Today

Introduce two asset problem, liquidity constraints:

- Motivated by housing
- Allows for liquidity constraints to affect wider population than very poor
- Heterogeneity in non-liquid wealth introduces heterogeneity in MPC
- Key: Invest in illiquid, high returning asset and consume all income each period, generating high MPC out of transitory shocks

Today

- Based on recent work by Kaplan Violante, revival of older work by Baumol Tobin
- Quick review empirical facts
- Simple 3-period model
- Full lifecycle model

Examples of MPC Estimates

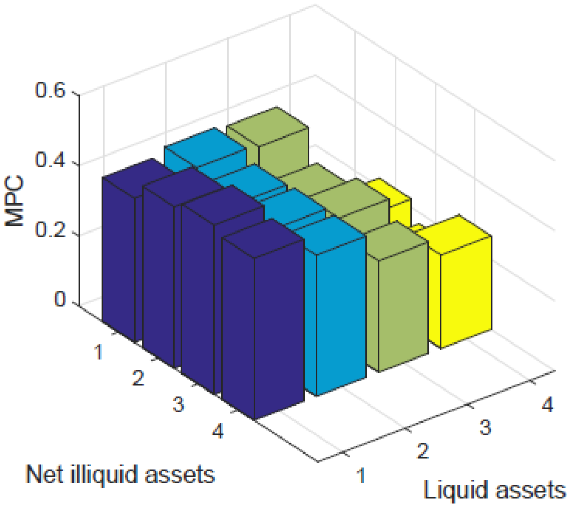
TABLE I

ESTIMATES OF THE 2001 REBATE COEFFICIENT ($\hat{\beta}_2$)[a]

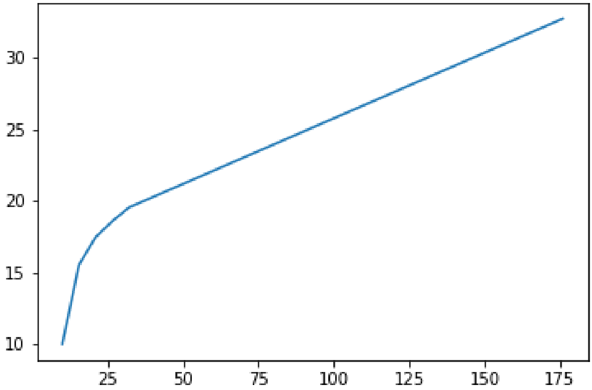
	Nondurables
JPS 2006, 2SLS ($N = 13{,}066$)	0.375 (0.136)
Trim top & bottom 0.5%, 2SLS ($N = 12{,}935$)	0.237 (0.093)
Trim top & bottom 1.5%, 2SLS ($N = 12{,}679$)	0.219 (0.079)
MS 2011, IVQR ($N = 13{,}066$)	0.244 (0.057)

[a]Nondurables include food (at home and away), utilities, household operations, public transportation and gas, personal care, alcohol and tobacco, miscellaneous goods, apparel good and services, reading materials, and out-of-pocket health care expenditures. JPS 2006: Johnson, Parker, and Souleles (2006); MS 2011: Misra and Surico (2011). 2SLS: Two-Stage Least Squares; IVQR: Instrumental Variable Quantile Regression.

Fagereng Holm Natvik 2016



Where we see high MPC in standard model



Wealthy-Hand-to-Mouth

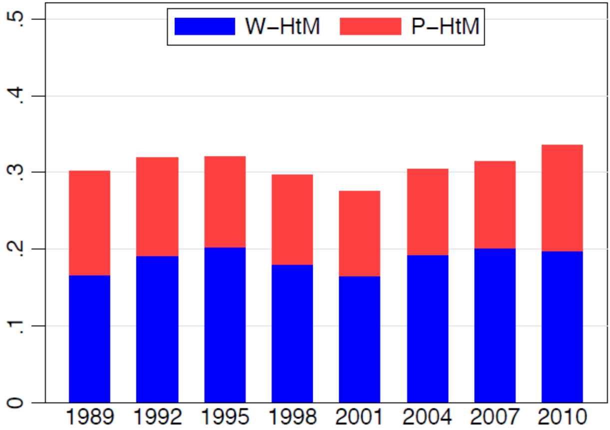
- Class of households with high total but low liquid wealth
- High return, illiquid assets that generate trade-off between better consumption smoothing (liquid wealth) and higher lifetime consumption (illiquid wealth)
- Why don't households smooth consumption:
  - High opportunity costs for holding liquid wealth
  - High transaction costs for adjusting illiquid wealth
  - High borrowing costs
- Two types of constraints:
  - Traditional borrowing constraint ($a > -b$)
  - Non-negative liquid wealth constraint ($m > 0$)

Three types of households

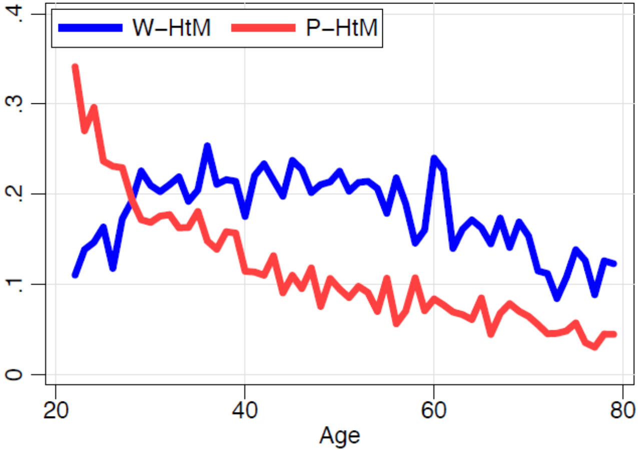
Kaplan Violante Weidner (2014):

1. Poor-hand-to-mouth: ($a = 0$, $0 \leq m < y/2$)
2. Wealthy-hand-to-mouth: ($a > 0$, $0 \leq m < y/2$)
3. Non-hand-to-mouth: ($a > 0$, $y/2 \leq m$)

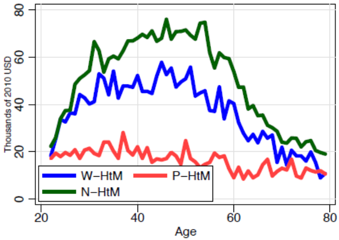
HtM Share



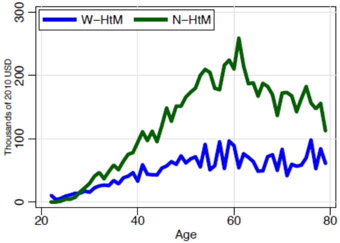
HtM by Age



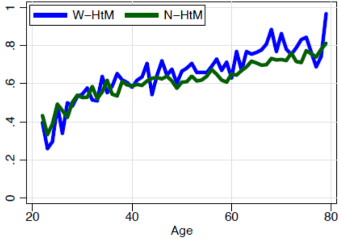
Comparison across types



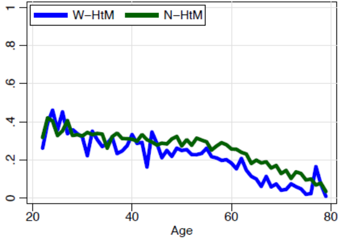
(a) Median income



(b) Median illiquid wealth

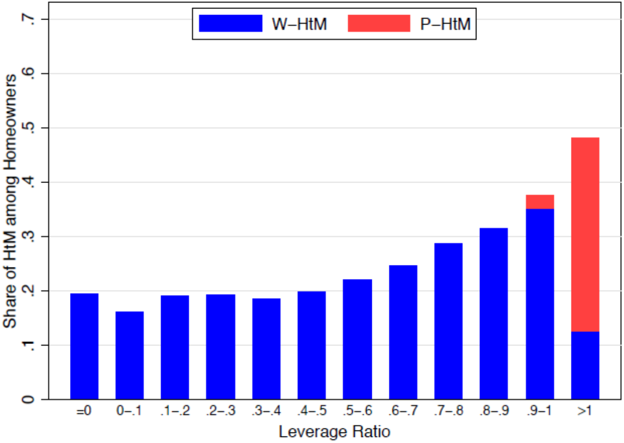


(c) Portfolio share: housing



(d) Portfolio share: retirement accounts

HtM and Housing Leverage



Simple Model

- Preferences over two period consumption, no discounting
- Initial endowment $\omega = 1$
- Two assets:
  - Illiquid asset paying $R > 1$, can't be accessed before period 2
  - Liquid asset paying return 1
  - No borrowing
- Receive deterministic income y_1 after portfolio choice is made, deterministic y_2 in second period.
  - $y_2 = \Gamma > 1$
  - $y_1 \in \{0, R + \Gamma\}$
- $c_1 < m_1 + y_1$, $c_2 = m_2 + Ra_1 + y_2$.
- Utility is CRRA, ies parameter σ
- Hand-to-mouth
  - Poor-HtM: $m_2 = 0$, $a = 0$
  - Wealthy-HtM: $m_2 = 0$, $a > 0$
  - Non-HtM: $m_2 > 0$, $a > 0$

Solution: No Illiquid Asset

$$v_1(m_1) = \max u(x_1) + u(m_2 + \Gamma)$$
$$s.t. \;\; c_1 + m_2 = y_1 + m_1$$
$$m_2 \geq 0$$

Solution:

$$m_2 = \max\{\frac{y_1 - \Gamma + m_1}{2}, 0\}$$

- Two cases depending on income path:
  - If y_1 is high, interior solution: $c_1 = c_2 = (y_1 + \Gamma + m_1)/2$
  - If y_1 is low, corner solution ($m_2 = 0$): $c_1 = y_1 + m_1$, $c_2 = \Gamma$

Solution: Illiquid Asset

$$
\begin{aligned}
v_1(m_1, a) = \max_{c_1, m_2} & \; u(c_1) + u(m_2 + Ra + \Gamma) \\
s.t. \;\; & c_1 + m_2 = y_1 + m_1 \\
& m_2 \geq 0
\end{aligned}
$$

Solution:

$$
m_2 = \max\{\frac{y_1 - \Gamma + m_1 - Ra}{2}, 0\}
$$

- Two cases depending on income path:
  - If y_1 is high, interior solution ($m_2 > 0$): $c_1 = c_2 = (y_1 + \Gamma + m_1 + Ra)/2$
  - If y_1 is low, corner solution ($m_2 = 0$): $c_1 = y_1 + m_1$, $c_2 = \Gamma + Ra$

Solution: Illiquid Asset

If y_1 is high:

$$v_0 = \max_{a,m_1} u((y_1 + \Gamma + m_1 + Ra)/2)$$
$$s.t. \;\; 1 = a + m_1$$

- Invest all assets in illiquid asset because $R > 1$
- $c_1 = c_2 = (y_1 + \Gamma + R)/2$
- Not HtM

Solution: Illiquid Asset

If y_1 is low:

$$v_0 = \max_{a,m_1} u(m_1) + U(Ra + \Gamma)$$
$$s.t. \ \ 1 = a + m_1$$

which has the solution

$$a = \max\{\frac{R^\sigma - \Gamma}{R + R^\sigma}, 0\}$$
$$m_1 = \min\{\frac{R^\sigma + \Gamma}{R + R^\sigma}, 1\}$$

- Thus, $m_1 > 0$ always
- If $R < \Gamma^{1/\sigma}$, then $a = 0$, and household is poor HtM
- If $R > \Gamma^{1/\sigma}$, then wealthy HtM with consumption $c_1 = (R + \Gamma)/(R + R^\sigma)$ and $c_2 = R^\sigma c_1 > \Gamma c_1$

Solution: Illiquid Asset

Thus, model can deliver all three types of consumers:

- Non-HtM if income is high
- Poor HtM if income is low and $R < \Gamma^{1/\sigma}$
- Wealthy HtM if income is low and $R > \Gamma^{1/\sigma}$

Forces in determining wealthy vs. poor HtM:

- R - makes investment in illiquid asset more attractive, more willing to not smooth consumption
- Γ - Reduces the role of the illiquid asset as a saving instrument, since the slope of the income profile makes later returns less valued
- σ - the more the household is willing to accept consumption fluctuations across periods, and the more likely it is to become wealthy HtM rather than poor HtM.

MPC - Illiquid Asset

Three types of consumers have different MPCs at time 1. Suppose at time 1 households receives increase in m_1 of ϵ:

- Non-HtM : MPC=.5
- Poor HtM:

$$c_1 + m_2 = \epsilon + 1$$
$$m_2 = \{(\epsilon + 1 - \Gamma)/2, 0\}$$
$$c_1 = \begin{cases} \epsilon + 1 \;\; if \;\; \epsilon < \Gamma - 1 \\ (\epsilon + 1 + \Gamma)/2 \;\; if \; otherwise \end{cases}$$

- Wealthy HtM:

$$c_1 + m_2 = \epsilon + 1$$
$$m_2 = max\{(\epsilon + 1 - R(R - \Gamma)/(R + R^\sigma) - \Gamma)/2, 0\}$$
$$c_1 = \begin{cases} \epsilon + 1 \; if \; \epsilon < R(R - \Gamma)/(R + R^\sigma) + \Gamma - 1 \\ (\epsilon + 1 + R(R - \Gamma)/(R + R^\sigma) + \Gamma)/2 \;\; otherwise \end{cases}$$

Full model

Structural model to study consumption response to fiscal stimulus payments:

- Baumol-Tobin meets life cycle
- Incomplete markets framework, two assets
  1. Liquid asset with borrowing
  2. Illiquid asset with transaction cost that offers higher return, consumption value (i.e., housing)
- Model generates wealthy hand-to-mouth households, improves model of fiscal policy
- Consistent with MPC estimates

Model

- Demographics: No uncertainty, household works for J^{work} periods, retires for J^{ret} periods
- Preferences: CES over housing and consumption:

$$V_{i,j}^{1-\sigma} = \left(c_{i,j}^{\phi} s_{i,j}^{1-\phi}\right)^{1-\sigma} + \beta \mathbb{E}\left[V_{i,j+1}^{1-\gamma}\right]^{\frac{1-\sigma}{1-\gamma}}$$

- Endowed with earnings (standard)
- Government: taxes income progressively, consumption linearly, runs a progressive SS system and balances budget

Model

- Assets:
  - Liquid asset $m_{i,j}$ with borrowing constraint $\bar{m}$ and return $R^m_+ = 1/q^m_+$ if m positive, $R^m_- = 1/q^m_-$ if m negative, where $R^m_+ < R^m_-$
  - Illiquid asset $a_{i,j}$ with no borrowing constraint, return $R^a = 1/q^a > R^m_+$
  - Transaction cost κ if $a_{i,j} \neq a_{i,j+1}$
- Housing: $s_{i,j} = h_{i,j} + \zeta a_{i,j}$ = purchases of housing services+ flow from housing stock
- $a_{i,0}$, $m_{i,0}$ exogenous
- Only risk is income!

Model

$$V_j(a_j, m_j, y_j) = \max\left[V_j^N(a_j, m_j, y_j), V_j^A(a_j, m_j, y_j)\right]$$

where

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

$$s.t.$$

$$c_j + h_j + q^m m_{j+1} \leq +m_j + y_j - T()$$

$$s_j = h_j + \zeta a_{j+1}$$

$$a_{j+1} \geq 0, m_{j+1} \geq -\bar{m}$$

and

Model

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

$$s.t.$$

$$c_j + h_j + q^a a_{j+1} + q^m m_{j+1} \leq a_j + m_j - \kappa + y_j - T()$$

$$s_j = h_j + \zeta a_{j+1}$$

$$a_{j+1} \geq 0, m_{j+1} \geq -\bar{m}$$

Two Euler Equations

Short run Euler equation:

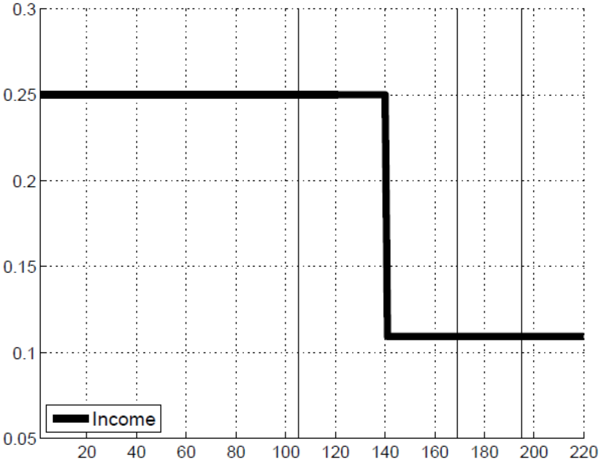
$$u'(c_j) = \beta R(m_{j+1}) u'(c_{j+1})$$

Long run Euler equation:

$$u'(c_j) = (\beta R^a)^N u'(c_{j+N})$$

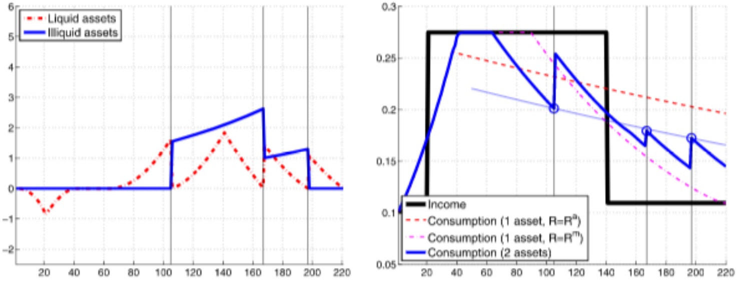
Wedge in long run Euler equation induced by κ.

Example


0.3
0.25
0.2
0.15
0.1
0.05
20
40
60
80
100
120
140
160
180
200
220
Income

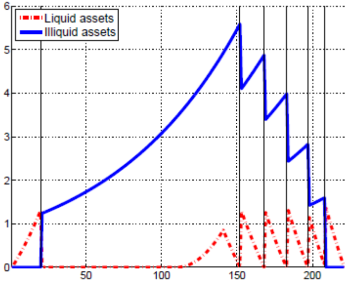
Example

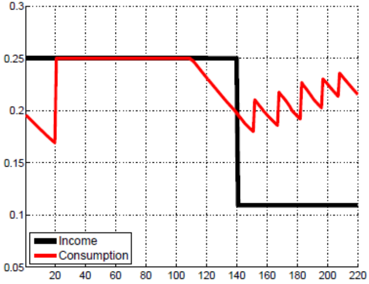
If return on illiquid asset is low:



Example- W HtM

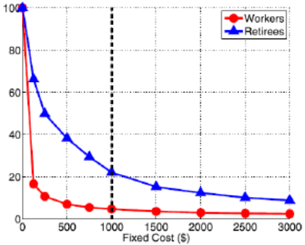
If return on illiquid asset is high



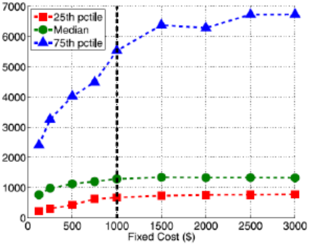


- Agent features endogenous hand to mouth behavior
- Consumes the rebate check and does not respond to the news
- Small welfare gain of smoothing vs κ and $R^a - R^m$
  Cochrane (1989)

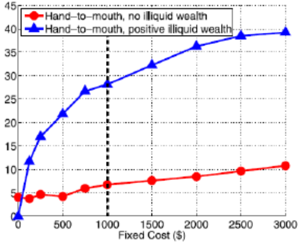
Adjustment cost



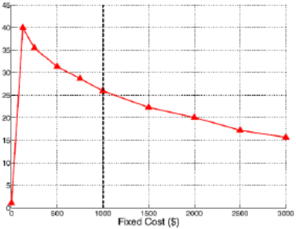
(a) Percentage of households adjusting



(b) Distribution of liquid wealth ($)



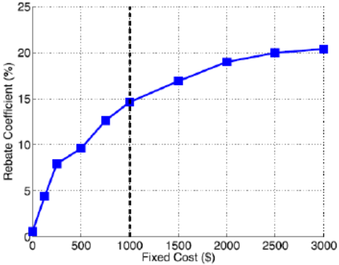
(c) Percentage of HtM households



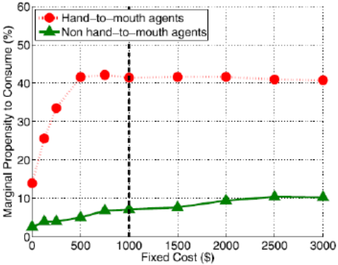
(d) Percentage of borrowers

Non-HtM vs. HtM

CONSUMPTION RESPONSE TO FISCAL STIMULUS PAYMENTS 1225



(a) Rebate coefficient



(b) Average marginal prop. to consume

Timing

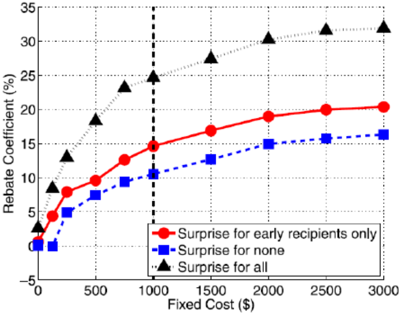
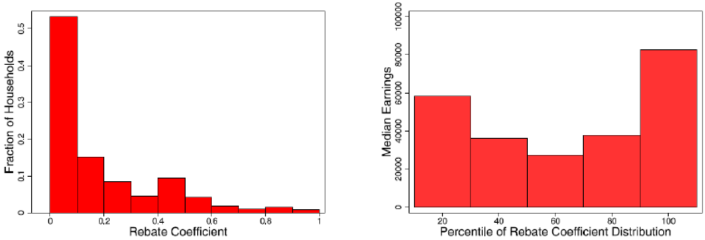


FIGURE 6.—Rebate coefficients under alternative assumptions on timing of arrival of news.

Distribution of MPC



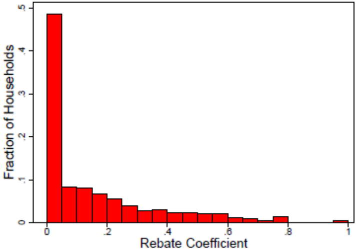
(a) Distribution of rebate coefficients in the population

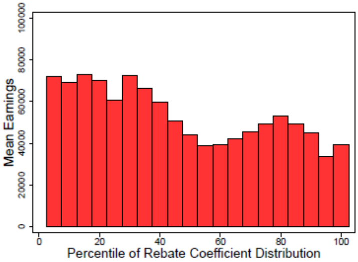
(b) Median earnings by quintile of rebate coefficient distribution

FIGURE 7.—Heterogeneity in rebate coefficients in the model ($\kappa = \$1{,}000$).

Distribution of MPC

Empirical (Misra Surico 2011):





Rebate Size

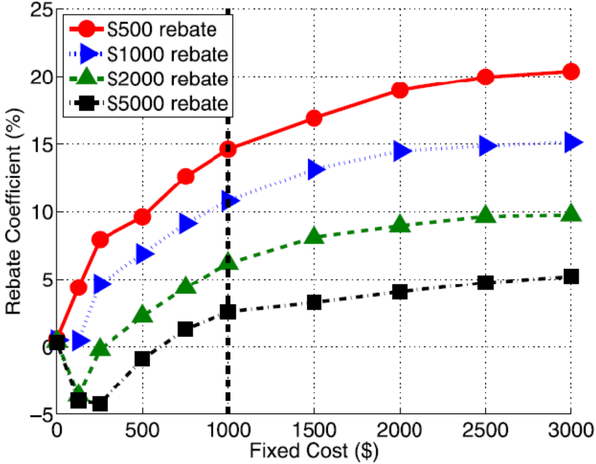


FIGURE 8.—Rebate coefficients by stimulus payment size.