Credit Cards and Consumption

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The views expressed in this presentation are the authors’ and not necessarily those of the Consumer Financial Protection Bureau or the United States.
Motivation

1. Dual-purpose CC use (US consumers)
   - Most have a card (77%) & use it (80% adopters)
   - Similar volume and value shares (15-20%)
   - Rewards: Yes (64%)
   - Interest: revolvers (14-16%), convenience (0%)
   - Debt puzzles: revolving ($5-6k) + liquid and/or illiquid

2. Mostly segregated theoretical modeling
   - Consumption-saving – debt, credit, smoothing
   - Money-payments – transactions costs, A/U, ACS, 2SMs

3. Incomplete data support/access
   - Debt OR payments, not both
   - Reliance on central moments & calibration
   - Subsets of revolving credit accounts not all
   - Insufficient longitudinal panels

Sources: Survey of Consumer Payment Choice, SCF, CFPB Making Ends Meet Survey.
Consumption models with revolving credit and/or life-cycle behavior and/or hyperbolic discounting:
Gourinchas and Parker (2002); Laibson, Repetto, and Tobacman (2003); Telukova (2013)

Econometric studies with micro panel credit card data:
Gross and Souleles (2002); Agarwal et al (2015); Fulford and Schuh (2015)

Money demand/payment choice with cash, debit, and credit:
Telukova and Wright (2008); Koulayev et al (2016); Wamori and Welte (2017); Alvarez and Lippi (2017); Briglevics and Schuh (2018)

Primary contributions

1. MODELING: Credit cards used for payment & debt
2. DATA: Rich longitudinal panel of micro data
   ▶ NY Fed Consumer Credit Panel (CCP), 1999-2017
   ▶ Diary of Consumer Payment Choice (DCPC)
   ▶ SCF and CEX surveys
3. ESTIMATION: Method of Simulated Moments (McFadden 1989) rather than calibration
4. RESULTS: Estimated model reveals:
   ▶ Mixed preferences (50-50 patient, impatient)
   ▶ Persistent debt utilization over life & business cycle
   ▶ Strong consumption reaction to liquidity shocks
   ▶ Utility of CC payments (0.3% of expenditures) = $40b
     (merchant fees $60b)
   ▶ But NOT life-cycle shift from revolving to convenience...
Notes: Observed individual debt may includes both convenience and revolving debt.
Source: Author’s calculations from Equifax/CCP.
Credit and debt largest changes early in life.
Biggest source of “saving” for those under 40.

Compare to Attanasio, Banks, Meghir, and Weber (1999)
Life-cycle: CC utilization

Source: Author's calculations from Equifax/CCP
Life-cycle: CS distributions of utilization

Credit utilization percentiles
20 40 60 80
Age
99 90 75 Median
1 and 10
Credit utilization\(_{it}\) = \(\theta_t + \theta_a + \alpha_i + \beta\text{Credit utilization}_\{i,t-1\} + \epsilon_{it}\)

<table>
<thead>
<tr>
<th>CCP</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.647***</td>
<td>(0.00131)</td>
</tr>
<tr>
<td>Observations</td>
<td>347,642</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.429</td>
</tr>
<tr>
<td>Fixed effects</td>
<td>Yes</td>
</tr>
<tr>
<td>Age and year effects</td>
<td>Yes</td>
</tr>
<tr>
<td>Number of accounts</td>
<td>10,451</td>
</tr>
<tr>
<td>Frac. Variance from FE</td>
<td>0.477</td>
</tr>
</tbody>
</table>

Only 0.647\(^4\) = 0.175 of a shock to utilization left after a year.
Model: Payments decision

- Each period consumer must decide how to pay for expenditure
- Model payments as a transaction cost driving a small wedge between expenditure $X_t$ and consumption $C_t$
- For each fraction of expenditures (indexed by $\pi$) consumer chooses whether to pay by credit card or “cash”
- $N(\pi)$ is relative cost of cash
  - If $N(\pi) > 0$ prefer credit card
  - If $N(\pi) < 0$ prefer cash
- **Key for identification:** If revolving, lose “float” of free credit, makes using credit card for payments more expensive
Simple linear function: \( N(\pi) = \nu_0 - \nu_1 \pi \)
### Estimating CC convenience value

<table>
<thead>
<tr>
<th></th>
<th>Fraction on Credit card</th>
<th>Std. error</th>
<th>Std. dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>All consumers</td>
<td>0.172</td>
<td>0.0082</td>
<td>0.310</td>
</tr>
<tr>
<td>All revolvers</td>
<td>0.156</td>
<td>0.0130</td>
<td>0.283</td>
</tr>
<tr>
<td>All convenience users</td>
<td>0.182</td>
<td>0.0105</td>
<td>0.324</td>
</tr>
</tbody>
</table>

#### Model Estimates

<table>
<thead>
<tr>
<th></th>
<th>Level $\nu_0$</th>
<th>Slope $\nu_1$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.035</td>
<td>0.194</td>
</tr>
<tr>
<td></td>
<td>0.0216</td>
<td>0.1259</td>
</tr>
</tbody>
</table>

#### Implied value of Credit Card use (in percent of consumption)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Revolvers</td>
<td>0.235%</td>
<td>0.1512</td>
</tr>
<tr>
<td>Convenience users</td>
<td>0.319%</td>
<td>0.0962</td>
</tr>
</tbody>
</table>

Source: Authors’ calculations from Federal Reserve Bank of Boston Diary of Dairy of Consumer Payment Choice
Intertemporal model

\[
\max_{\{X_s, \pi_s, f_s\}_{s=t}^T} \left\{ E \left[ \sum_{s=t}^T \beta_j^{s-t} u(C_is) + \beta_j^{T+1} S(A_iT) \right] \right\} \text{ subject to }
\]

\[C_is = \nu_is(1 - f_i,s\phi^c_s)X_is\]  
(Consumption and expenditures)
\[X_is \leq W_is\]  
(Expenditures limited by liquidity)
\[W_is = R_i,sA_{i,s-1} + Y_is + B_is - K_is\]  
(Evolution of liquidity)
\[A_{i,s-1} = W_{i,s-1} - B_{is-1} - X_{is-1}\]  
(Assets and liquidity)
\[\nu_is = \nu(\pi_is; A_{i,s-1})\]  
(Payment decision)
\[f_is = f(F_i,s, W_{i,s})\]  
(Default decision)
\[F_i,s = H(F_{i,s-1}, f_{i,s-1})\]  
(Evolution of default state)

- Key constraint: liquidity \(W_{it}\) from assets \(A_{it-1}\), credit limit \(B_{it}\), and income \(Y_{it}\), minus expenditure shock \(K_{is}\)
- Expenditures \(X_is\) become consumption through payment choice \(\nu_is\) and cost if default \(f_{i,s}\)
Shocks and Income

- Permanent-Transitory income:
  \[ Y_{i,t+1} = P_{i,t+1}(U_{i,t+1} - F_{i,t+1} \phi^y_{t+t}) \]
  \[ P_{i,t+1} = G^j_{t+1} P_{it} M_{i,t+1}, \]

- \( G^j_t \) follows CEX income
- Shocks \( M_{i,t+1} \) and \( U_{i,t+1} \) log normal
- Allow for transitory unemployment/low-income shock
- Income reduced by \( \phi^y_{t+t} \) if in default state

- Transitory expenditure shocks
  \[ K_{it} = kP_{i,t} \] with probability \( p^k \)

- Beginning and end of life
- Bequests
Borrowing

- Credit limit as fraction of permanent income

\[ B_{it} = b_t P_{it} b_f^{F_{it}} \]

- \( b_t \) grows so that \( E_i[B_{it}] \) matches observed credit limits
- Produces direct correspondence between income, credit, and consumption decisions
- Distribution of credit and income match
- Borrowing and saving at different rates

\[ R_{i,t} = R(A_{i,t-1}, F_{i,t}) = \begin{cases} R & \text{if } A_{i,t-1} \geq 0 \\ R_B & \text{if } A_{i,t-1} < 0 \\ R_D & \text{if } A_{i,t-1} < 0 \text{ and in default at } t-1 \end{cases} \]
Default

- Default if:
  1. Expenditure shock pushes liquidity below 0 → consume $c_{min}P_{it}$.
  2. Decide to default → consume all liquidity, minus a penalty $(1 - \phi^c_{t})W_{it}$

- After default, enter default state
  - Assets in next period 0
  - Credit limit reduced to by multiple $b_f < 1$
  - Interest rate on borrowing increased to $R_D$
  - Income in each period reduced by $\phi^y_t = \phi^y(R_B - 1)b_tP_{it}$
  - Exit default with constant probability each period, expected length of default 7 years
Consumption policy with default by choice
Estimation with heterogeneity

- Allow for two sub-populations with different preferences
- Mix populations by estimating:
  - Fraction of population $A$: $f^A$
  - Fraction of mean life-cycle income earned by $A$: $\zeta^A$
  - Hold population average life-cycle income equal CEX, so $f^A$ and $\zeta^A \rightarrow f^B$ and $\zeta^B$

- First stage: estimate payments decision, life-cycle income, credit limit, income volatility, interest rates

- Second stage: estimate 12 parameters jointly:
  \[ \theta = \{ \gamma^A, \beta^A, \lambda_0^A, \lambda_1^A, \gamma^B, \beta^B, \lambda_0^B, \lambda_1^B, f^A, \zeta_0^A, p^k, k \} \]

- Default costs identified only up to inequality
Method of Simulated Moments Estimation

1. Given preferences $\theta$ and first stage $\chi$, numerically find
   - Consumption $C_t(W_t, P_t, F_t, I_{t-1}^R; \theta, \chi)$ at each age, liquidity, permanent income, default, revolving status
   - Default liquidity at which $V^D > V^{ND}$

2. Simulate consumption/savings/debt/default at every age for large population

3. Compare simulated and actual consumption and debt profiles

4. Go back to 1 with new $\theta$, stop when find $\theta$ that minimizes difference between simulated and actual life-cycle profiles

Technical Details
## Estimates

<table>
<thead>
<tr>
<th>Population A</th>
<th>Population B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CRRA</strong> $\gamma^A$</td>
<td>0.089</td>
</tr>
<tr>
<td>$\gamma^A$</td>
<td>(0.027)</td>
</tr>
<tr>
<td><strong>Discount</strong> $\beta^A$</td>
<td>0.890</td>
</tr>
<tr>
<td>$\beta^A$</td>
<td>(0.001)</td>
</tr>
<tr>
<td><strong>Initial wealth</strong> $\lambda_0^A$</td>
<td>1.106</td>
</tr>
<tr>
<td>$\lambda_0^A$</td>
<td>(0.080)</td>
</tr>
<tr>
<td><strong>Late life inc.</strong> $\lambda_1^A$</td>
<td>0.602</td>
</tr>
<tr>
<td>$\lambda_1^A$</td>
<td>(0.060)</td>
</tr>
<tr>
<td><strong>Mix</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Share</strong> $f^A$</td>
<td>0.621</td>
</tr>
<tr>
<td>$f^A$</td>
<td>(0.012)</td>
</tr>
<tr>
<td><strong>Inc. mult.</strong> $\zeta^A$</td>
<td>1.131</td>
</tr>
<tr>
<td>$\zeta^A$</td>
<td>(0.100)</td>
</tr>
<tr>
<td><strong>Expenditure Shock</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Prob. of exp. shock</strong></td>
<td>0.044</td>
</tr>
<tr>
<td></td>
<td>(0.015)</td>
</tr>
<tr>
<td><strong>Size of exp. Shock</strong></td>
<td>0.635</td>
</tr>
<tr>
<td></td>
<td>(0.125)</td>
</tr>
</tbody>
</table>
## Consumption path

<table>
<thead>
<tr>
<th>Age</th>
<th>Consumption and income ($ yearly, log scale)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model consumption</td>
</tr>
<tr>
<td></td>
<td>CEX consumption</td>
</tr>
<tr>
<td></td>
<td>CEX income and model income</td>
</tr>
<tr>
<td></td>
<td>Population A consumption</td>
</tr>
<tr>
<td></td>
<td>Population B consumption</td>
</tr>
</tbody>
</table>

![Graph showing consumption and income across different age groups](image-url)
Debt path

Credit card debt and limit (\$, log scale)

- Model debt
- Equifax credit card debt
- Equifax credit card limit
- Population A debt
- Population B debt
Default path

![Default path graph](image)

- Model with bankruptcy
- Population A with bankruptcy
- Population B with bankruptcy
- CCP with bankruptcy
Model prediction: Utilization path

The graph illustrates the utilization over age for different populations and models. The x-axis represents age, ranging from 30 to 70, and the y-axis represents utilization, ranging from 0 to 1. The graph includes:

- **Model utilization** (dashed red line)
- **Equifax utilization** (solid blue line)
- **Population A** (dashed green line)
- **Population B** (dashed orange line)

The model prediction shows a steady decrease in utilization with age for all populations, indicating a consistent trend across different utilization metrics.
Model prediction: Wealth path

![Model prediction: Wealth path graph](image_url)

- **Model mean log wealth + 10,000**
- **SCF per person mean log wealth + 10,000**

<table>
<thead>
<tr>
<th>Age</th>
<th>Wealth ($) (log scale)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>5,000</td>
</tr>
<tr>
<td>40</td>
<td>10,000</td>
</tr>
<tr>
<td>50</td>
<td>20,000</td>
</tr>
<tr>
<td>60</td>
<td>50,000</td>
</tr>
<tr>
<td>70</td>
<td>100,000</td>
</tr>
</tbody>
</table>
Model prediction: Fraction revolving

![Graph showing the fraction revolving over different age ranges for Population A and Population B. The graph compares model predictions with the SCF fraction revolving.]
Out of sample predictions

- Three tests:
  1. Aggregate credit falls 35% to match 2008-2009
  2. Micro reduced-form utilization dynamics
  3. Response to randomly allocated income shock

- Each experiment incorporates full model heterogeneity:
  - Life-cycle
  - Heterogeneous agents with different histories (utilization, consumption)
  - Different preferences (patient, impatient)
### Reduced-form micro utilization dynamics

<table>
<thead>
<tr>
<th></th>
<th>CCP</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit utilization&lt;sub&gt;t-1&lt;/sub&gt;</td>
<td>0.647*** (0.00131)</td>
<td>0.699*** (0.000492)</td>
</tr>
<tr>
<td>Observations</td>
<td>347,642</td>
<td>2,168,011</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.429</td>
<td>0.491</td>
</tr>
<tr>
<td>Fixed effects</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Age and year effects</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Number of accounts</td>
<td>10,451</td>
<td>46,607</td>
</tr>
<tr>
<td>Frac. Variance from FE</td>
<td>0.477</td>
<td>0.217</td>
</tr>
</tbody>
</table>
Giving people cash one way to increase consumption, useful for counter-cyclical policy

- Tax-rebate literature (Kaplan and Violante, 2014; Parker et al., 2013) suggests around 25% of rebate spent within one quarter
- Much too large for standard models: PIH says spend annuity, buffer-stock with standard preferences very low as well
- Kaplan and Violante (2014) suggest explanation is wealthy hand-to-mouth

Our explanation simpler, but complementary: Because more than half of population revolving, more than half must have pretty high marginal propensity to consume
### Policy: Effect of cash stimulus

\[ \Delta C_{it} = \alpha + f(\text{age}_{it}) + \beta \text{Cash}_{it} + \epsilon_{it} \]

<table>
<thead>
<tr>
<th></th>
<th>Full pop.</th>
<th>Pop. A</th>
<th>Pop B.</th>
<th>Full pop.</th>
<th>Pop. A</th>
<th>Pop B.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transitory income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.226***</td>
<td>0.270***</td>
<td>0.0904***</td>
<td>0.296***</td>
<td>0.340***</td>
<td>0.162***</td>
</tr>
<tr>
<td></td>
<td>(0.0250)</td>
<td>(0.0334)</td>
<td>(0.0333)</td>
<td>(0.0248)</td>
<td>(0.0330)</td>
<td>(0.0337)</td>
</tr>
<tr>
<td>Permanenent credit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.296***</td>
<td>0.340***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.0248)</td>
<td>(0.0330)</td>
</tr>
<tr>
<td>limit increase</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>533,288</td>
<td>329,560</td>
<td>203,728</td>
<td>533,288</td>
<td>329,560</td>
<td>203,728</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.000</td>
<td>0.001</td>
<td>0.000</td>
<td>0.001</td>
<td>0.001</td>
<td>0.000</td>
</tr>
<tr>
<td>Age effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Tax rebate literature: \( \approx 0.25 \)
Summary: Why is utilization so stable?

- Stability from three interacting sources
  - Liquidity constraint: Impatient want to spend more, increase in credit allows to do so
  - Payments: Credit card use a fraction of consumption, which is determined by income. Increase in permanent income increases both credit limit and credit cards
  - Precaution: Increase in credit increases buffer, allows spend more (Fulford, 2013)
Conclusions and insights

1. Need heterogeneous preferences to fit the data
   ▶ Plausible *estimated* discount rates

2. Need CC payments to identify impatience
   ▶ Margin between convenience and revolving

3. Need life-cycle credit dynamics to understand constraints
   ▶ Large changes in early life are important

4. Model generally fits and predicts data well
   ▶ Exception: life-cycle decline in share of revolvers


Credit is a **BIG** life-cycle change

Attanasio, Banks, Meghir, and Weber (1999)

Comparable estimates from the CCP

Back to presentation
Distributions of Credit, Debt, and Utilization
Credit utilization: non-parametric

Credit utilization in one quarter
\[ E[y|x] = 0.041 + 0.896x \]

Credit utilization today

Credit utilization in one year
\[ E[y|x] = 0.077 + 0.786x \]

Credit utilization in two years
\[ E[y|x] = 0.100 + 0.698x \]

Difference in credit utilization from own mean

Credit utilization in one quarter
\[ E[y|x] = 0.666x \]

Credit utilization in one year
\[ E[y|x] = 0.339x \]

Credit utilization in two years
\[ E[y|x] = 0.128x \]
Credit and Debt

Log Debt_{it} = \theta_i + \theta_t + \theta_a + \alpha \text{Log Limit}_{i,t-1} + \beta \text{Log Debt}_{i,t-1} + \epsilon_{it}

<table>
<thead>
<tr>
<th></th>
<th>Log Debt_t</th>
<th>Log Limit_t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log Debt_{t-1}</td>
<td>0.505***</td>
<td>0.00687***</td>
</tr>
<tr>
<td></td>
<td>(0.00157)</td>
<td>(0.000561)</td>
</tr>
<tr>
<td>Log Credit Limit_{t-1}</td>
<td>0.414***</td>
<td>0.848***</td>
</tr>
<tr>
<td></td>
<td>(0.00262)</td>
<td>(0.000933)</td>
</tr>
<tr>
<td>Observations</td>
<td>296,369</td>
<td>307,805</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.432</td>
<td>0.778</td>
</tr>
<tr>
<td>Accounts</td>
<td>10,028</td>
<td>10,149</td>
</tr>
<tr>
<td>Fixed effects</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Zero included</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Age effects</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Long term credit impact</td>
<td>0.862</td>
<td></td>
</tr>
<tr>
<td>Credit salience (\sigma)</td>
<td>0.443</td>
<td></td>
</tr>
</tbody>
</table>
First stage estimates of other parameters

- Income profile 5-degree age polynomial estimated from CEX
- Income volatility estimates from Gourinchas and Parker (2002) and Carroll and Samwick (1997) calculated from PSID, adjusted for quarterly
- $r_B = 14.11\%$ (average of Fed G19 adjusted for default using Edelberg (2006)).
- $r = 5.4\%$ (average return on an all bond portfolio 1926-2015)
- Adjust for inflation 2.15% from 2000-2015
- Allow for expected aggregate growth of 1.5% (average 1947-2015)
Beginning and end of life

- Initial wealth/income log normal, mean $\lambda_0$, variance matching permanent income
- At $T^{Ret}$, no more income uncertainty, disposable income $\lambda_1 P_{T - 1}^{Ret}$ income every period
- Die with some probability before 94, certainly at 94
- Bequest: annuity of assets left to heirs
Have to allow for “negative” bequests of credit card debt that must be payed out of other assets

Don’t want marginal utility to be infinite → implies strong counterfactual preference to never hold debt

Utility of giving annuity to heirs with their own income

\[
S(A_t) = \left( \sum_{s=0}^{\tilde{T}} \beta^s \left( \frac{\zeta P_t + r(A_t)A_t}{1 - \gamma} \right) \right)
\]

Strength of bequest motive $\zeta$: how much more income heirs have, value of rest of the estate
Estimation using Method of Simulated Moments

- At each age find difference between empirical and simulated moment:

\[ g_t^D(\theta; \chi) = \frac{1}{D} \left( \frac{1}{K_t} \sum_{k=1}^{K_t} D_{k,t} - \frac{1}{N} \sum_{i=1}^{N} \hat{D}_{i,t}(\theta; \chi) \right) \]

- Scale so that percentage deviations in debt same weight as deviation in consumption

- Search for minimum weighted squares difference from empirical moments:

\[ \min_{\theta \in \Theta} g(\theta; \chi)' W g(\theta; \chi) \]

- Generally use \( W = \Omega_g^{-1} \), robust to alternatives
Estimation using Method of Simulated Moments

\[
\min_{\theta \in \Theta} g(\theta; \chi)' W g(\theta; \chi)
\]

- Also use “optimal” \( W \) where first estimate \( \theta \) consistently using \( W = \Omega_g^{-1} \), then take into account how first stage estimates might improve efficiency of weighting.
- Use equal weighting, where normalize each block of block diagonal \( W = \Omega_g^{-1} \) by trace, given exactly equal weight to consumption and debt moments.
- Calculate variance-covariance of \( \hat{\theta} \) following Laibson, Repetto, and Tobacman (2007) to allow \( K_t \) to vary.
- Only know local optimum and loss function has multiple peaks.
  - Start search grid of 10 dimensional space. Present best result, characterize other peaks in paper.
Identification of Default Costs

[Graph showing consumption and liquidity over time for different individuals and age groups, with labels indicating start and stop of saving and borrowing behaviors.]
Identification of Default Costs

The graph illustrates the relationship between the sum of squared residuals (g'Wg) and the cost of default parameter. As the cost of default parameter increases, the sum of squared residuals decreases, indicating a better fit of the model to the data.
Identification of Default Costs

![Graph showing fraction in default vs age with different models and populations with and without bankruptcy.]

- Model with bankruptcy
- Population A with bankruptcy
- Population B with bankruptcy
- Standard default cost with bankruptcy
- CCP with bankruptcy
Consumption policy with voluntary default

![Graph showing consumption policy with voluntary default.](image-url)