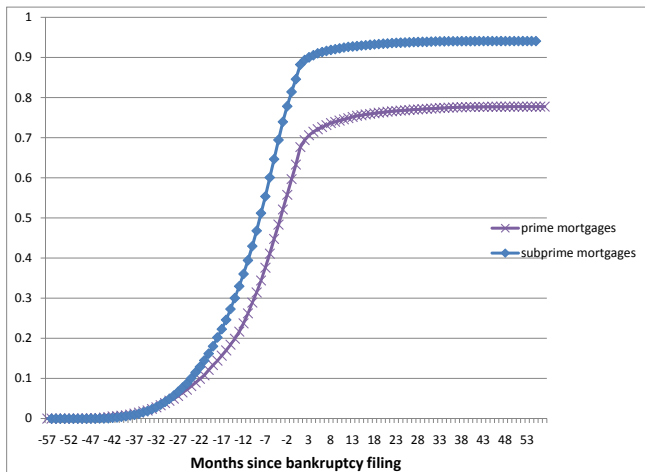
The Link between Bankruptcy and Default

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- Both choices alleviate pressure on budget constraint.
- Legal provisions allow to convert undischarged mortgage debt into unsecured debt (precisely a lender's **recourse**).
- They find that the **correlation** between bankruptcy and mortgage default is **0.6** and **0.86** for **prime** and **subprimes**, respectively.
 - 77% (94%) of owners end up defaulting on their prime (subprime) mortgages after they file for bankruptcy

Li and White (2009)

Default Conditional On Bankruptcy?

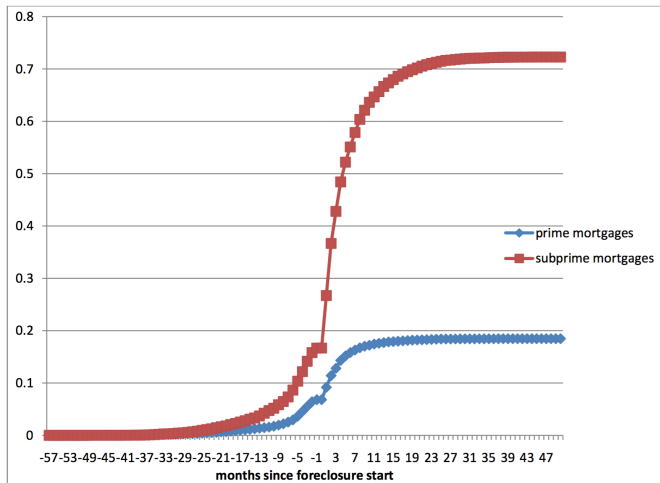
Homeowners' Cumulative Default Rate Conditional on Bankruptcy



Li and White (2009)

Bankruptcy Conditional On Default?

Homeowners' Cumulative Bankruptcy Filing Rate Conditional on Foreclosure



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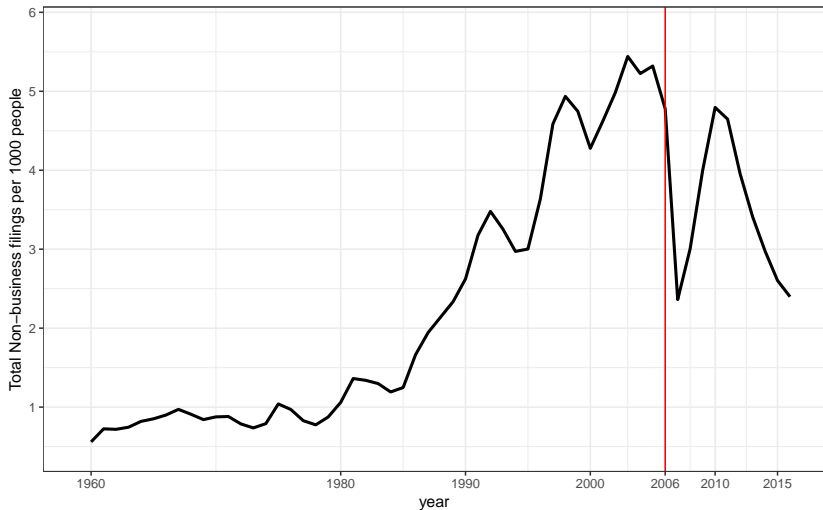
Model Fit

Policies

BAPCPA

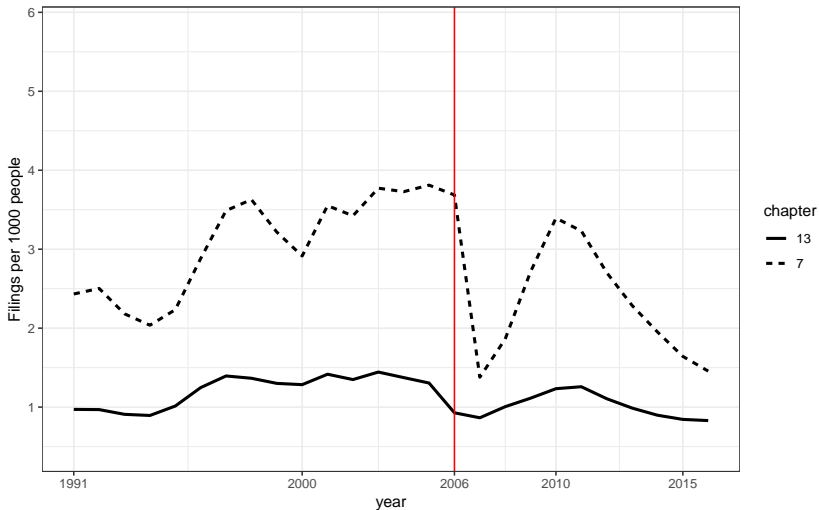
Bankruptcy Trend

Source: American Bankruptcy Institute, All Non-business Filings



Bankruptcy Trends by Chapter

Source: American Bankruptcy Institute

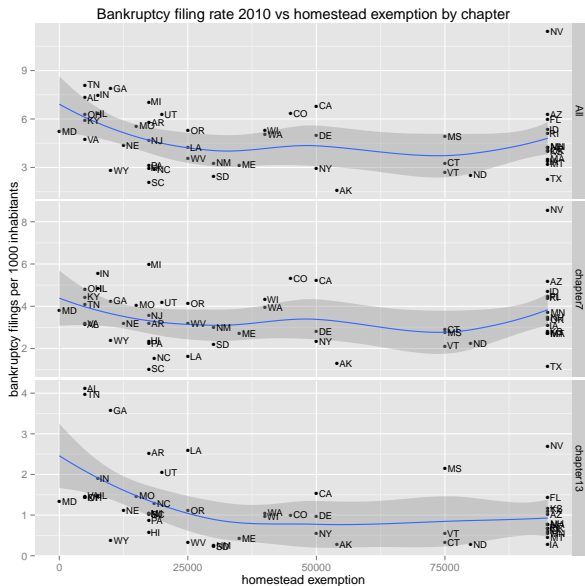


Homestead Exemption and Bankruptcy Rates

Why don't we see more bankruptcy with higher Homestead Exemption? Credit Rationing:

- Gropp et al. (1997)
- Pavan (2005)
- Li and Oswald (2017)
- Lenders react to institutions.

Homestead Exemption and Bankruptcy Rates



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Model Outline

- Lifecycle model with preferences over consumption, housing and leisure.
- Two assets: unsecured $a \in \mathbb{R}$ and secured $m \in \mathbb{R}_+$.
- Different set of discrete choices for renters and owners.

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- Two assets: unsecured $a \in \mathbb{R}$ and secured $m \in \mathbb{R}_+$.
- Different set of discrete choices for renters and owners.
- Interest on $a < 0$ is endogenously priced.
- Interest on m is fixed.
- Exogenous wage process by education e - given wage w , choose hours worked.

Utility

Agents choose:

- consumption c
- hours supplied to labor market $l \in \{l_1, \dots, l_L\} \equiv \mathcal{L}$, and
- housing floorspace $h \in \{\underline{h}, h_1, \dots, \bar{h}\} \equiv \mathcal{H}$ with $\mathbf{H} \equiv \mathbf{1}[h > \underline{h}]$:

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$$u(c, l, h) = \frac{\left(c^\omega (L - l - \mathbf{1}[l > 0]\theta_P)^{1-\omega} \right)^{1-\gamma}}{1 - \gamma} \exp(\theta_H h) + \mathbf{H}\mu h$$

where

- Leisure is $L - l - \mathbf{1}[l > 0]\theta_P$, and L is the leisure endowment
- θ_P is a fixed cost of participation
- θ_H strength of housing preference
- μ warm glow ownership utility

House Prices and Wages

- Prices are similar to Mitman (2016): no aggregate shocks.
- Every individual i 's house value varies *idiosyncratically*.

$$p_{i0} = 1$$

$$p_{it} = \rho_p p_{it-1} + \epsilon_{it-1}$$

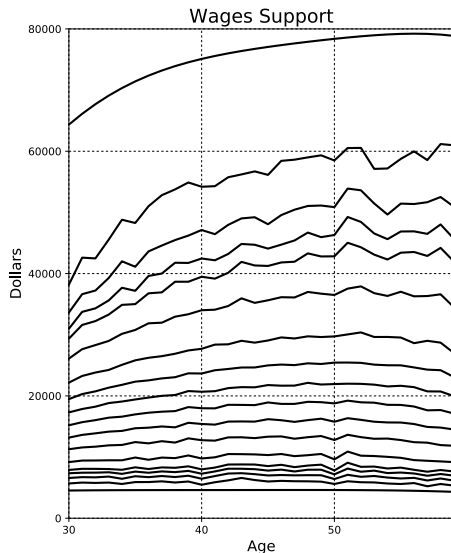
$$\epsilon_{it} \sim N(0, \sigma_p^2)$$

- Wages as in De Nardi et al. (2016):

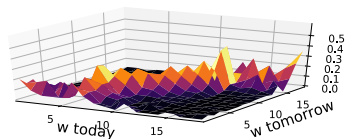
$$\ln w_{itj} = d_j + e_i + f(t)^e + \eta_{itj}^e$$

$$i = 1, \dots, N; t = 25, \dots, 60; j = 1968, \dots, 2013$$

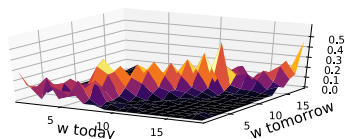
De Nardi et al. (2016): Wages at full time labor supply.



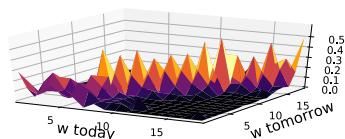
Transition age 30



Transition age 44



Transition age 59



Financial Markets

① Unsecured Debt: $a' < 0$

- Unsecured credit institutions extend one-period discount bonds $a' < 0$ to consumers
- They know bankruptcy is an option, hence take that into account when pricing **each individual** loan.
- We assume free entry, hence zero expected profit on each loan.

② Mortgage Lenders: m

- Offer a **unique** fixed rate mortgage (FRM). Mortgage vintage is state variable.
- They charge a fixed rate $r^m = r + \hat{r}$, r the risk-free rate, \hat{r} an exogenous default premium.

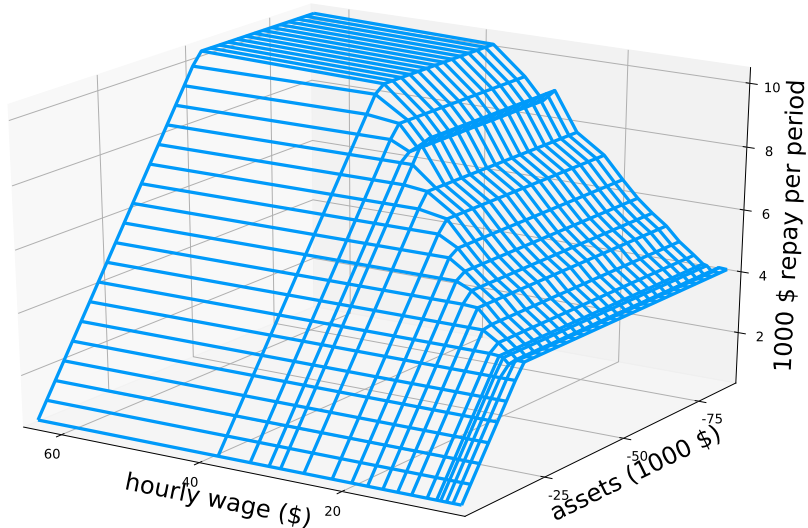
Unsecured Debt: Eaton and Gersovitz (1981)

- We follow Eaton and Gersovitz (1981).
- A negative asset choice $a' < 0$ implies unsecured borrowing.
- For a consumer with state vector X , the interest rate for loan $a' < 0$ depends on the **probability of bankruptcy** $\pi(a'|X)$

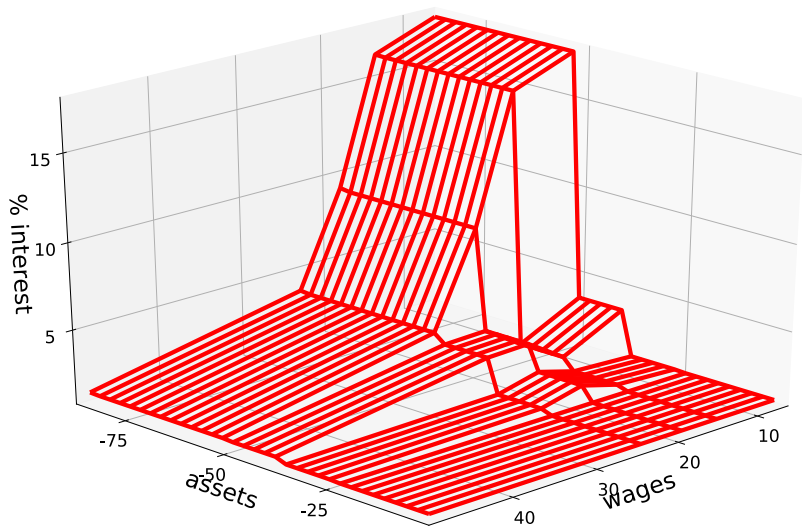
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- A negative asset choice $a' < 0$ implies unsecured borrowing.
- For a consumer with state vector X , the interest rate for loan $a' < 0$ depends on the **probability of bankruptcy** $\pi(a'|X)$
- There is **no unobserved** state variable, i.e. full information, and bank can compute π .
- Consumer promises to return $-a' > 0$ units of consumption good to the bank tomorrow ...
- ... in exchange for $\frac{q(a'|X)}{1+r}$ units of consumption today.

Chapter 13 Repayment function at age 1: $\bar{y}_1(a, w)$



Implied Interest Rate



Bankruptcy and Mortgage Default for Consumers

- Consumers enter **bankruptcy punishment state** upon filing for bankruptcy:
 - 1 Exclusion from credit market: $a' \geq 0$, no new mortgage.
 - 2 Suffer a non-monetary utility loss λ .
 - 3 Lasts T_{bk} periods on average. Exit with prob δ .
- If not in that state, they have the option to file every period.

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- If not in that state, they have the option to file every period.
- **Filing** means that $a = 0$, and that the future value comes from the punishment state.
- **Defaulting** on the mortgage means that $m = 0$, $\mathbf{H} = 0$. There may follow a deficiency judgment if **recourse** is allowed. (Any Remaining negative equity would be forwarded to next period as unsecured debt.)

Discrete Choices in Non-punishment State

Renters: Value function W

- 1 Rent,
- 2 Buy,
- 3 File chapter 7, and
- 4 File chapter 13 bankruptcy.

Discrete Choices in Non-punishment State

Renters: Value function W

- 1 Rent,
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- 4 File chapter 13 bankruptcy.

Owners: Value function V

- 1 Stay,
- 2 Sell,
- 3 Default,
- 4 File chapter 7,
- 5 File chapter 13,
- 6 File chapter 7 *and* Default.

Discrete Choices in Non-punishment State

Renters: Value function W

- 1 Rent,
- 2 Buy,
- 3 file chapter 7, (if $a < 0$)
- 4 file chapter 13 bankruptcy. (if $a < 0$)

Owners: Value function V

- 1 Stay,
- 2 Sell,
- 3 Default, (if equity < 0)
- 4 file chapter 7, (if $a < 0$)
- 5 file chapter 13 bankruptcy. (if $a < 0$)
- 6 File chapter 7 *and* Default. (if $a < 0$ and equity < 0)

Discrete Choices in Non-punishment State

Renters: Value function W

- 1 Rent,
- 2 Buy,
- 3 ~~file chapter 7, (if $a < 0$)~~
- 4 ~~file chapter 13 bankruptcy. (if $a < 0$)~~

Owners: Value function V

- 1 Stay,
- 2 Sell,
- 3 Default, (if equity < 0)
- 4 ~~file chapter 7, (if $a < 0$)~~
- 5 ~~file chapter 13 bankruptcy. (if $a < 0$)~~
- 6 ~~File chapter 7 and Default. (if $a < 0$ and equity < 0)~~

Renter Conditional Value Function

Discrete Choice: *Rent*

- Today's interest rate depends on tomorrow's likelihood of bankruptcy.
- Stay on as renter, pay rent x , and tomorrow's value is W_{t+1}
- $q_t(a'|w)$ takes into account expected chapter 13 repayments given (a', w) .

$$W_t^{\text{rent}}(a, w) = \max_{\substack{a' \in \mathbb{R} \\ l \in \mathcal{L}}} u(c, l, \underline{h}) + \beta E_{w'|w, t} [W_{t+1}(a', w')]$$

s.t.

$$c + \frac{q_t(a'|w)}{1+r} = wl + a - x$$

$$\pi^7(a'|w) = E_{w'|w, t} [I_{t+1}^7(a', w')]$$

$$\pi^{13}(a'|w) = E_{w'|w, t} [I_{t+1}^{13}(a', w')]$$

Renter Conditional Value Function

Discrete Choice: *File 13*

- Tomorrow's value is W_{t+1}^{13} , which depends on **repayment** \bar{y}
- no savings choice in period of filing: $a = a' = 0$.
- Utility penalty $\lambda \in [0, 1]$

$$W_t^{\text{file } 13}(a, w) = \max_{l \in \mathcal{L}} u(c\lambda, l, \underline{h}) + \beta E_{w'|w, t} \left[W_{t+1}^{13}(\bar{y}(a, w), 0, w') \right]$$

s.t.

$$c - 0 = wl + 0$$

Owner Conditional Value Function

Discrete Choice: *Default*

- Defined only for equity < 0
- Any remaining debt gets carried forward if a **deficiency judgment** is obtained (with probability ψ).
- **Non-recourse** would imply $\psi = 0$.

$$V_t^{\text{default}}(S) = \max_{\substack{a' \in \mathbb{R} \\ l \in \mathcal{L}}} u(c, l, \underline{h}) + \beta E_{w'| (w, t)} [W_{t+1} (\psi e + a', w')]$$

s.t.

$$c + \frac{q_t(a'|w)}{1+r} = wl + a - x$$

$$e = (1 - \phi)(ph - m) < 0$$

Datasets Used

We want to match a series of aggregate moments by age and education for the period 2000–2006, i.e. pre-BAPCPA (and housing crash).

- Wage, Ownership Rate and Hours worked age profiles from PSID.
- Aggregate Bankruptcy rates from ABI.
- Default Rates: EquiFax 90+ days in default.
- Variation in legal environment: choose a baseline set of states.

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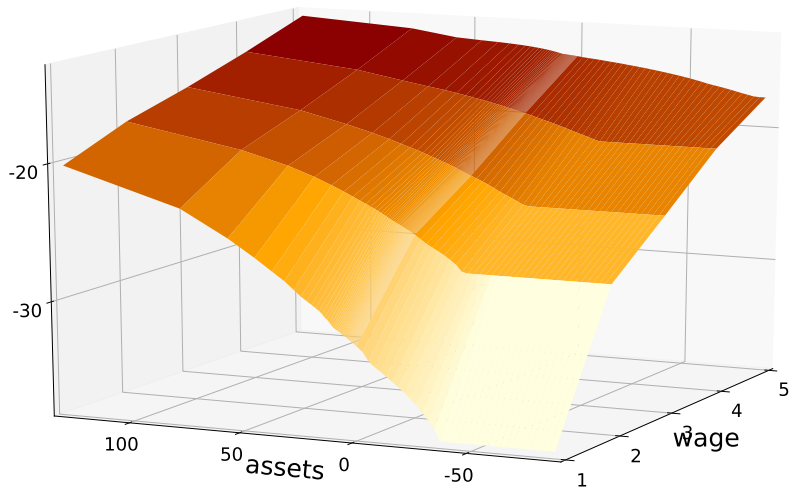
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Policies

BAPCPA

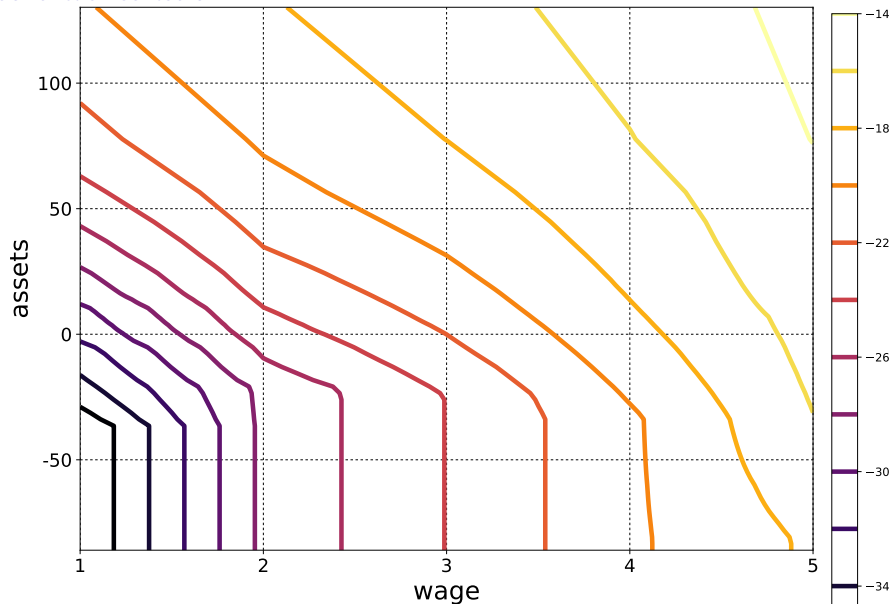
Solution of the Model

Value Function Surface

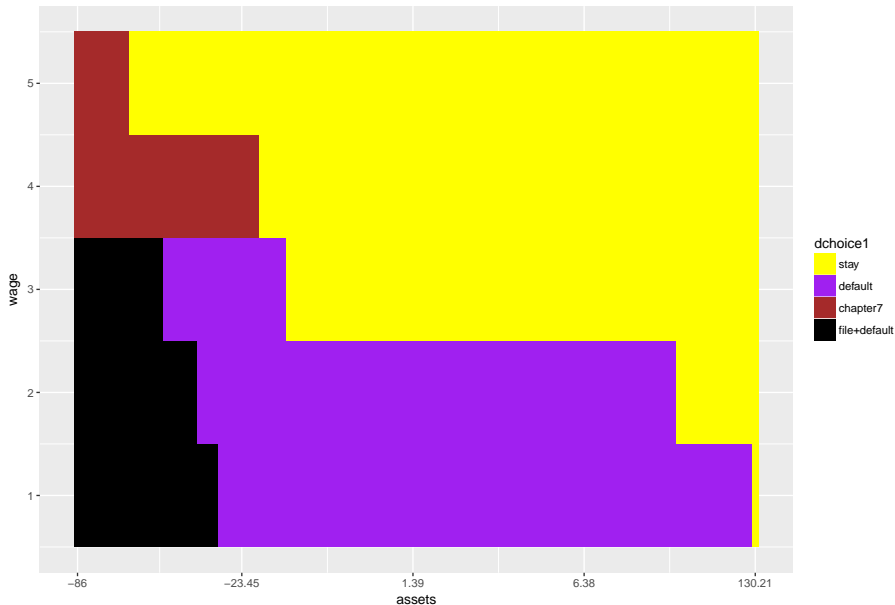


Solution of the Model

Value Function Contours



Owners Discrete Choice with Equity = -108.43



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Estimation

- We do standard SMM.
- Parameters λ^e and θ_H^e vary by education groups high/low education.
- **high** education: 14+ years.
- The moment function contains all aggregate moments.
- Age profiles of ownership and hours not in the objective function for now, but out of sample test.

Parameter Estimates

		Estimate	Std. error
Utility: c, l and h			
Weight of consumption	ω	0.61	–
CRRA	γ	2.1	–
Fixed Cost of Participation	θ_P	800	–
Housing utility parameter (high)	θ_H^h	–0.136	–
Housing utility parameter (low)	θ_H^l	–0.138	–
Warm glow utility of housing	μ	0.01	–
Utility: Bankruptcy			
Ch. 13 Consumption penalty (high)	λ_{13}^h	1	–
Ch. 13 Consumption penalty (low)	λ_{13}^l	0.842	–
Ch. 7 Consumption penalty (high)	λ_7^h	0.829	–
Ch. 7 Consumption penalty (low)	λ_7^l	0.7	–
Bequest penalty if BK	θ_{BK}	12.1	–

Exogenously Set Parameters

Prob of exit from bankruptcy state	δ	0.2
2003 Median household income 1000 USD		43
Risk free gross interest rate	$1 + r$	1.02
Discount factor	β	0.95
Rental price of housing	p_r	0.02
fixed cost of selling	ϕ	0.06
Probability of deficiency	ψ	0.1
Homestead exemption modulo median income	ξ	1
Downpayment ratio	χ	0.1
Mortgage interest rate	r_m	0.06
Annual hours worked full time	l_L	2277
Annual leisure endowment (hours)	L	4000
House price shock persistence	ρ_p	0.96
House price shocks SD	σ_p	0.15

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Aggregate Moments for High Education

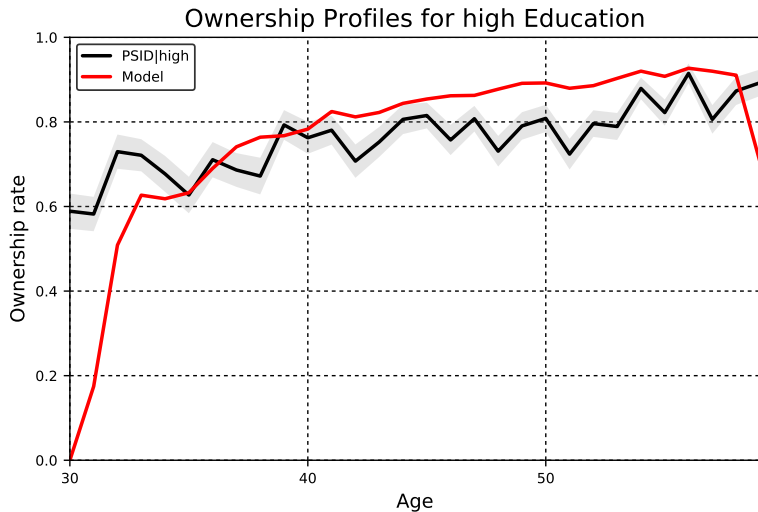
Aggregate Moments for high Education		
Moment	Model	Data
Bankruptcy	4.822	4.978
Bankruptcy 7	3.456	3.533
Bankruptcy 13	1.365	1.362
Default	0.789	0.847
Homeownership	76.627	76.016
Hours	2193.7	2072.05

Aggregate Moments for Low Education

Aggregate Moments for low Education		
Moment	Model	Data
Bankruptcy	4.931	4.978
Bankruptcy 7	3.618	3.533
Bankruptcy 13	1.313	1.362
Default	0.84	0.847
Homeownership	67.589	67.81
Hours	2176.7	2072.05

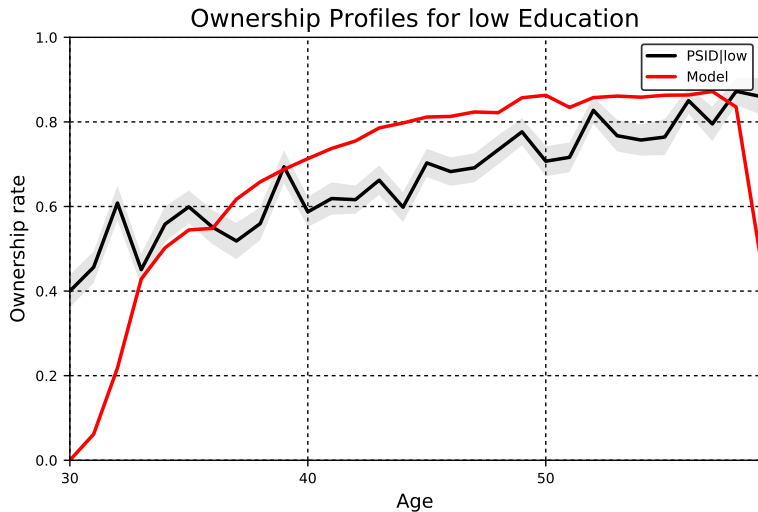
Ownership Profiles

High Education



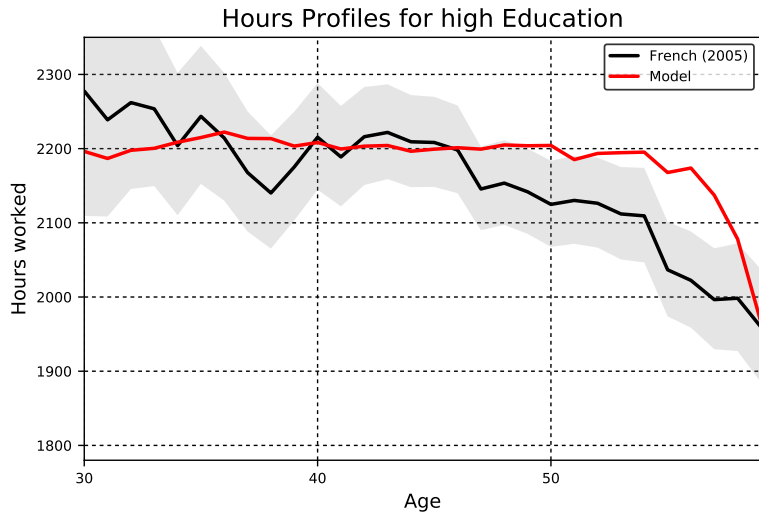
Ownership Profiles

Low Education



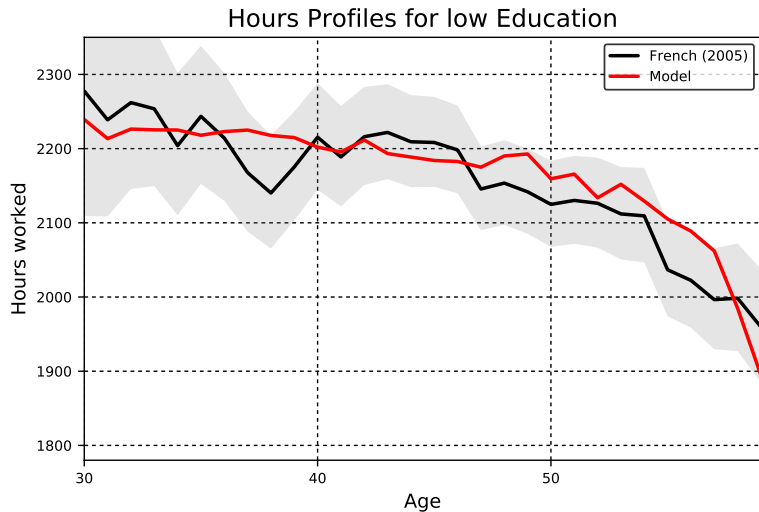
Hours Profiles

High Education



Hours Profiles

Low Education



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BAPCPA

Implementation

- Meanstest: only people below state median income can file chapter 7.
- Homestead cap: Homestead exemption cannot exceed \$125,000
- Filing for chapter 7 now incurs greater filing costs: set to 2% of median income (as in Mitman (2016))
- Compare two steady states: **Baseline** vs **BAPCPA**, keeping shock sequences fixed.

BAPCPA Aggregate Results: High Education

Experiment: BAPCPA		
Moment	Baseline	BAPCPA
Bankruptcy	4.822	4.667
Bankruptcy 7	3.456	2.664
Bankruptcy 13	1.365	2.003
Default	0.789	0.791
Homeownership	76.627	77.093
Hours	2193.7	2193.73
Interest	1.079	1.065
median($a file$)	-1.152	-1.212
$\mathbb{E}[V t = 1]$	-17.636	-17.444
Results for high Education		

Discussion

- On an aggregate level, small impact on Welfare.
- Bankruptcy and Interest rates fall for both groups.
- No big changes apart from that.
- Must drill down into subgroups.

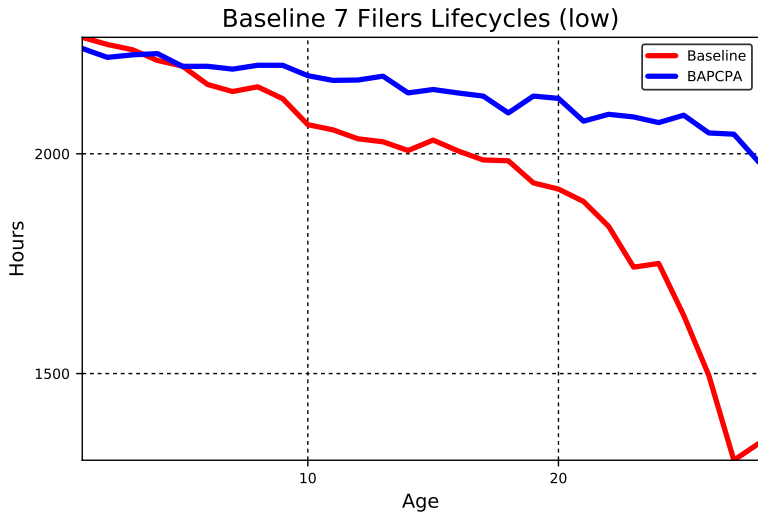
Which baseline filers file again under BAPCPA

High Education

Filed in Baseline, file in BAPCPA ?			
Category	Number	Fraction of baseline filers	At same age
7 \rightarrow 7	878	0.638	0.926
13 \rightarrow 13	343	0.599	0.929
7 \rightarrow 13	217	0.158	0.774

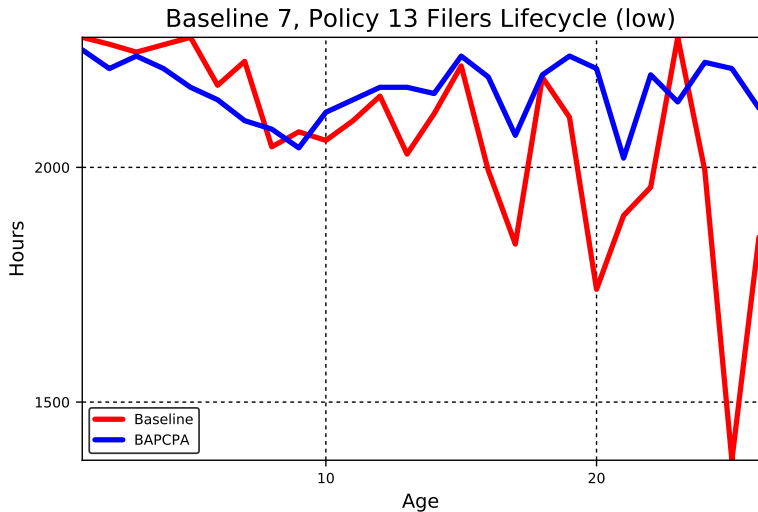
BAPCPA – Labor Supply

Lifecycle profile for people who filed 7 in baseline (Low)



BAPCPA – Labor Supply

filed 7 in baseline, 13 in policy (Low)

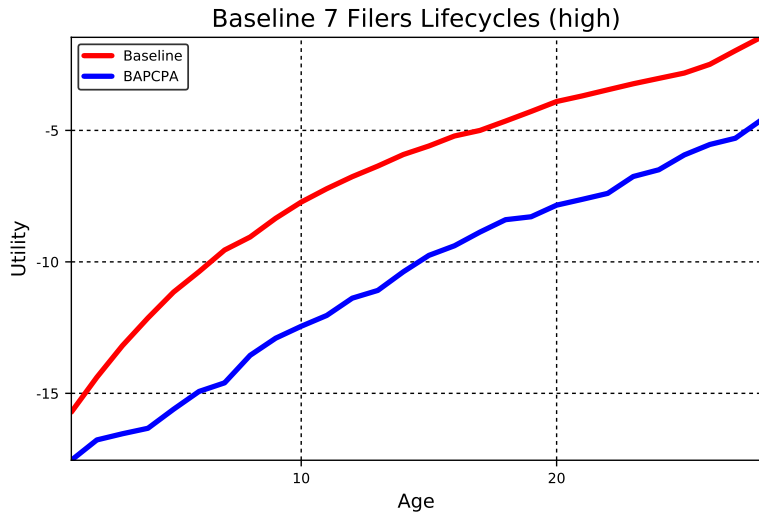


Discussion of Hours Results

- A very large fraction of baseline filers files again.
- At the same age.
- What are the implications for Welfare?
- Overall, highly educated benefit from the reform, low educated suffer.
- But what about the group of filers?

BAPCPA – Utility

Lifecycle profile for people who filed 7 in baseline (High)



Conclusion

- We constructed a model to analyse the BAPCPA reform.
- We are able to fit the main data moments.
- The policy has negligible impact on aggregate welfare.
- The affected population of filers, however, has greatly reduced utility.
- Their labor supply strongly increases.

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