A Model of the Consumption Response to Fiscal Stimulus Payments

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Fiscal stimulus payments (a.k.a. tax rebates)

Frequently used instrument to stimulate spending during recessions

They are small, anticipated, temporary, (almost) lump-sum
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2. **2008**: *Economic Stimulus Act* provided most households with payments of $300-$600 per adult and $300 per child. Total payout was $79b, or 2.2% of quarterly Y.
Fiscal stimulus payments (a.k.a. tax rebates)

Frequently used instrument to stimulate spending during recessions

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1. **2009**: *American Recovery and Reinvestment Act* refundable tax credit up to $400 per adult ("Making Work Pay").

2. **2008**: *Economic Stimulus Act* provided most households with payments of $300-$600 per adult and $300 per child. Total payout was $79b, or 2.2% of quarterly Y.

3. **2001**: *Economic Growth and Tax Relief Reconciliation Act*: taxpayers entitled to rebate of up to $300 per adult. Total payout was $38b: 8% of quarterly G, or 1.7% of quarterly Y.
Fact and motivation

Households spend around 25% of their stimulus payment on non-durable consumption in the quarter they receive it

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Sharp violation of standard life-cycle model which predicts:

1. Response to temporary shock is small
2. Response to anticipated income change is zero

Unless borrowing constraints are binding
Preview of idea and results

- **Structural model** to study consumption response to fiscal stimulus payments
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- **Baumol-Tobin** model of money-demand integrated within life cycle, incomplete markets framework → two assets:
  1. liquid asset + credit
  2. illiquid asset s.t. transaction cost, but with:
     (i) higher return
     (ii) flow of consumption services

- Model generates **wealthy hand-to-mouth** households
  Consistent with **SCF data**
  **Micro foundation for spender-saver** models of fiscal policy
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- Quantitatively account for observed rebate coefficients
Evidence on consumption response to FSP

Lifecycle model with two assets

SCF evidence on liquid and illiquid wealth

Quantitative analysis
The 2001 tax rebate

EGTRRA cut lowest tax rate \((\leq 12,000)\) from 15% to 10%

Checks (typically $300 or $600) corresponding to “advance refund” for 2001 sent to 92 million taxpayers between Jul-Sep
The 2001 tax rebate

EGTRRA cut lowest tax rate ($\leq 12,000) from 15% to 10%

Checks (typically $300 or $600) corresponding to “advance refund” for 2001 sent to 92 million taxpayers between Jul-Sep

Three key features of this tax rebate:

1. anticipated (at least for some): EGTRRA enacted in May

2. lump-sum: fixed amount per adult

3. randomized timing: checks mailed out by last 2 digits of SSN
Measuring the response to tax rebates

CEX added special module to quarterly interview in second half of 2001 asking whether rebate was received, when, and how much
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\[ C_{i,t+1} - C_{i,t} = \sum_s \beta_{0s} \text{month}_{s,i} + \beta_1' X_{i,t} + \beta_2 \text{Rebate}_{i,t+1} + u_{i,t+1} \]

\( X_{i,t} \): age, change in \# of adults, change in \# of children
Measuring the response to tax rebates

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\( X_{i,t} \): age, change in # of adults, change in # of children

\( \beta_2 \equiv \) fraction of rebate check spent in quarter it was received net of response of control group

\[ \ldots \text{not a MPC out of the rebate} \]
Measuring the response to tax rebates

<table>
<thead>
<tr>
<th>Estimates of Rebate Coefficient $\hat{\beta}_2$ for 2001 Tax Rebates</th>
<th>Strictly Nondurable</th>
<th>Nondurable</th>
</tr>
</thead>
<tbody>
<tr>
<td>JPS 2006, 2SLS ($N = 13,066$)</td>
<td>0.202 (0.112)</td>
<td>0.375 (0.136)</td>
</tr>
<tr>
<td>H 2008, 2SLS ($N = 12,710$)</td>
<td>0.242 (0.106)</td>
<td></td>
</tr>
<tr>
<td>MS 2011, IVQR ($N = 13,066$)</td>
<td>0.244 (0.057)</td>
<td></td>
</tr>
</tbody>
</table>

- $\hat{\beta}_2$ ranges between 20% and 40% for non-durable consumption
- More recent estimates put weight in 20% to 25% range

**Strictly Nondurable:** food, utilities, household operations, public transportation and gas, alcohol and tobacco and miscellaneous goods

**Nondurable:** strictly nondurable plus apparel goods and services, reading materials and out-of-pocket health care expenditures
Outline

Evidence on consumption response to FSP

Lifecycle model with two assets

SCF evidence on liquid and illiquid wealth

Quantitative analysis
Model

Demographics: household $i$ works for $J^{\text{work}}$ periods 
lives as retiree for $J^{\text{ret}}$ periods

Preferences: $V_{ij}^{1-\sigma} = \left( c_{ij}^\phi s_{ij}^{1-\phi} \right)^{1-\sigma} + \beta \left( \mathbb{E}_j \left[ V_{ij+1}^{1-\gamma} \right] \right)^{\frac{1-\sigma}{1-\gamma}}$

$c_{ij}$: non-durable consumption
$s_{ij}$: housing services

Earnings: idiosyncratic household earnings risk

$log y_{ij} = \chi_j + z_{ij} + u_{ij}$

$z_{ij}$ is unit root, $u_{ij}$ is $i.i.d.$ interpreted as measurement error

No aggregate uncertainty
Model

**Two Assets:** 1) liquid asset $m_{ij} \geq -\bar{m}_{ij}$ with return $R^m \equiv \frac{1}{q^m}$

\[ R^- \geq R^m \]

2) illiquid asset $a_{ij} \geq 0$ with return $R^a \equiv \frac{1}{q^a} > R^m$

**Housing:** $s_{ij} = h_{ij} + \zeta a_{ij+1}$

= purchases of housing services

+ flow from housing component of illiquid asset

**Transactions Cost:** fixed money, utility, or time cost $\kappa$ for each deposit into or withdrawal from illiquid account

**Government:** taxes income progressively, consumption linearly, runs a progressive SS system and respects an intertemporal budget constraint
Model

\[ V_j(a_j, m_j, z_j) = \max\{ V_j^N(a_j, m_j, z_j), V_j^A(a_j, m_j, z_j) \} \]
Model

\[ V_j^N (a_j, m_j, z_j) = \max_{c_j, h_j, m_{j+1}} \left\{ \left( c_j^\phi s_j^{1-\phi} \right)^{1-\sigma} + \beta \left( \mathbb{E}_j \left[ V_{j+1}^{1-\gamma} \right] \right)^{\frac{1-\sigma}{1-\gamma}} \right\}^{\frac{1}{1-\sigma}} \]

subject to

\[ c_j + h_j + q^m m_{j+1} \leq m_j + y_j(z_j) - T(y_j, a_j, m_j, c_j) \]
\[ q^a a_{j+1} = a_j \]
\[ s_j = h_j + \zeta a_{j+1} \]
\[ m_{j+1} \geq -\bar{m}_j \]

\[ V_j^A (a_j, m_j, z_j) = \max_{c_j, h_j, a_{j+1}, m_{j+1}} \left\{ \left( c_j^\phi s_j^{1-\phi} \right)^{1-\sigma} + \beta \left( \mathbb{E}_j \left[ V_{j+1}^{1-\gamma} \right] \right)^{\frac{1-\sigma}{1-\gamma}} \right\}^{\frac{1}{1-\sigma}} \]

subject to

\[ c_j + h_j + q^a a_{j+1} + q^m m_{j+1} \leq a_j + m_j - \kappa + y_j(z_j) - T(\cdot) \]
\[ s_j = h_j + \zeta a_{j+1} \]
\[ a_{j+1} \geq 0, m_{j+1} \geq -\bar{m}_j \]
Example of two-asset economy
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[Euler Equations]
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\[ \text{Euler Equations} \]
Example of two-asset economy

[Graph showing the consumption of two assets over income with Euler Equations]

- Income
- Consumption (1 asset, \( R = R^a \))
- Consumption (1 asset, \( R = R^m \))
- Consumption (2 assets)
Example of two-asset economy

[Euler Equations]
Agent features endogenous hand to mouth behavior
Agent features endogenous hand to mouth behavior
Consumes the rebate check and does not respond to the news
Small welfare gain of smoothing vs $\kappa$ and $R^a - R^m$
Cochrane (1989)
Parametrization (quarterly model)

- **Demographics:**
  \[ J^{work} = 38 \text{ years (22-59)} \]
  \[ J^{ret} = 20 \text{ years (60-79)} \]

- **Preferences:**
  \[ \frac{1}{\sigma} = 1.5 \text{ (IES)} \]
  \[ \gamma = 4 \text{ (risk aversion)} \]
  \[ \phi = 0.85 \text{ (1 - exp. share on housing)} \]

- **Earnings:** Match growth of earnings inequality over life cycle

- **Credit limit:**
  \[ \bar{m}_{ij} = 0.18 \cdot y_{ij} \text{ (SCF)} \]

- **Government:**
  expenditures, debt, tax system and SS system reproduce key features of US counterpart in 2001
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- **Set** \( \{ R^m, R^a, \kappa, \beta, \zeta \} \) from micro data on household portfolios
Evidence on consumption response to FSP

Lifecycle model with two assets

SCF evidence on liquid and illiquid wealth

Quantitative analysis
Liquid and illiquid wealth in SCF 2001

- **Sample:** all households 22+, except top 5% of distribution of net worth, to make SCF and CEX samples comparable
Liquid and illiquid wealth in SCF 2001

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- **Liquid assets:** checking, savings, money market, directly held mutual funds, stocks and bonds and call accounts plus cash holdings ($2,800)

- **Unsecured debt:** revolving debt on credit card balances ($0)

- **Illiquid assets:** net worth minus net liquid assets ($54,600)
  - housing net of mortgages and other secured debt ($31,000)
  - retirement accounts ($950)
Liquid and illiquid wealth over the lifecycle

- Median liquid wealth: $2,600. Median illiquid wealth: $54,600
Measurement of hand-to-mouth households

Insight: households at a kink in their budget constraint
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- **HtM in liquid wealth (LW):**
  - Households with $LW^+ \leq y/2$ or $LW^- \leq$ credit limit

- **Wealthy HtM:**
  - HtM in liquid wealth & positive illiquid assets

- **HtM in net worth (NW):**
  - Households with $NW^+ \leq y/2$ or $NW^- \leq$ credit limit
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It is a lower bound
Hand to Mouth: 30% in liquid wealth, 5% – 13% in net worth
Hand-to-mouth households

Wealthy Hand to Mouth: 17% – 25%
Calibration

- **Assets Returns:**
  - Illiquid asset: After-tax real return $r^a = 2.3\%$
  - Liquid asset: After-tax real return $r^m = -1.5\%$

- **Housing Services $\zeta$:** Match imputed rent of owner-occupied housing net of maintenance, mortgage interest, and property tax $\Rightarrow 4.0\%$ (annualized)

- **Discount Factor $\beta$:** Match median illiquid wealth of $54,600 $\Rightarrow 0.953$ (annualized)

- **Borrowing rate $r^m$:** Match fraction of households with revolving cc debt of 20% $\Rightarrow 6\%$ (annualized)

- **Transactions Cost $\kappa$:** Match fraction of hand-to-mouth households of 1/3 $\Rightarrow 1,000$
Calibration of asset returns

1. Construct average returns by asset class from 1960-2009:
   - Cash and checking accounts: zero nominal return
   - Money market and savings accounts: 3 month treasury bills
   - Stocks: CRSP value-weighted portfolio incl dividends
   - Bonds: 3 month treasury bills
   - Retirement accounts: Return $\times 1.35$ (employer contribution)
   - Certificates of deposit: Federal Reserve Board database

2. All returns are risk adjusted subtracting $\text{var}(\text{return})$

3. Use observed portfolios in SCF to construct household-specific returns on liquid and illiquid wealth $\rightarrow$ cross-sectional mean
Calibration of consumption flow from housing

\[ \zeta = r^h - m^h - n^h - (1 - \tau^{ded})(\tau^{prop} + i^{mort}) \]

- \( r^h \): imputed rents for owner-occupied housing (NIPA) (8.6%)
- \( m^h \): maintenance and repair expenditures (1.0%)
- \( n^h \): home-owner insurance expenditures (0.35%)
- \( \tau^{prop} \): property taxes (1.0%)
- \( i^{mort} \): mortgage interests times L/V ratio (2.9%)
- \( \tau^{ded} \): average marginal tax rate (23.8%)
Borrowers in the model

Model matches the data for $r^m = 10\%$ \& $\kappa = $2,000
Hand to mouth in the model

- Model matches the data for $\kappa = $2,000
Outline

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Quantitative analysis
Tax rebate experiment

- In 2001: Q2, govt announces all households will receive a tax rebate of $500 paid out at 2001: Q2 (group A) or 2001: Q3 (group B)

- After 10 years, permanent additional proportional earnings tax
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- After 10 years, permanent additional proportional earnings tax

- Two features of economic environment in 2001
  1. Bush tax cuts (EGTRRA)
     - Unexpected tax reform announced in 2001:Q2 (with rebate), takes effect gradually from 2002:Q1
  2. Mild 2001-02 recession
     - Unexpected 1.5% decline in earnings, over 3 quarters, followed by 8 quarter recovery
Rebate coefficient in the model

- Rebate coefficient rising with $\kappa$ (1% in one-asset model)
Rebate coefficient in the model

- Rebate coefficient rising with $\kappa$ (1% in one-asset model)
- Rebate coefficient is negative for small transaction costs
Role of hand-to-mouth households

- Rebate coef. rising with fraction of hand-to-mouth households
MPC across household types

- Action entirely from hand-to-mouth households
MPC across household types

- Action entirely from hand-to-mouth households
- Average MPC $\simeq$ Rebate coefficient
Heterogeneity in rebate coefficients

Misra & Surico (2011):

1. Consumption responses are heterogeneous in the population
2. High income households at both ends of distribution
Heterogeneity in rebate coefficients

Misra & Surico (2011):

1. Consumption responses are **heterogenous** in the population

2. High income households at both ends of distribution
Broda-Parker (2012): households do not respond to the news
Aggregate economic conditions

- Size of recession matters for borrowing and adjustment
Availability of credit determines sign of effect
Size-asymmetry of responses (Hsieh)

Same households who have large MPC out of 2001 tax rebate do not respond to (larger) distributions from Alaskan Permanent Fund
Size-asymmetry of responses (Hsieh)

Same households who have large MPC out of 2001 tax rebate do not respond to (larger) distributions from Alaskan Permanent Fund.

Larger rebate ⇒ more adjustment ⇒ lower consumption response
Conclusions

- Baumol-Tobin model of money demand integrated into a lifecycle incomplete markets framework

- Generates *wealthy hand-to-mouth* consumers

  Microfoundation for Campbell-Mankiw spender-saver model

- Model capable of responses to fiscal stimulus payments that are: (i) large; (ii) heterogeneous; and (iii) size-asymmetric

- Model displays strong non-linearities in the aggregate
## Liquid and illiquid wealth in SCF 2001

<table>
<thead>
<tr>
<th></th>
<th>50th pct</th>
<th>Mean</th>
<th>Fraction Positive</th>
<th>After-Tax Real Return</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Earnings + benefits (22-59)</strong></td>
<td>41,000</td>
<td>52,745</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td><strong>Net worth</strong></td>
<td>62,441</td>
<td>150,411</td>
<td>0.95</td>
<td>1.8</td>
</tr>
<tr>
<td><strong>Net liquid wealth</strong></td>
<td>2,630</td>
<td>31,001</td>
<td>0.77</td>
<td>-1.5</td>
</tr>
<tr>
<td>Cash, checking, saving, MM</td>
<td>2,816</td>
<td>12,456</td>
<td>0.87</td>
<td>-2.0</td>
</tr>
<tr>
<td>MF, stocks, bonds, T-Bills</td>
<td>0</td>
<td>19,935</td>
<td>0.28</td>
<td>1.9</td>
</tr>
<tr>
<td>Revolving credit card debt</td>
<td>0</td>
<td>1,617</td>
<td>0.20</td>
<td>–</td>
</tr>
<tr>
<td><strong>Net illiquid wealth</strong></td>
<td>54,600</td>
<td>119,409</td>
<td>0.93</td>
<td>2.3</td>
</tr>
<tr>
<td><strong>Housing net of mortgage debt</strong></td>
<td>31,000</td>
<td>72,592</td>
<td>0.68</td>
<td>2.0</td>
</tr>
<tr>
<td>Retirement accounts</td>
<td>950</td>
<td>34,455</td>
<td>0.53</td>
<td>3.8 x 1.35</td>
</tr>
<tr>
<td>Life insurance</td>
<td>0</td>
<td>7,740</td>
<td>0.27</td>
<td>0.4</td>
</tr>
<tr>
<td>Certificates of deposit</td>
<td>0</td>
<td>3,807</td>
<td>0.14</td>
<td>1.2</td>
</tr>
<tr>
<td>Saving bonds</td>
<td>0</td>
<td>815</td>
<td>0.17</td>
<td>0.4</td>
</tr>
</tbody>
</table>