Consumer Bankruptcy, Mortgage Default, and Labor Supply

Wenli Li, Philadelphia Fed

Costas Meghir, Yale

Florian Oswald, SciencesPo Paris

November 30, 2017
Introduction

- Consumers suffer from **shocks**. Unemployment, medical expenses, house price crash, divorce, etc.

- Bankruptcy and Mortgage Default provide **insurance** against shocks.
  - In the US, Bankruptcy and default institutions vary greatly by state.
  - 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 $\infty$ in Texas.

2. **Chapter 13:**
   - Debt restructuring plan with scheduled **repayments**.
   - House and other assets are not seized.
## Homestead Exemption Example

<table>
<thead>
<tr>
<th></th>
<th>Maryland</th>
<th>Texas</th>
</tr>
</thead>
<tbody>
<tr>
<td>House Value</td>
<td>$300,000</td>
<td>$300,000</td>
</tr>
<tr>
<td>Mortgage</td>
<td>$250,000</td>
<td>$250,000</td>
</tr>
<tr>
<td>Equity</td>
<td>$50,000</td>
<td>$50,000</td>
</tr>
<tr>
<td>Homestead Exemption</td>
<td>0</td>
<td>$\infty$</td>
</tr>
<tr>
<td>Unsecured Debt</td>
<td>$25,000</td>
<td>$25,000</td>
</tr>
<tr>
<td>Result of Bankruptcy</td>
<td>Forced Sale</td>
<td>Keep House</td>
</tr>
</tbody>
</table>
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

- Credit Bureau (Equifax) Data has LTV and bankruptcy indicator.
- (Rates are not nationally representative.)

<table>
<thead>
<tr>
<th>Period</th>
<th>All LTV</th>
<th>LTV &gt; 95</th>
<th>LTV &lt; 95</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004–2012</td>
<td>0.1164</td>
<td>0.21</td>
<td>0.1</td>
</tr>
<tr>
<td>Pre 2006</td>
<td>0.015</td>
<td>0.047</td>
<td>0.012</td>
</tr>
<tr>
<td>Post 2006</td>
<td>0.12</td>
<td>0.22</td>
<td>0.11</td>
</tr>
</tbody>
</table>

Homeowners with Mortgages only
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).

• 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)

Homeowners’ Cumulative Bankruptcy Filing Rate Conditional on Foreclosure


months since foreclosure start

prime mortgages
subprime mortgages
Introduction

Descriptive Data Overview

Model

Data

Results
  Estimation
  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.
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.
Introduction

Descriptive Data Overview

Model

Data

Results
  Estimation
  Model Fit

Policies
  BAPCPA
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.

• 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 \( l \in \{l_1, \ldots, l_L\} \equiv \mathcal{L} \), and
- housing floorspace \( h \in \{h, h_1, \ldots, \bar{h}\} \equiv \mathcal{H} \) with \( H \equiv 1[h > \underline{h}] \):

\[
U(c, l, h) = (c - \Theta P(L - l - 1[l > 0] \Theta P))^{1-\omega} \gamma^{1-\gamma} \exp(\theta H h) + \mu_h
\]

where

- Leisure is \( L - l - 1[l > 0] \Theta P \), and
- \( \Theta P \) is a fixed cost of participation,
- \( \theta \) is the strength of housing preference,
- \( \mu_h \) is the warm glow ownership utility.
Utility

Agents choose:

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

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

where

- Leisure is $L - l - 1[l > 0] \theta_P$, and $L$ is the leisure endowment
- $\theta_P$ is a fixed cost of participation
- $\theta_H$ strength of housing preference
- $\mu$ 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*.

\[
p_{i0} = 1 \\
p_{it} = \rho_p p_{it-1} + \varepsilon_{it-1} \\
\varepsilon_{it} \sim N(0, \sigma_p^2)
\]

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

\[
\ln w_{itj} = d_j + e_i + f(t)^e + \eta_{itj} \\
i = 1, \ldots, N; t = 25, \ldots, 60; j = 1968, \ldots, 2013
\]
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.
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 $\pi(a'|X)$.

There is no unobserved state variable, i.e. full information, and bank can compute $\pi$.

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

\[ \frac{q(a'|X)}{1+r} = \frac{a'}{1+r} \implies \frac{1+r}{q(a'|X)} a' = \text{interest} \]
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 \( \lambda \).
  3. Lasts \( T_{bk} \) periods on average. Exit with prob \( \delta \).

- 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 \( m = 0, H = 0 \). 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.

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 $(a', w)$.

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

s.t.

\[
c + \frac{q_t(a'|w)}{1 + r} = \omega l + a - x
\]

\[
\pi^7(a'|w) = E_{w'|w,t} \left[ I^7_{t+1}(a', w') \right]
\]

\[
\pi^{13}(a'|w) = E_{w'|w,t} \left[ I^{13}_{t+1}(a', w') \right]
\]
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 $\lambda \in [0, 1]$

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

s.t.

\[
c - 0 = wl + 0
\]
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.
Introduction

Descriptive Data Overview

Model

Data

Results
  Estimation
    Model Fit

Policies
  BAPCPA
Estimation

• We do standard SMM.

• Parameters $\lambda^e$ and $\theta^e_H$ 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.

• **Will report only low education results here!**
  Please refer to my website for long presentation/paper.
# Parameter Estimates

<table>
<thead>
<tr>
<th>Utility: $c, l$ and $h$</th>
<th>Estimate</th>
<th>Std. error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight of consumption</td>
<td>$\omega$</td>
<td>0.61</td>
</tr>
<tr>
<td>CRRA</td>
<td>$\gamma$</td>
<td>2.1</td>
</tr>
<tr>
<td>Fixed Cost of Participation</td>
<td>$\theta_P$</td>
<td>800</td>
</tr>
<tr>
<td>Housing utility parameter (high)</td>
<td>$\theta_H^h$</td>
<td>$-0.136$</td>
</tr>
<tr>
<td>Housing utility parameter (low)</td>
<td>$\theta_H^l$</td>
<td>$-0.138$</td>
</tr>
<tr>
<td>Warm glow utility of housing</td>
<td>$\mu$</td>
<td>0.01</td>
</tr>
</tbody>
</table>

| Utility: Bankruptcy |
|---------------------|----------|------------|
| Ch. 13 Consumption penalty (high) | $\lambda_{13}^h$ | 1          | -          |
| Ch. 13 Consumption penalty (low) | $\lambda_{13}^l$ | 0.842     | -          |
| Ch. 7 Consumption penalty (high) | $\lambda_{7}^h$ | 0.829     | -          |
| Ch. 7 Consumption penalty (low) | $\lambda_{7}^l$ | 0.7       | -          |
| Bequest penalty if BK | $\theta_{BK}$ | 12.1      | -          |
## Exogenously Set Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prob of exit from bankruptcy state</td>
<td>$\delta$</td>
</tr>
<tr>
<td>2003 Median household income 1000 USD</td>
<td></td>
</tr>
<tr>
<td>Risk free gross interest rate</td>
<td>$1 + r$</td>
</tr>
<tr>
<td>Discount factor</td>
<td>$\beta$</td>
</tr>
<tr>
<td>Rental price of housing</td>
<td>$p_r$</td>
</tr>
<tr>
<td>fixed cost of selling</td>
<td>$\phi$</td>
</tr>
<tr>
<td>Probability of deficiency</td>
<td>$\psi$</td>
</tr>
<tr>
<td>Homestead exemption modulo median income</td>
<td>$\xi$</td>
</tr>
<tr>
<td>Downpayment ratio</td>
<td>$\chi$</td>
</tr>
<tr>
<td>Mortgage interest rate</td>
<td>$r_m$</td>
</tr>
<tr>
<td>Annual hours worked full time</td>
<td>$l_L$</td>
</tr>
<tr>
<td>Annual leisure endowment (hours)</td>
<td>$L$</td>
</tr>
<tr>
<td>House price shock persistence</td>
<td>$\rho_p$</td>
</tr>
<tr>
<td>House price shocks SD</td>
<td>$\sigma_p$</td>
</tr>
</tbody>
</table>
Introduction

Descriptive Data Overview

Model

Data

Results
  Estimation
  Model Fit

Policies
  BAPCPA
## Aggregate Moments for Low Education

<table>
<thead>
<tr>
<th>Moment</th>
<th>Model</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bankruptcy</td>
<td>4.931</td>
<td>4.978</td>
</tr>
<tr>
<td>Bankruptcy 7</td>
<td>3.618</td>
<td>3.533</td>
</tr>
<tr>
<td>Bankruptcy 13</td>
<td>1.313</td>
<td>1.362</td>
</tr>
<tr>
<td>Default</td>
<td>0.84</td>
<td>0.847</td>
</tr>
<tr>
<td>Homeownership</td>
<td>67.589</td>
<td>67.81</td>
</tr>
<tr>
<td>Hours</td>
<td>2176.7</td>
<td>2072.05</td>
</tr>
</tbody>
</table>
Ownership Profiles for low Education
Hours Profiles for low Education

- French (2005)
- Model
Introduction

Descriptive Data Overview

Model

Data

Results

  Estimation
  Model Fit

Policies

  BAPCPA
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: Low Education

<table>
<thead>
<tr>
<th>Moment</th>
<th>Baseline</th>
<th>BAPCPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bankruptcy</td>
<td>4.931</td>
<td>3.828</td>
</tr>
<tr>
<td>Bankruptcy 7</td>
<td>3.618</td>
<td>3.286</td>
</tr>
<tr>
<td>Bankruptcy 13</td>
<td>1.313</td>
<td>0.542</td>
</tr>
<tr>
<td>Default</td>
<td>0.84</td>
<td>0.828</td>
</tr>
<tr>
<td>Homeownership</td>
<td>67.589</td>
<td>67.768</td>
</tr>
<tr>
<td>Hours</td>
<td>2176.7</td>
<td>2175.33</td>
</tr>
<tr>
<td>Interest</td>
<td>1.107</td>
<td>1.095</td>
</tr>
<tr>
<td>median($a</td>
<td>file)</td>
<td>−1.091</td>
</tr>
<tr>
<td>$\mathbb{E}[V</td>
<td>t = 1]$</td>
<td>−28.515</td>
</tr>
</tbody>
</table>

Results for low Education
BAPCPA – Labor Supply
Lifecycle profile for people who filed 7 in baseline (Low)

Baseline 7 Filers Lifecycles (low)
BAPCPA – Labor Supply
filed 7 in baseline, 13 in policy (Low)

Baseline 7, Policy 13 Filers Lifecycle (low)
BAPCPA – Utility
filed 7 in baseline, 13 in policy (Low)
BAPCPA – Utility
Lifecycle profile for people who filed 7 in baseline (Low)

Baseline 7 Filers Lifecycles (low)

Baseline
BAPCPA

Utility
Baseline
-30
-20
-10

Age
10
20

-10
-20
-30
BAPCPA – Utility

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

Baseline 7 Filers Lifecycles (low)

Baseline

BAPCPA

Utility

0
-10
-20
-30

Age

10
20

10 20

20

Baseline

BAPCPA
BAPCPA – Utility
filed 7 in baseline, 13 in policy (Low)

Baseline 7, Policy 13 Filers Lifecycles (low)
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.


