A Model of the Consumption Response to Fiscal Stimulus Payments

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Direct cash transfers from government to households

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2. 2008: *Economic Stimulus Act* provided most households with payments of $300-$600 per adult and $300 per child.

3. 2001: *Economic Growth and Tax Relief Reconciliation Act* entitled taxpayers 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 about 20-40% of their stimulus payment on non-durable consumption in the quarter they receive it

⊛ Johnson-Parker-Souleles (2006,2009), Agarwal-Liu-Souleles (2007), Broda-Parker (2008), Shapiro-Slemrod (2003, 2008), Parker-Souleles-Johnson-McClelland (2011), Misra-Surico (2011)

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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

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  Consistent with SCF data

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  Consistent with SCF data
- Model's consumption response to tax rebate is $15\% - 30\%$

Outline of the talk

1. Micro evidence on consumption response to FSP
2. Lifecycle model with two assets and transaction costs
3. Evidence on households' holding of liquid and illiquid wealth
4. Results I: consumption response to FSP in model
5. Results II: other model implications

Outline

Evidence on consumption response to FSP

Lifecycle model with two assets

SCF evidence on liquid and illiquid wealth

Quantitative analysis

Additional Slides

The 2001 tax rebate

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

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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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$$C_{i,t+1} - C_{i,t} = \sum_s \beta_{0s} month_{s,i} + \beta_1' X_{i,t} + \beta_2 Rebate_{i,t+1} + u_{i,t+1}$$

$\mathbf{X_{i,t}}$: age, change in # of adults, change in # of children

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$\mathbf{X_{i,t}}$: 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

. . . not a MPC out of the rebate

Measuring the response to tax rebates

Estimates of Rebate Coefficient $\hat{\beta}_2$ for 2001 Tax Rebates

	Strictly Nondurable	Nondurable
JPS 2006, 2SLS ($N = 13,066$)	**0.202** (0.112)	**0.375** (0.136)
H 2008, 2SLS ($N = 12,710$)		**0.242** (0.106)
MS 2011, IVQR ($N = 13,066$)		**0.244** (0.057)

- $\hat{\beta}_2$ ranges between 20% and 40% for non-durable consumption
- More recent estimates put weight on lower end of 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

Model

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

Preferences: $\mathbb{E}_0 \sum_{j=0}^{J} \beta^j \frac{c_{ij}^{1-\gamma}-1}{1-\gamma}$

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 $m_{ij} \geq 0$ with return $R^m \equiv \frac{1}{q^m}$

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

Transactions Cost: fixed money, utility or time cost κ for each deposit into or withdrawal from illiquid account

Government: taxes income progressively, consumption linearly, runs a progressive SS system, and spends

respects intertemporal budget constraint

Model

$$V_j(a_j, m_j, z_j) = \max\left\{ V_j^N(a_j, m_j, z_j), V_j^A(a_j + m_j - \kappa^f, z_j) \right\}$$

Model

$$V_j(a_j, m_j, z_j) = \max\left\{ V_j^N(a_j, m_j, z_j), V_j^A(a_j + m_j, z_j) - \kappa^u \right\}$$

Model

$$V_j(a_j, m_j, z_j) = \max\left\{ V_j^N(a_j, m_j, z_j), V_j^A(a_j + m_j - \kappa^y y_j, z_j) \right\}$$

Model

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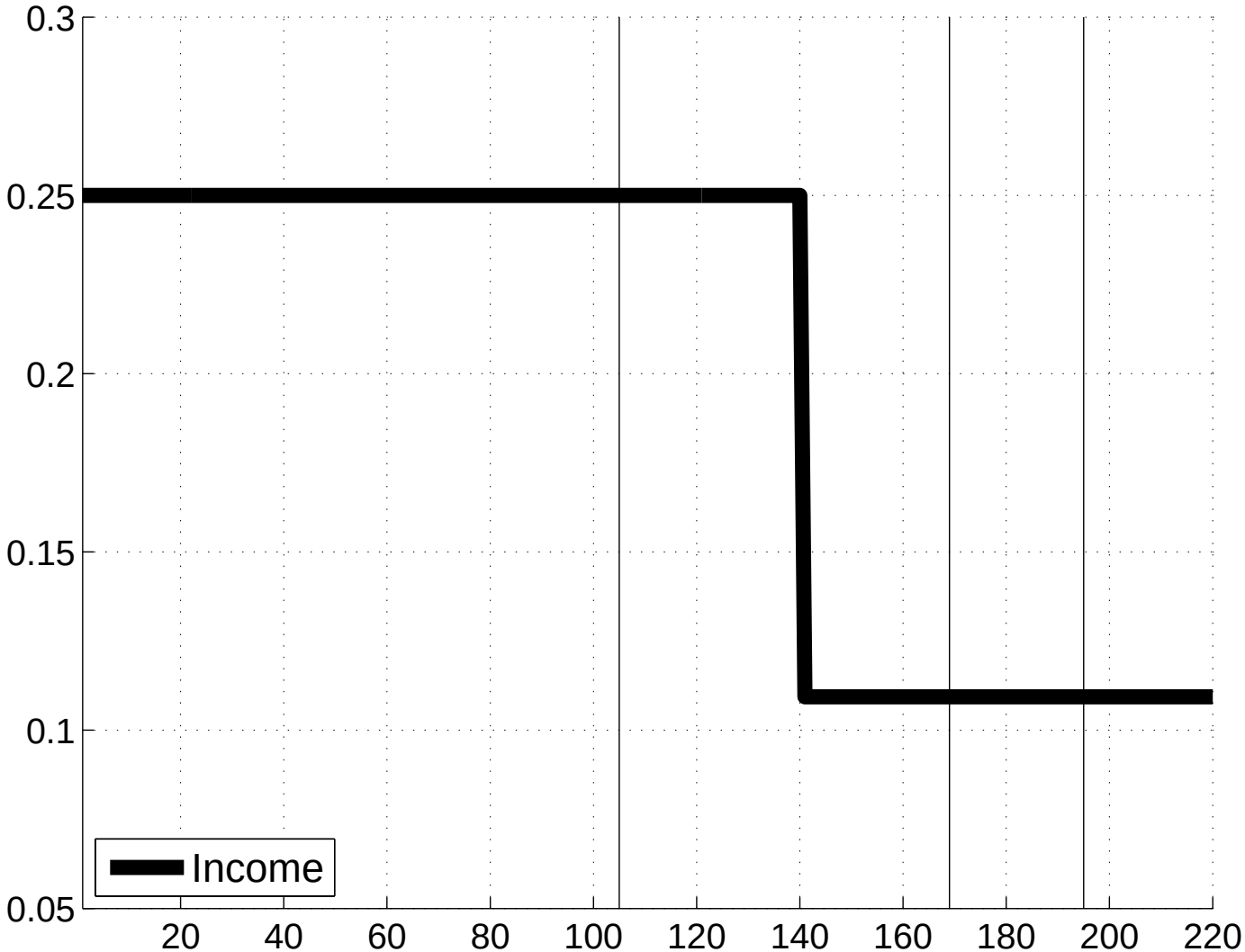
$$\begin{aligned} V_j^N(a_j, m_j, z_j) \quad = \quad & \max_{c_j, m_{j+1}} \{u(c_j) + \beta \mathbb{E} V_{j+1}(a_{j+1}, m_{j+1}, z_{j+1})\} \\ & \text{subject to} \\ & c_j + q^m m_{j+1} \leq m_j + y_j(z_j) - \mathcal{T}(y_j, a_j, m_j, c_j) \\ & q^a a_{j+1} = a_j \\ & m_{j+1} \geq 0 \end{aligned}$$

$$\begin{aligned} V_j^A(x_j, z_j) \quad = \quad & \max_{c_j, a_{j+1}, m_{j+1}} \{u(c_j) + \beta \mathbb{E} V_{j+1}(a_{j+1}, m_{j+1}, z_{j+1})\} \\ & \text{subject to} \\ & c_j + q^a a_{j+1} + q^m m_{j+1} \leq x_j + y_j(z_j) - \mathcal{T}(y_j, a_j, m_j, c_j) \\ & a_{j+1} \geq 0, m_{j+1} \geq 0 \end{aligned}$$

Example of two-asset economy



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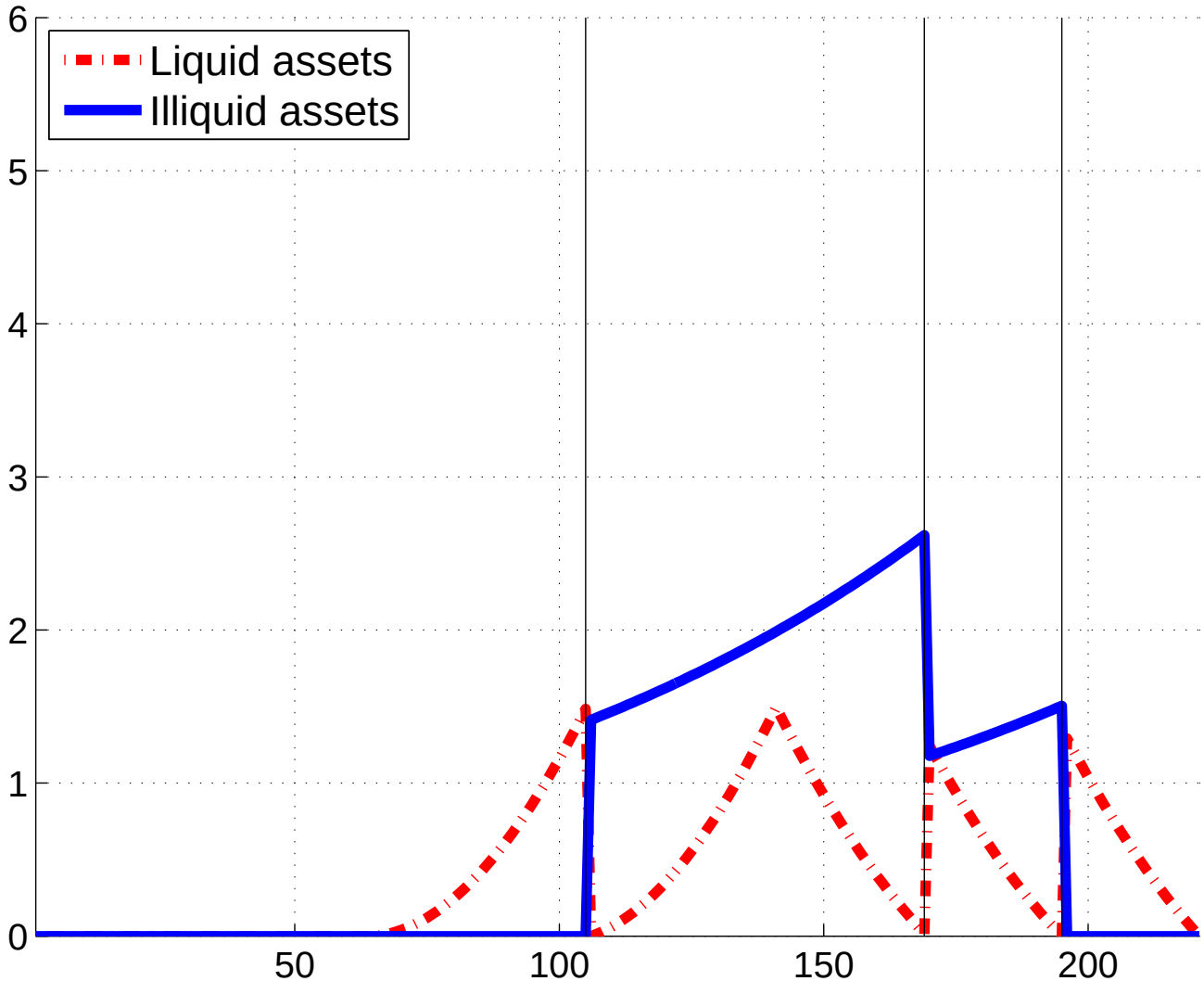

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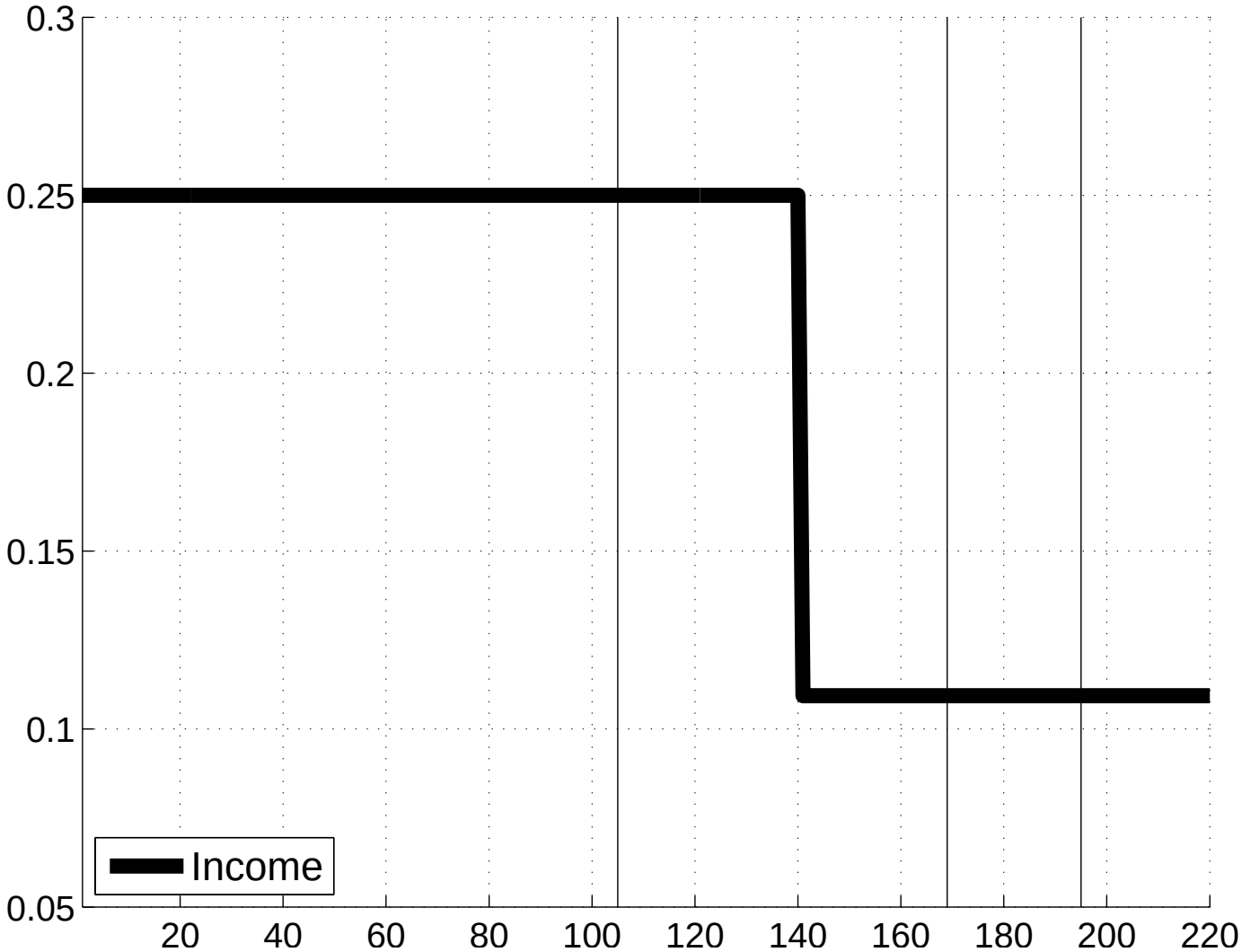

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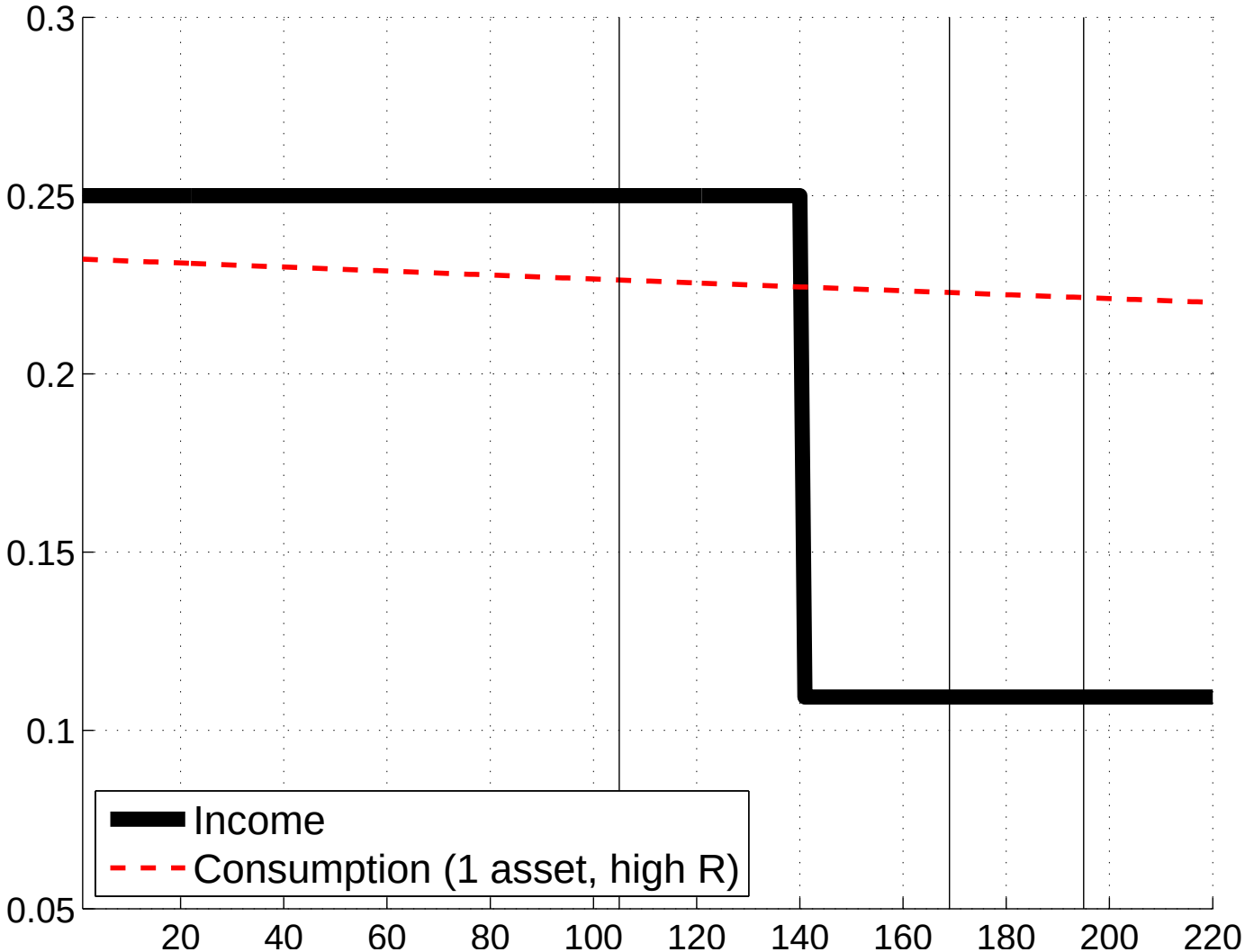

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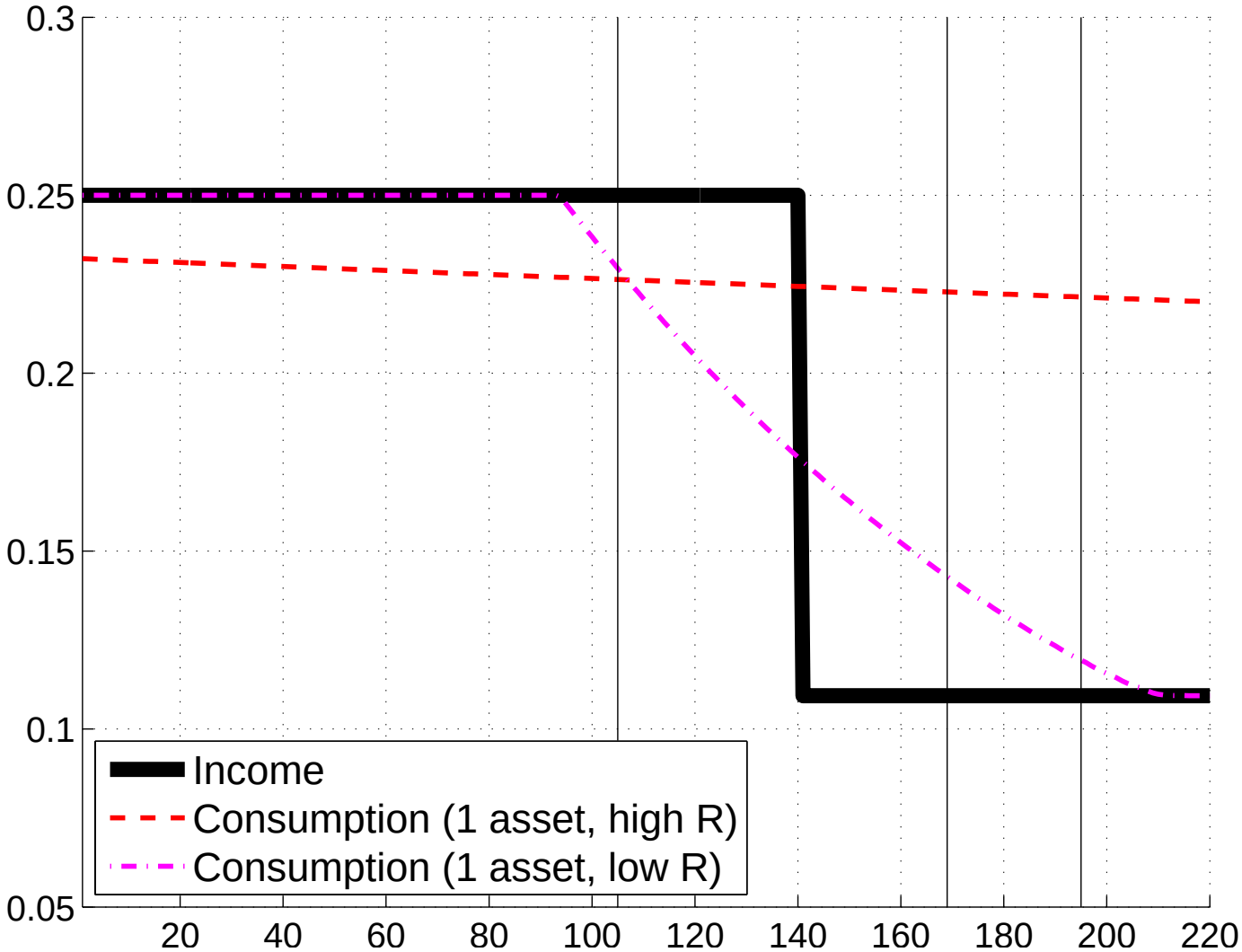

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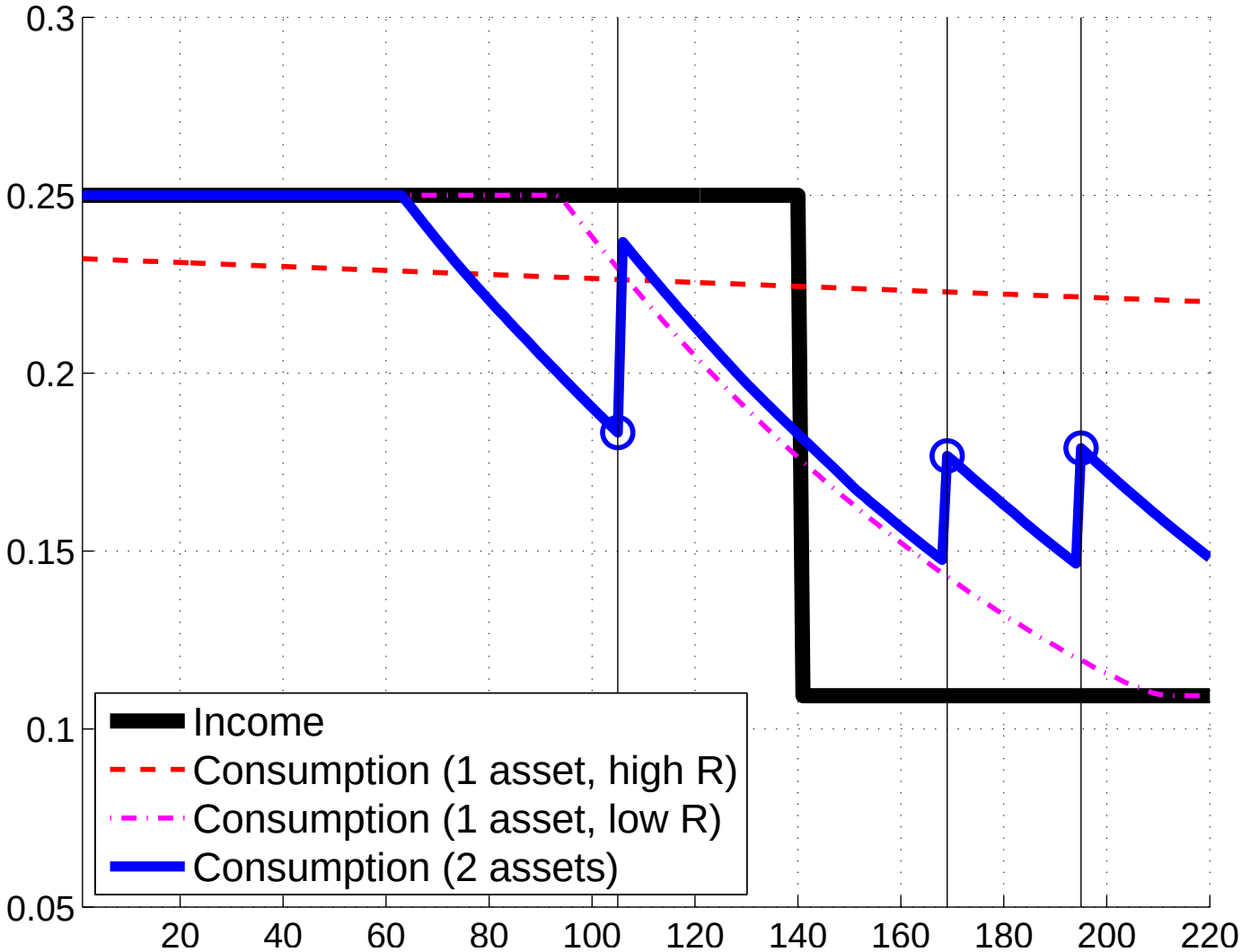

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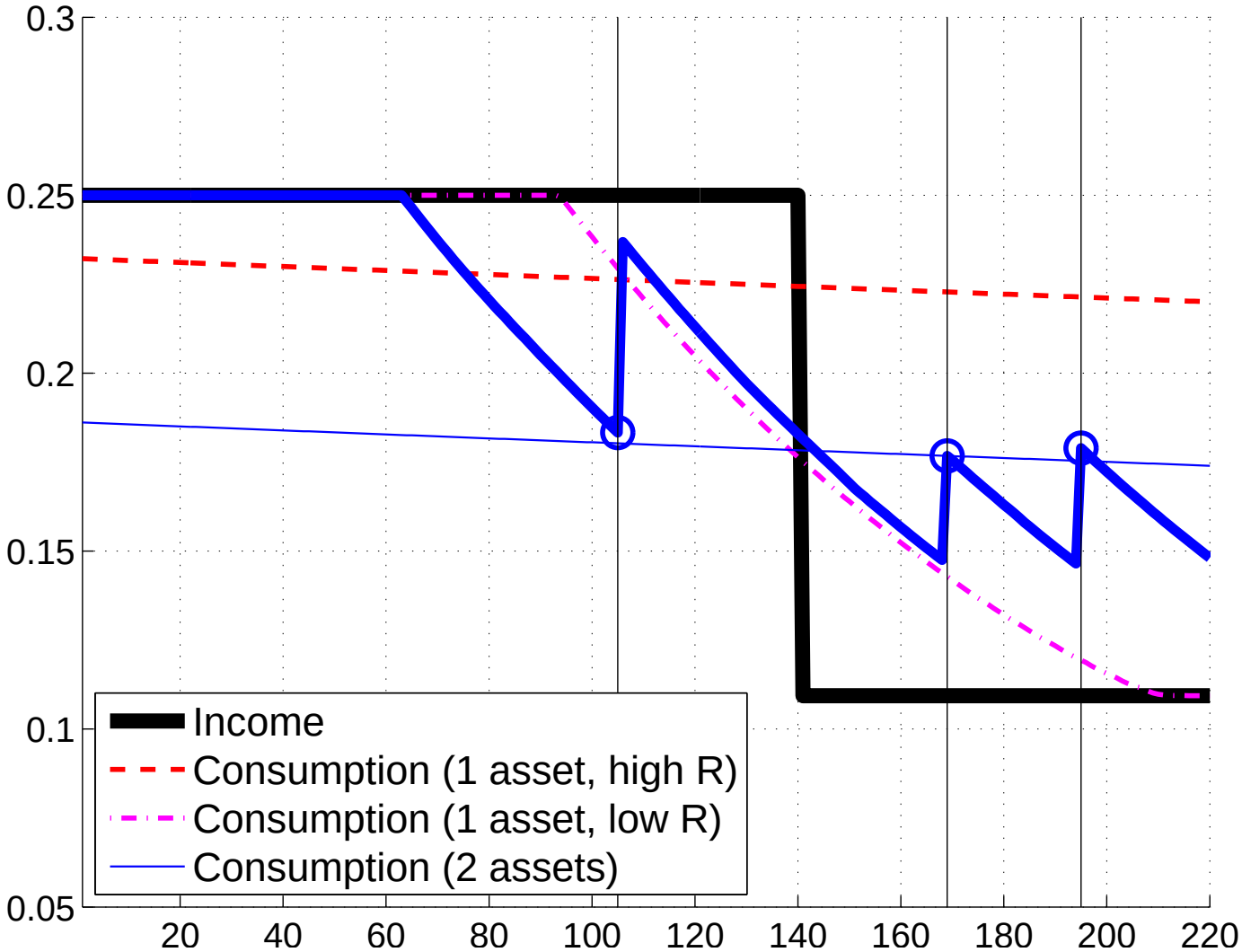
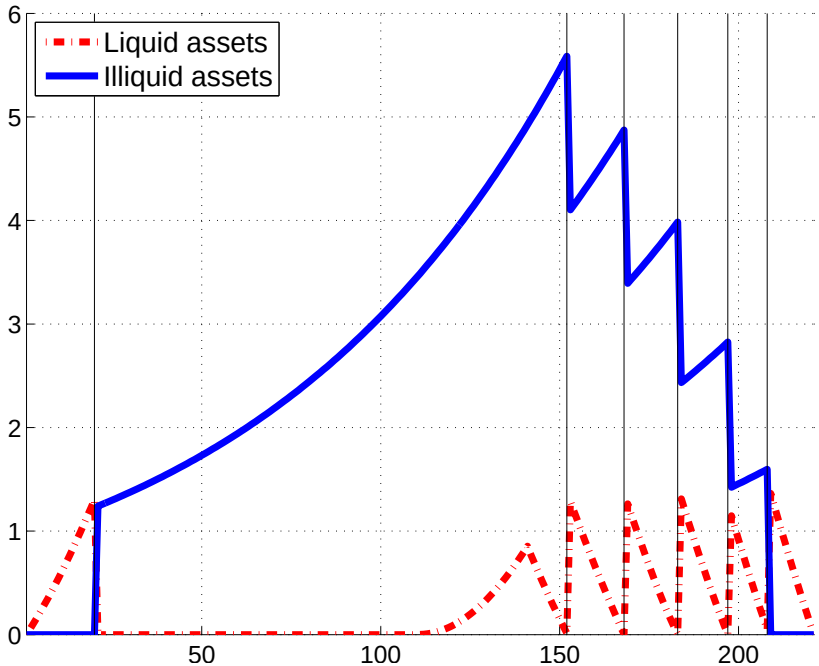
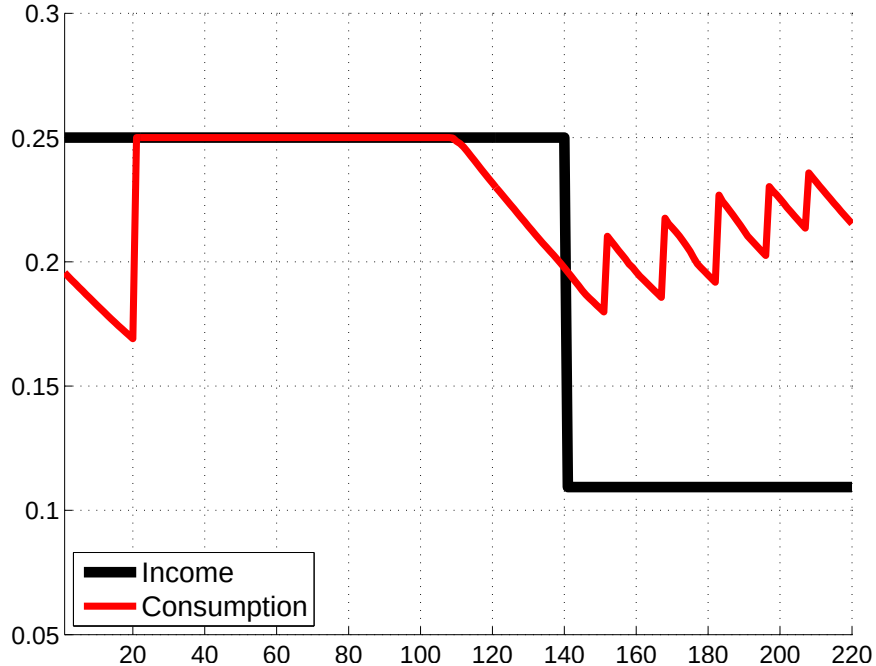


[Euler Equations]

A wealthy hand-to-mouth household





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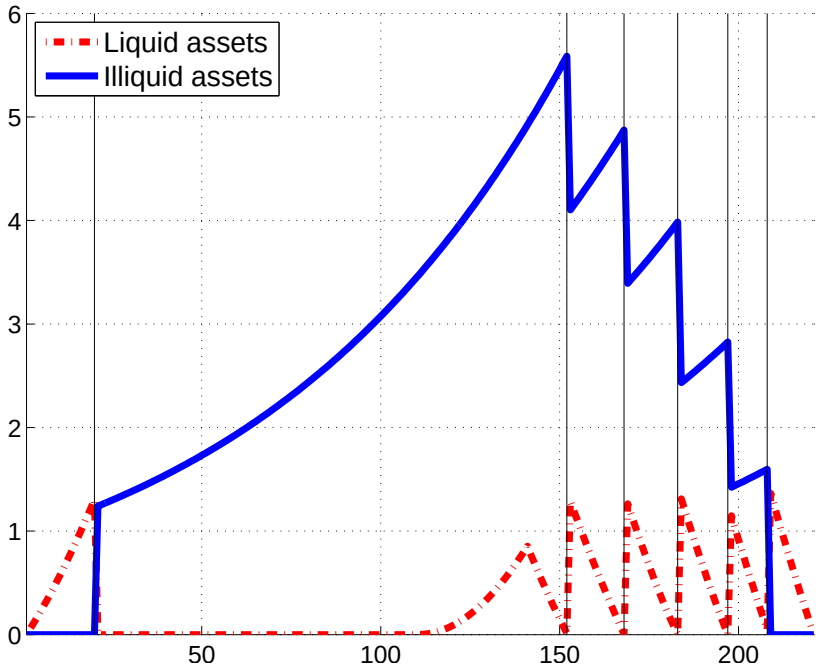

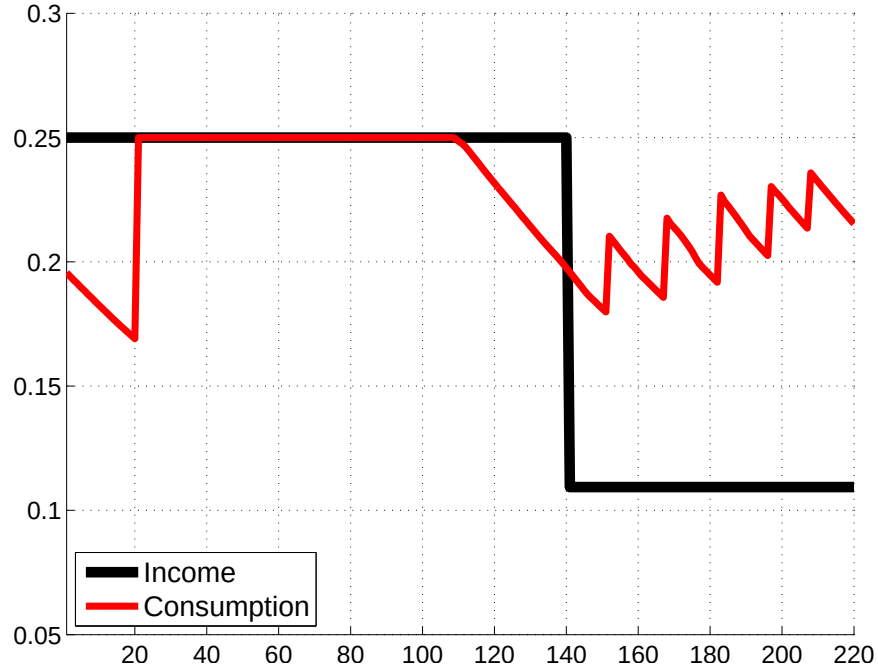

- Agent features endogenous hand to mouth behavior
- Consumes the rebate check and does not respond to the news
- Small welfare gain of smoothing vs κ and $R^a - R^m$
  Cochrane (1989)

Parametrization (quarterly model)

- Demographics: $J^{work} = 38$ years (22-59)
  $J^{ret} = 20$ years (60-79)
- Preferences: $\gamma = 1$ (log utility)
- Earnings: Method of moments estimator to match level and growth of earnings inequality over the life cycle
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- Set $\{R^m, R^a, \kappa, \beta\}$ from micro data on household portfolios

Outline

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

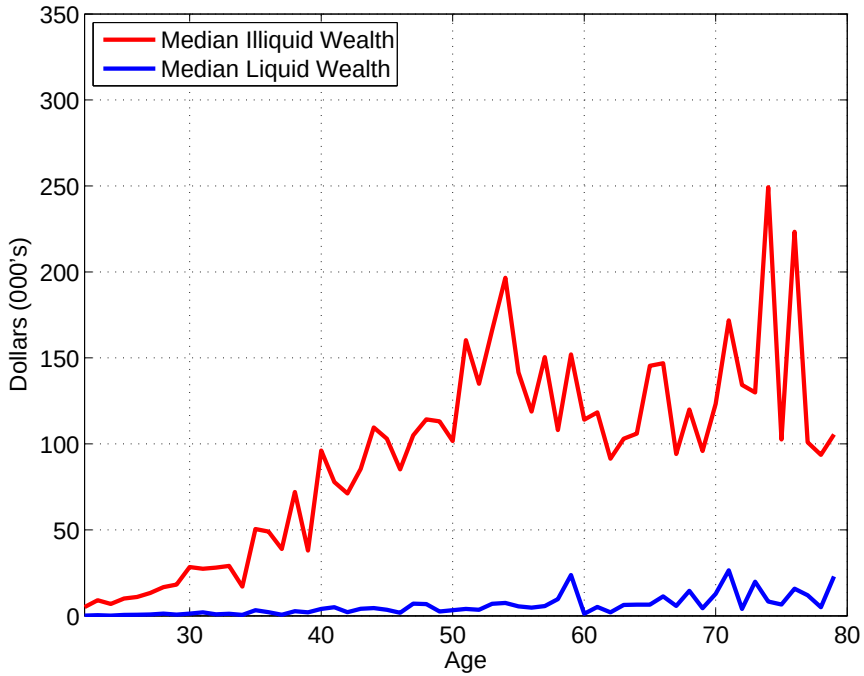
Liquid and illiquid wealth in SCF 2001

- Sample: all households 22+, except top 5% of distribution of net worth, to make SCF and CEX samples comparable
- Liquid assets: checking, savings, money market, directly held mutual funds, stocks and bonds and call accounts net of revolving debt on credit card balances ($2,700)
- Illiquid assets: net worth minus liquid assets ($70,000)
  - housing net of mortgages and other secured debt ($31,000)
  - vehicles net of installment loans ($11,000)
  - retirement accounts ($950)

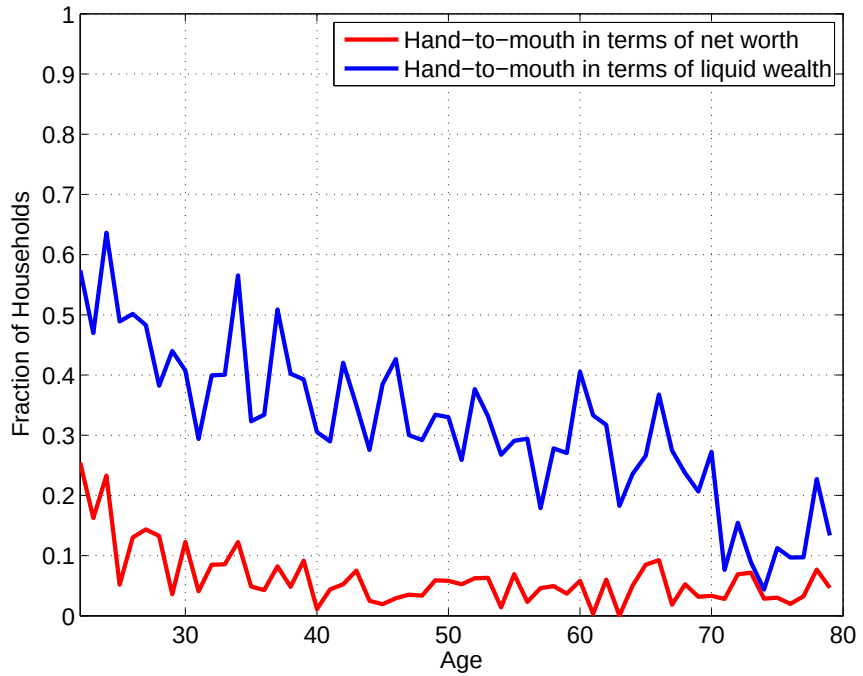
[wealth data]

Liquid and illiquid wealth over the lifecycle

Median wealth



Hand-to-mouth households



- Median liquid wealth: $\$2,700$. Median illiquid wealth: $\$70,000$
- 30% 'hand to mouth' in liquid wealth, vis-a-vis 6% in net worth

Liquid and illiquid wealth over the lifecycle

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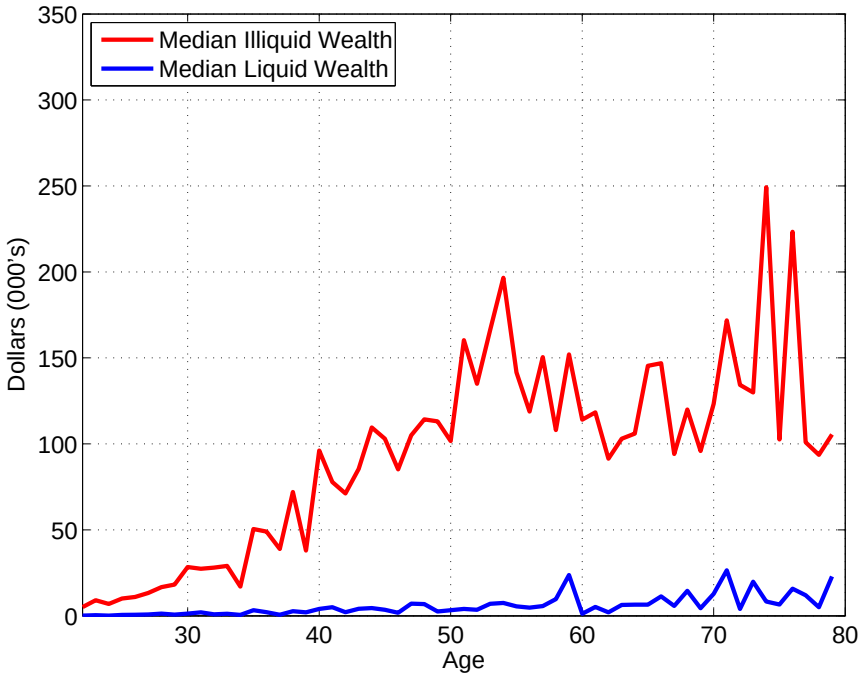

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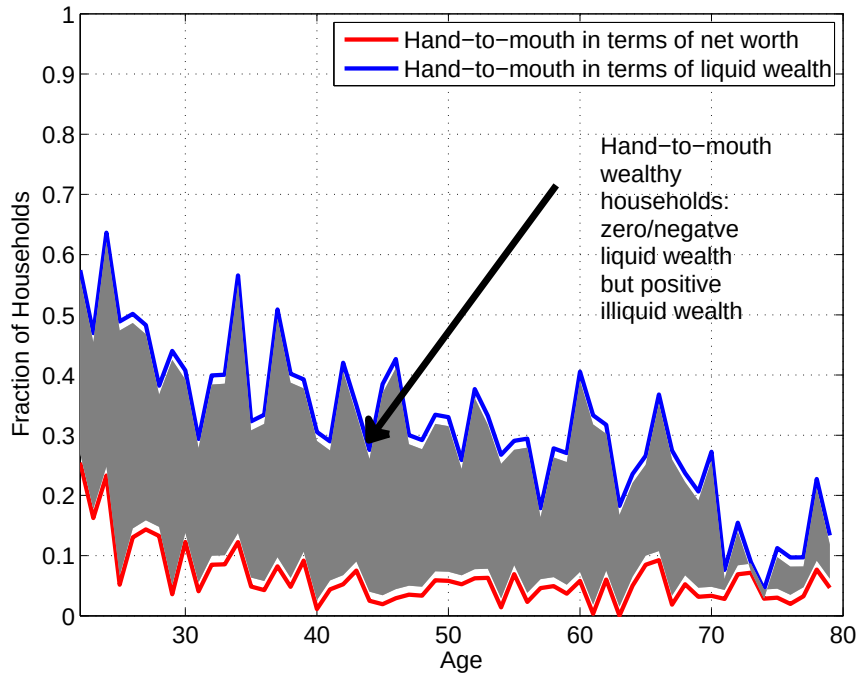

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Calibration (cont'd)

- Assets Returns:

  Illiquid asset After-tax real return $r^a = 6.2\%$

  Liquid asset After-tax real return $r^m = -1.1\%$

- Discount Factor β: Match median illiquid wealth of $\$70,000$
  $\Rightarrow 0.953$ (annualized)

- Transactions Cost κ: Broadly consistent with median liquid wealth, fractions of hand-to-mouth households, and frequency of adjustment $\Rightarrow \$500 - \$1,000$

[details of returns calibration]

Outline

Tax rebate experiment

- In quarter $t = 0$, govt announces all households will receive a tax rebate of \$500 paid out at $t = 0$ (group A) or $t = 1$ (group B)

- After 10 years, permanent additional proportional earnings tax

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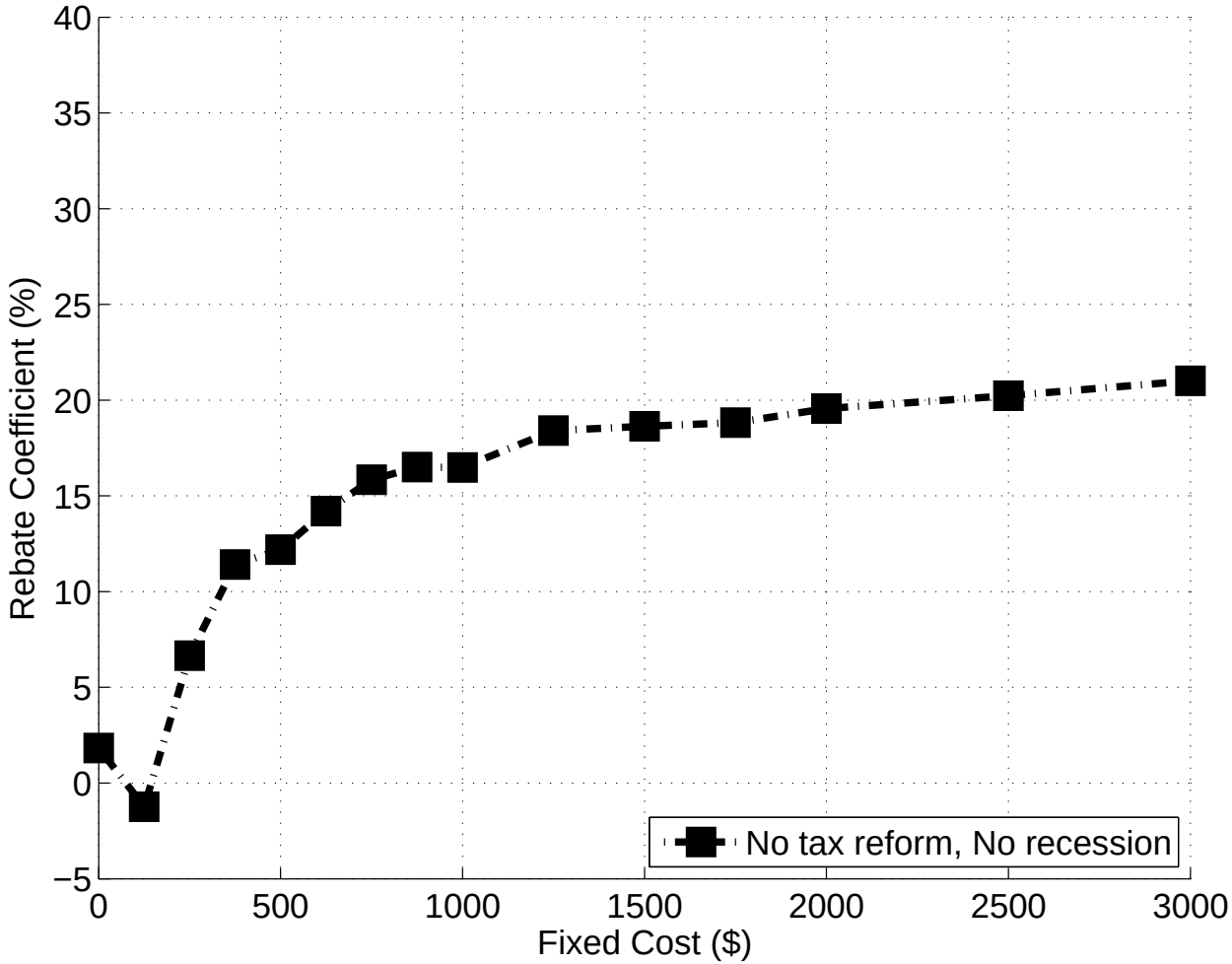
- Two key features of economic environment in 2001

  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 κ (2% in one-asset model)

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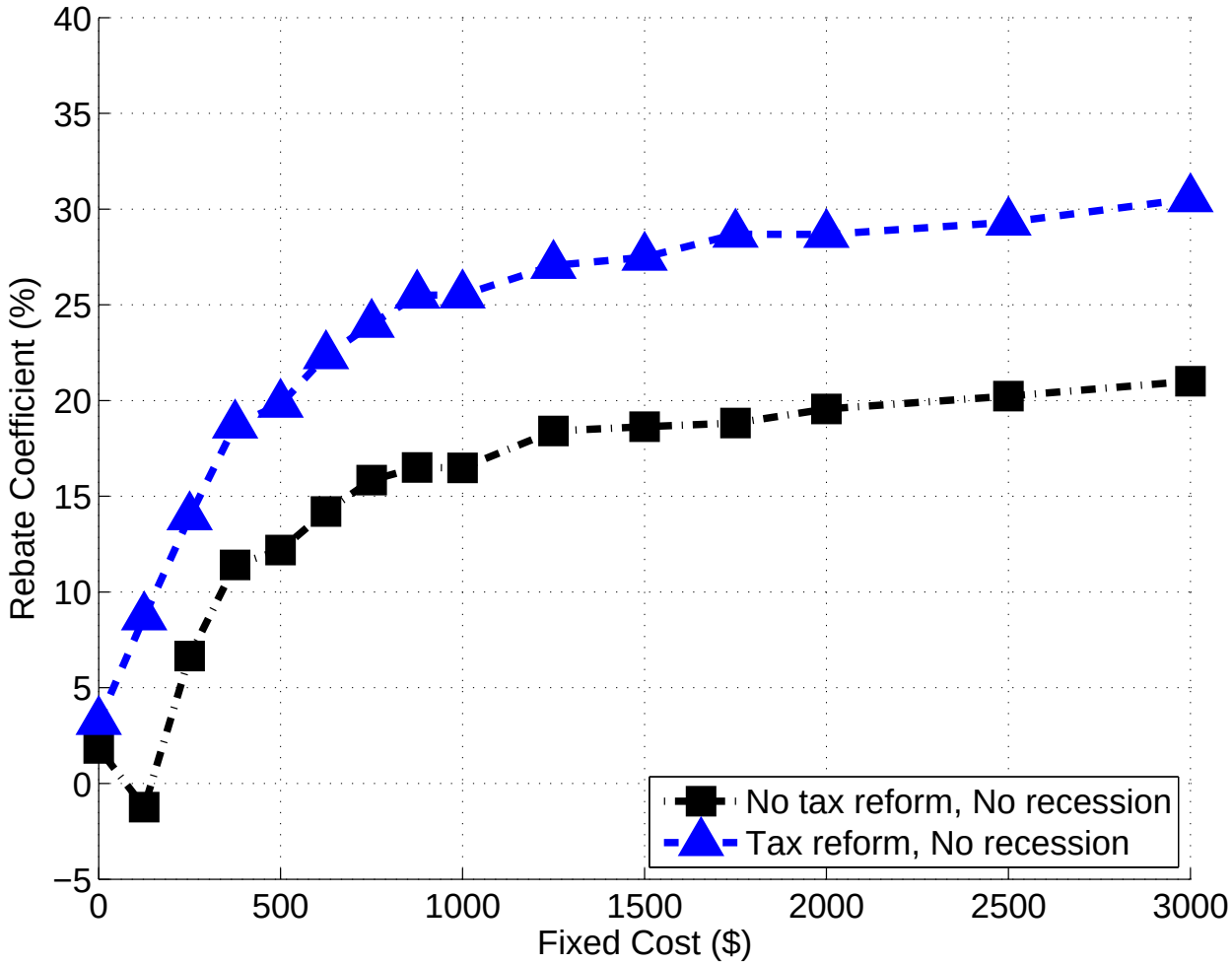

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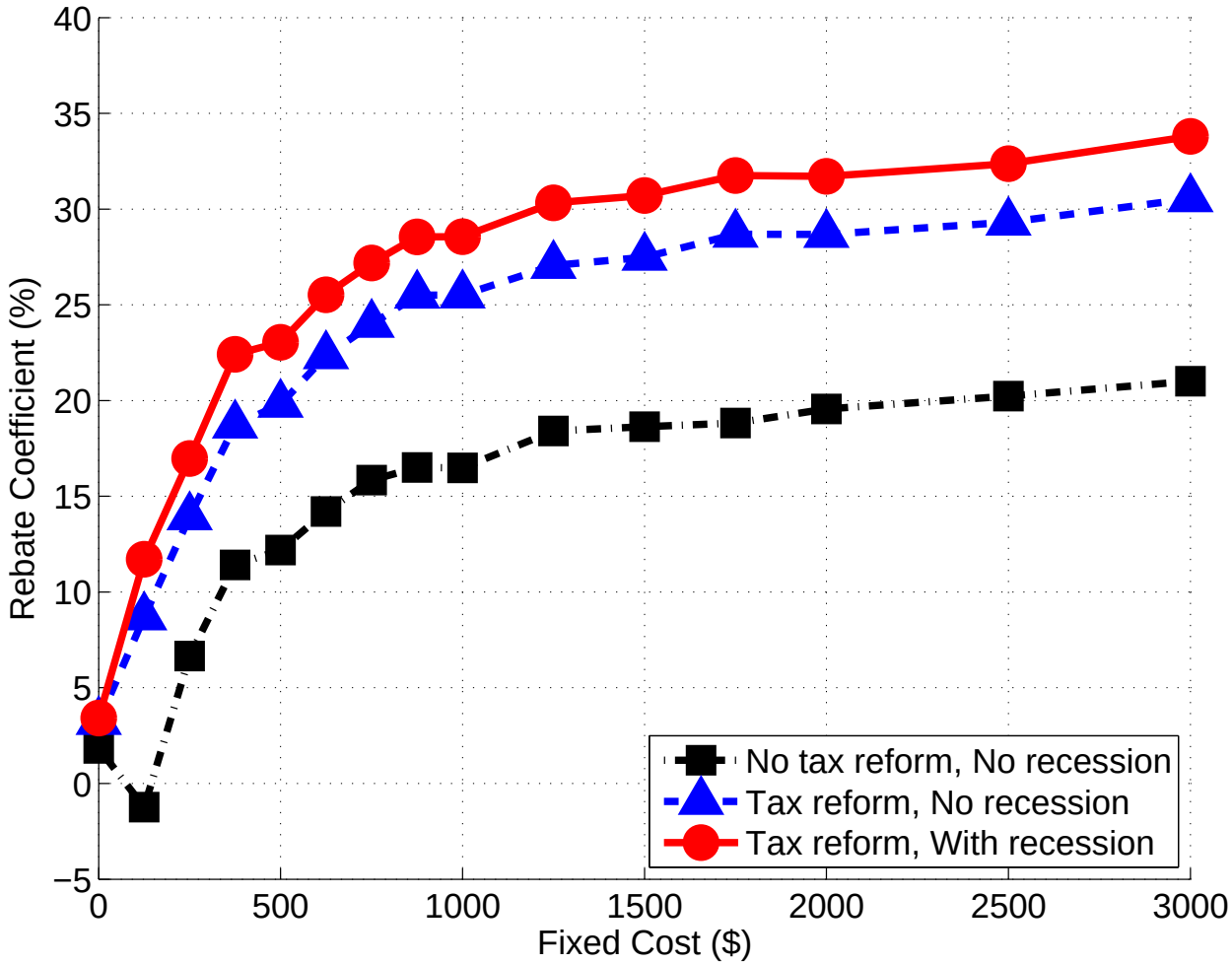

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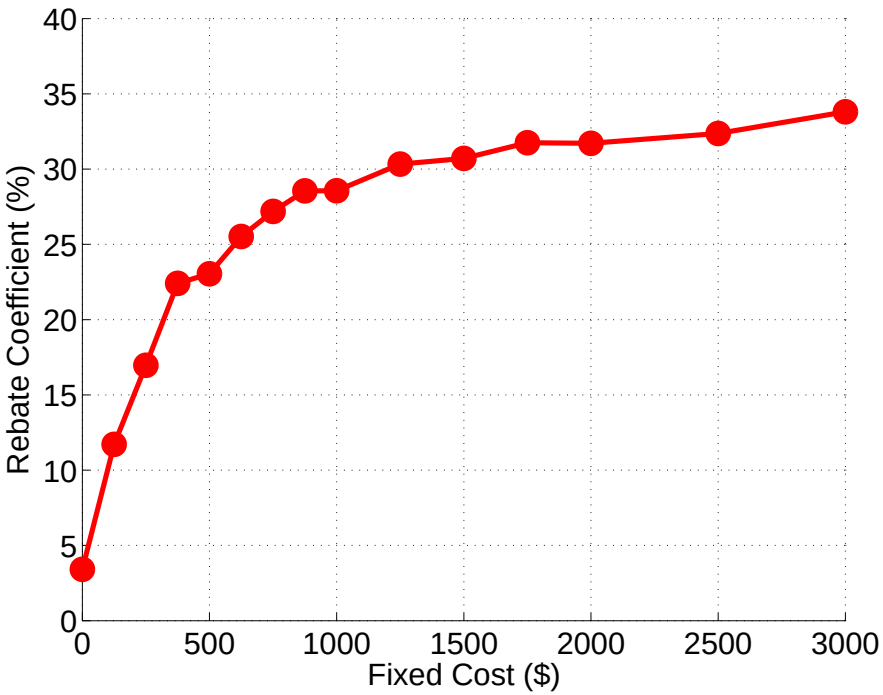
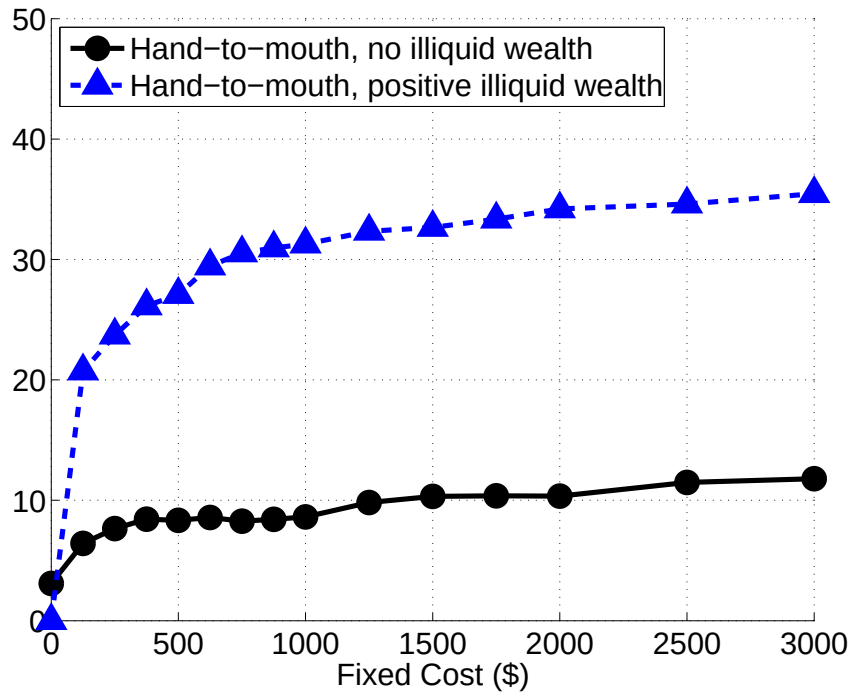
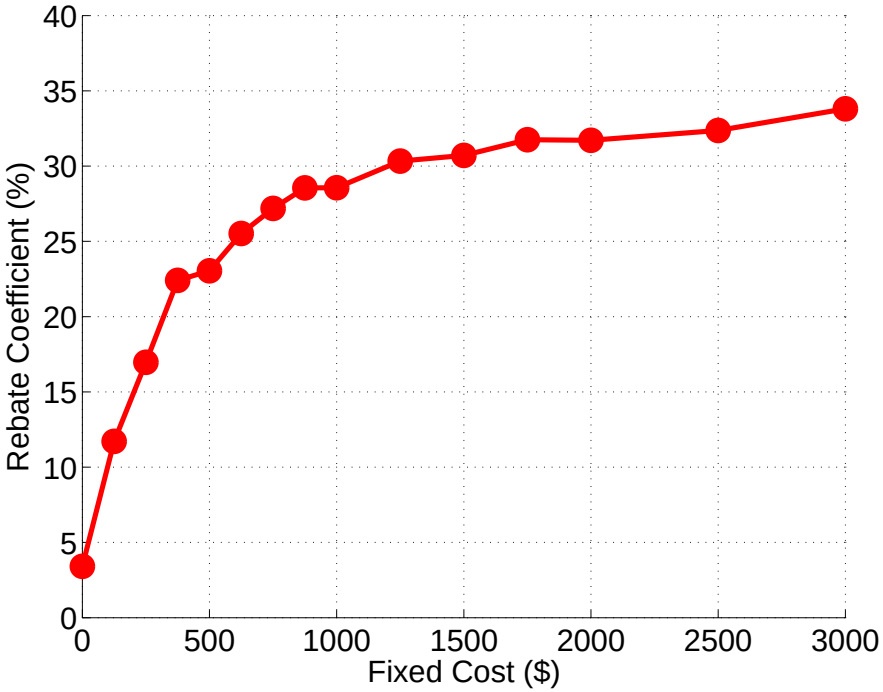
Hand-to-mouth households

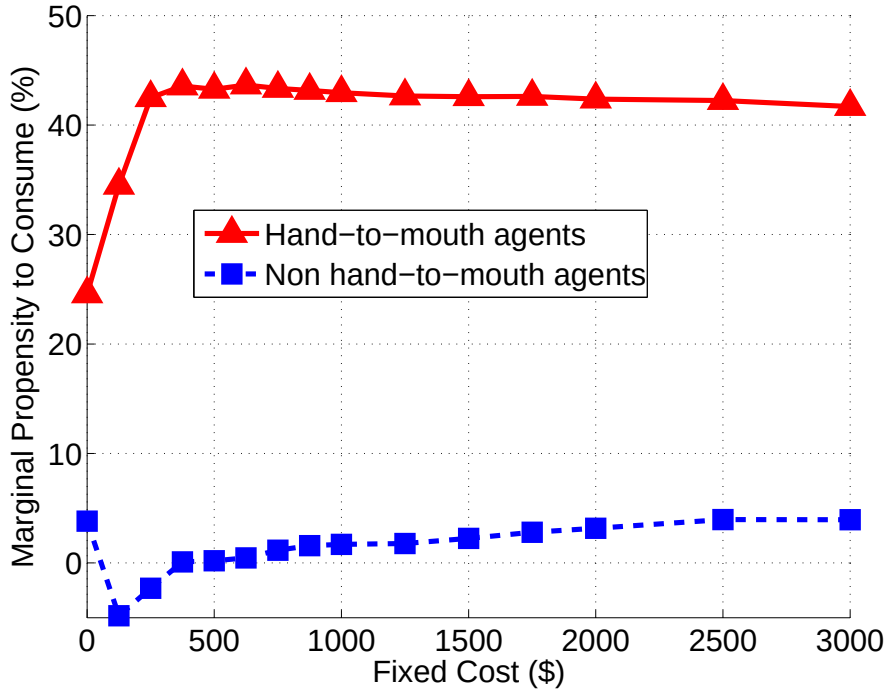




- Rebate coef rising with fraction of hand-to-mouth households

MPC across households





- Action entirely from hand-to-mouth households

Further implications and extensions

- Timing and anticipation [go to surprise]
- Heterogeneity in rebate coefficients [go to heterogeneity]
- Size asymmetry of responses [go to size]
- Lifecycle properties [go to lifecycle]
- Aggregate consumption response [go to aggregate response]
- Allowing for credit [go to borrowing]
- Utility costs and time costs [go to transactions cost]
- Alternative model for idiosyncratic risk [go to idiosyncratic]
- Frequency of adjustment [go to adjustment]

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) bimodal; and (iii) size-asymmetric

  . . . while being consistent with liquid/illiquid distributions

Outline

Consumption dynamics: no adjustment phase

- Case I: Positive liquid assets ($m_{t+1} > 0$)

$$\frac{1}{c_t} = \beta \frac{1}{c_{t+1}}$$

Consumption falls at rate $\beta < 1$

Consumption dynamics: no adjustment phase

- Case I: Positive liquid assets ($m_{t+1} > 0$)

$$\frac{1}{c_t} = \beta \frac{1}{c_{t+1}}$$

Consumption falls at rate $\beta < 1$

- Case II: No liquid assets ($m_{t+1} = 0$)

$$c_t = y_t$$

Borrowing constrained so consumption equals income

Consumption dynamics: adjustment in work

- Case III: Date of adjustment ($m_{t+1} = 0$)

$$\frac{1}{c_t} = \beta \frac{1}{c_{t+1}} + \lambda^m_{t+1}$$

Always optimal to deposit entire cash holdings so $m_{t+1} = 0$

Consumption has an "upward jump" between t and $t+1$.

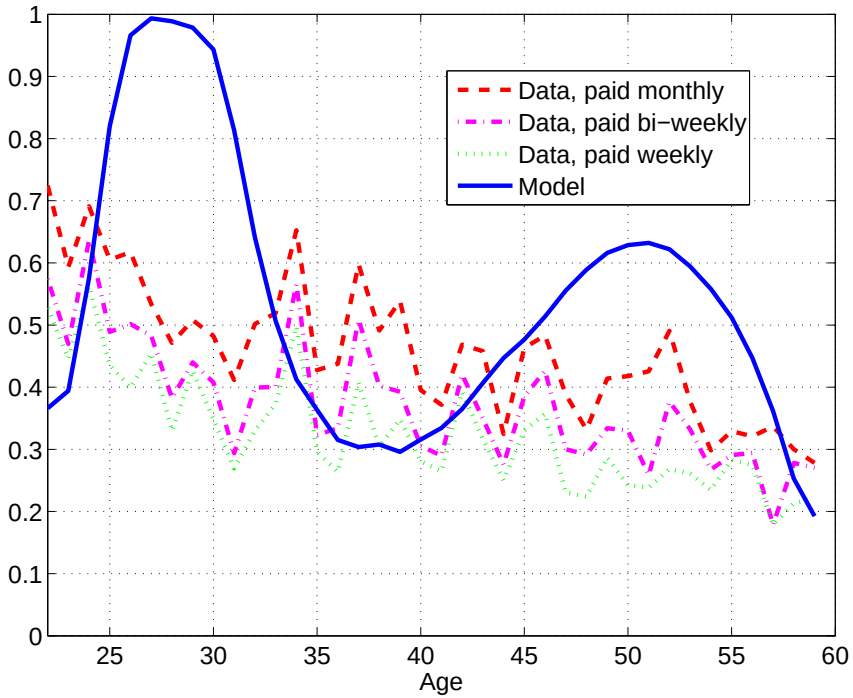
Between two adjustment dates, t and $t+j$

$$\frac{1}{c_t} \geq [\beta(1+r)]^j \frac{1}{c_{t+1}}$$

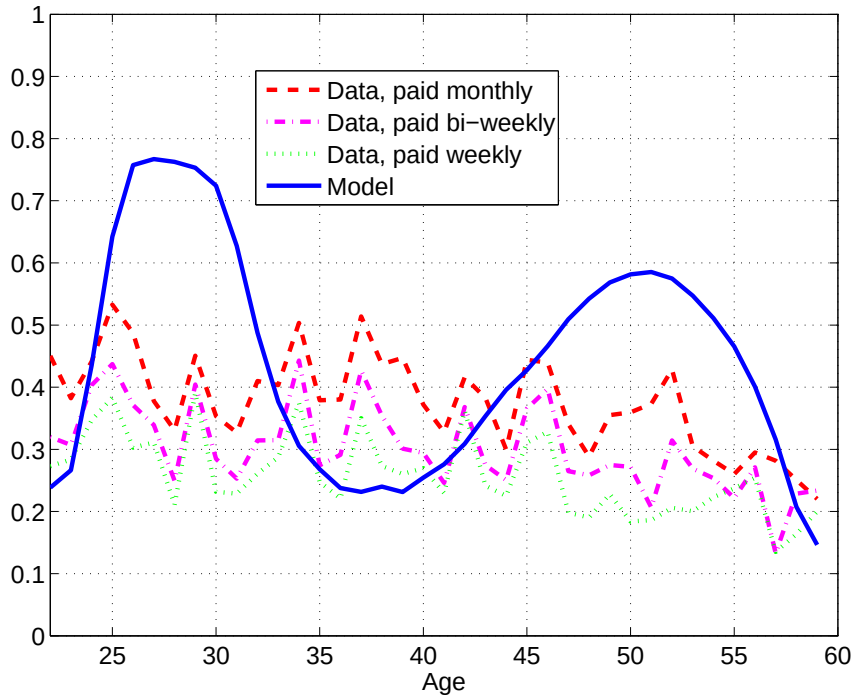
Consumption grows at rate at least $\beta(1+r)$

Hand-to-mouth agents in data and model

Fraction with Liquid Wealth ≤ 0



Fraction with Liquid Wealth ≤ 0 and Illiquid Wealth > 0



[return]

Size-asymmetry of responses (Hsieh, 2003)

Same households who have large MPC out of small income tax refunds do not respond to larger distributions from Alaskan Permanent Fund

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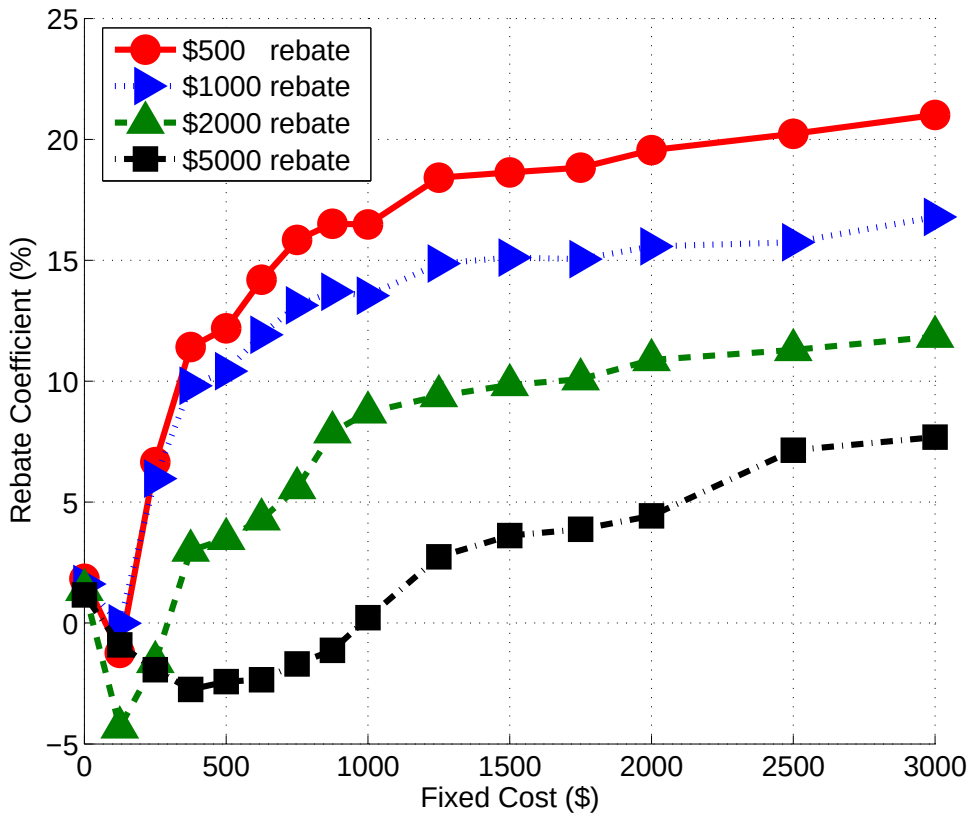

- Larger rebate ⇒ more adjustment ⇒ lower consumption response

[return]

Heterogeneity in rebate coefficients

Misra & Surico (2011):

1. Distribution of consumption responses is bimodal
2. High income households at both ends of distribution

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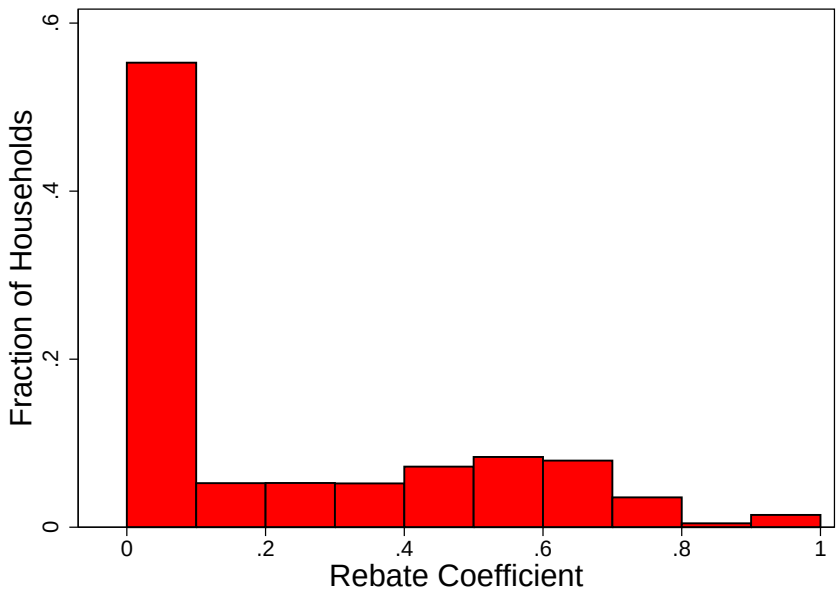
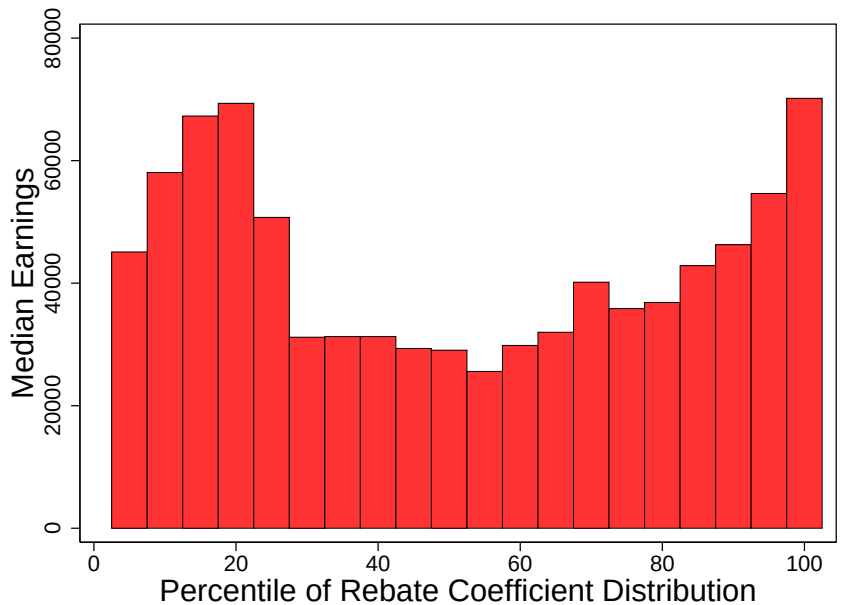
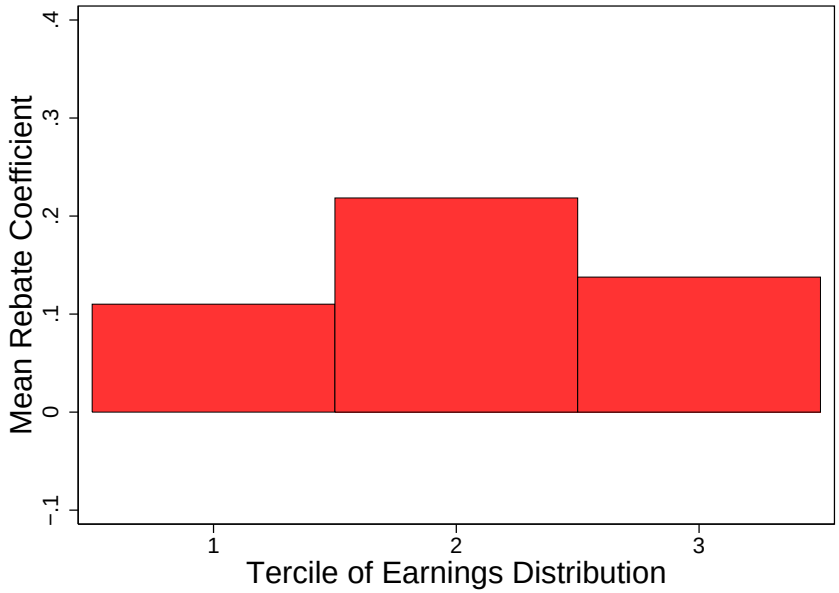
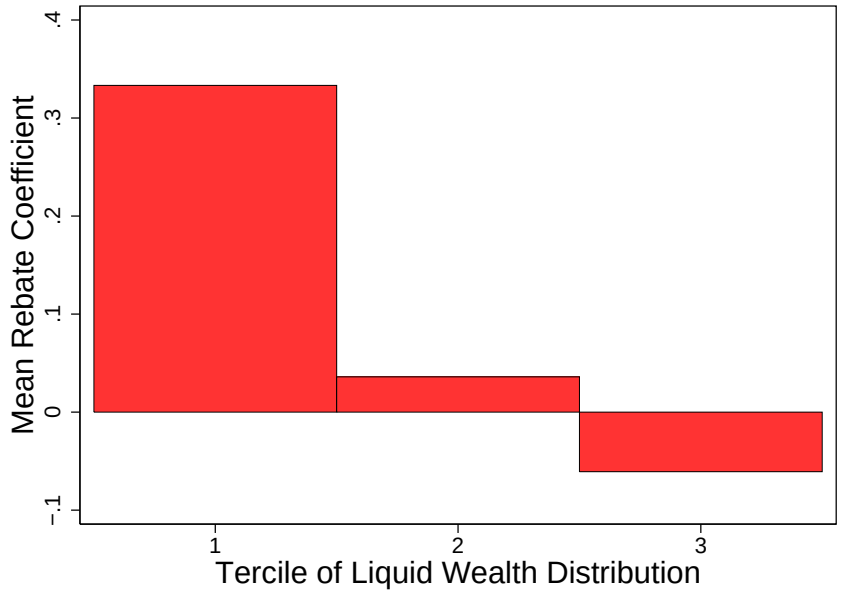




[return]

Correlation with earnings and liquid wealth





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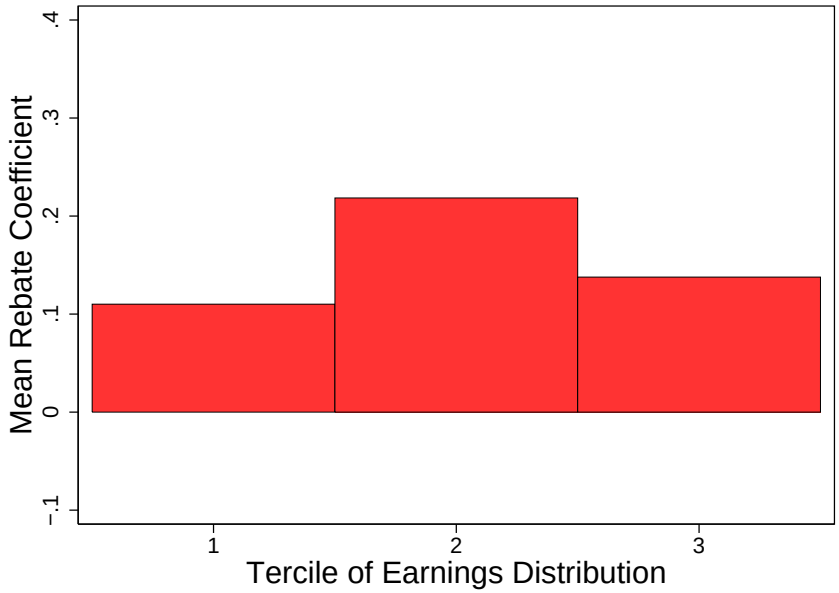
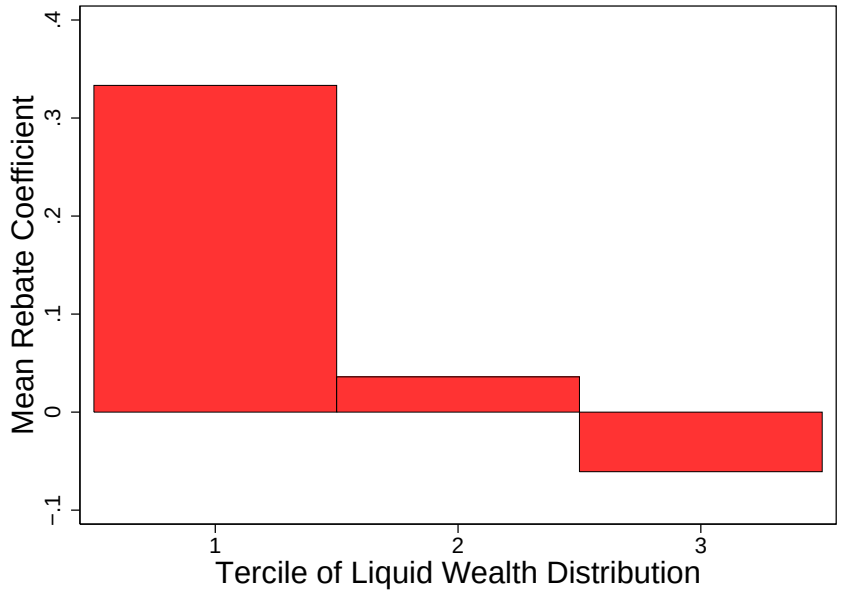


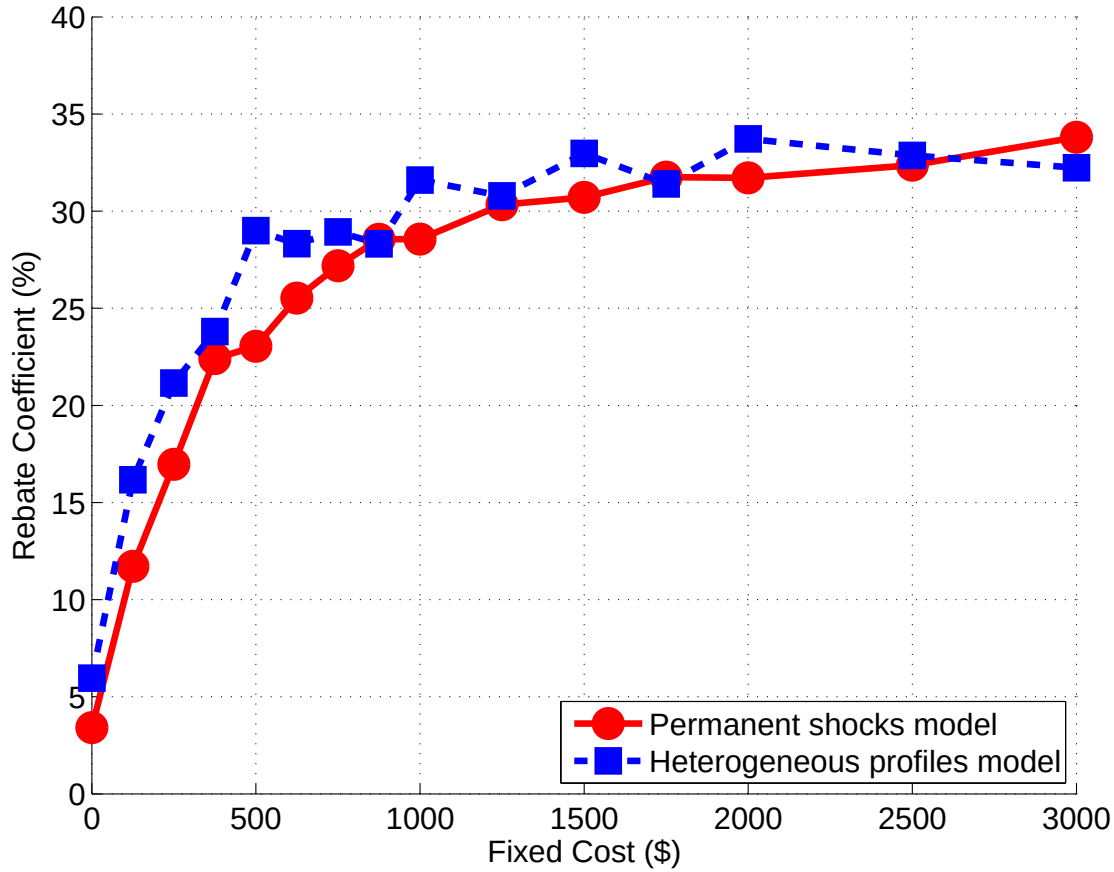


Empirical evidence:

1. JPS and Misra-Surico: low m not significant
2. Borda-Parker and Souleles: low m/y significant

[return]

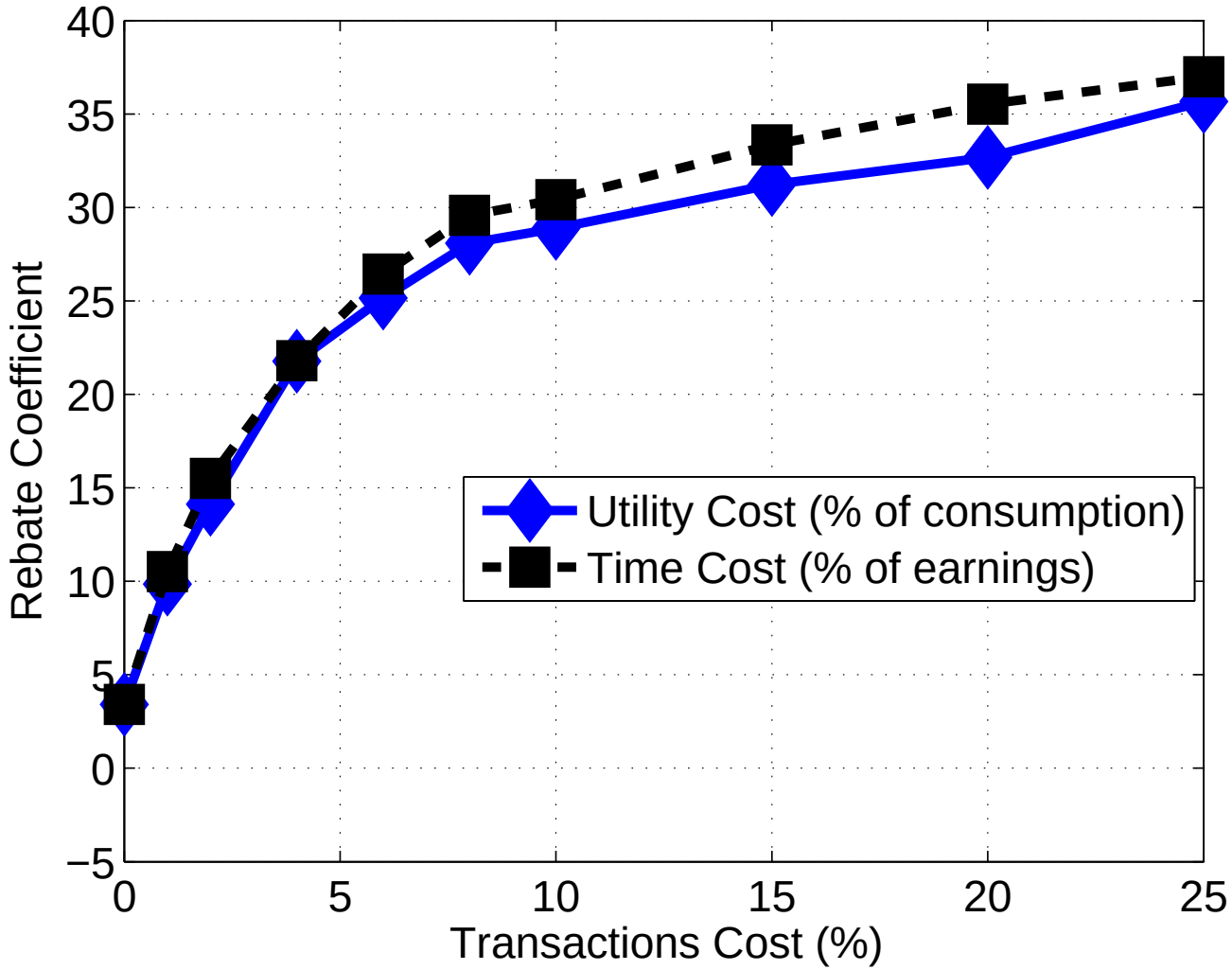
Idiosyncratic earnings risk



- If HIP instead of permanent shocks, then findings are robust

[return]

Alternate specification of transactions cost



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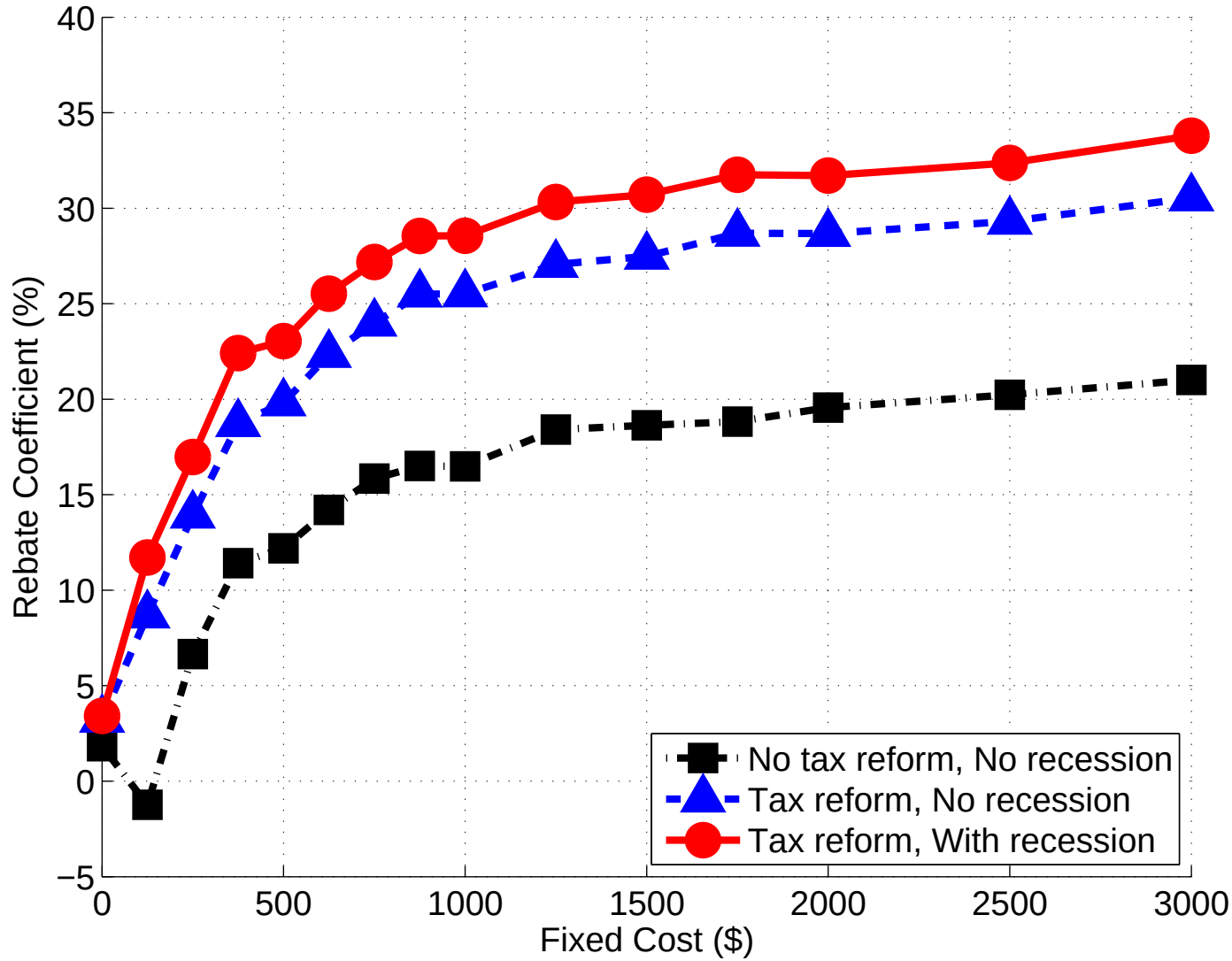
Tax reform and recession



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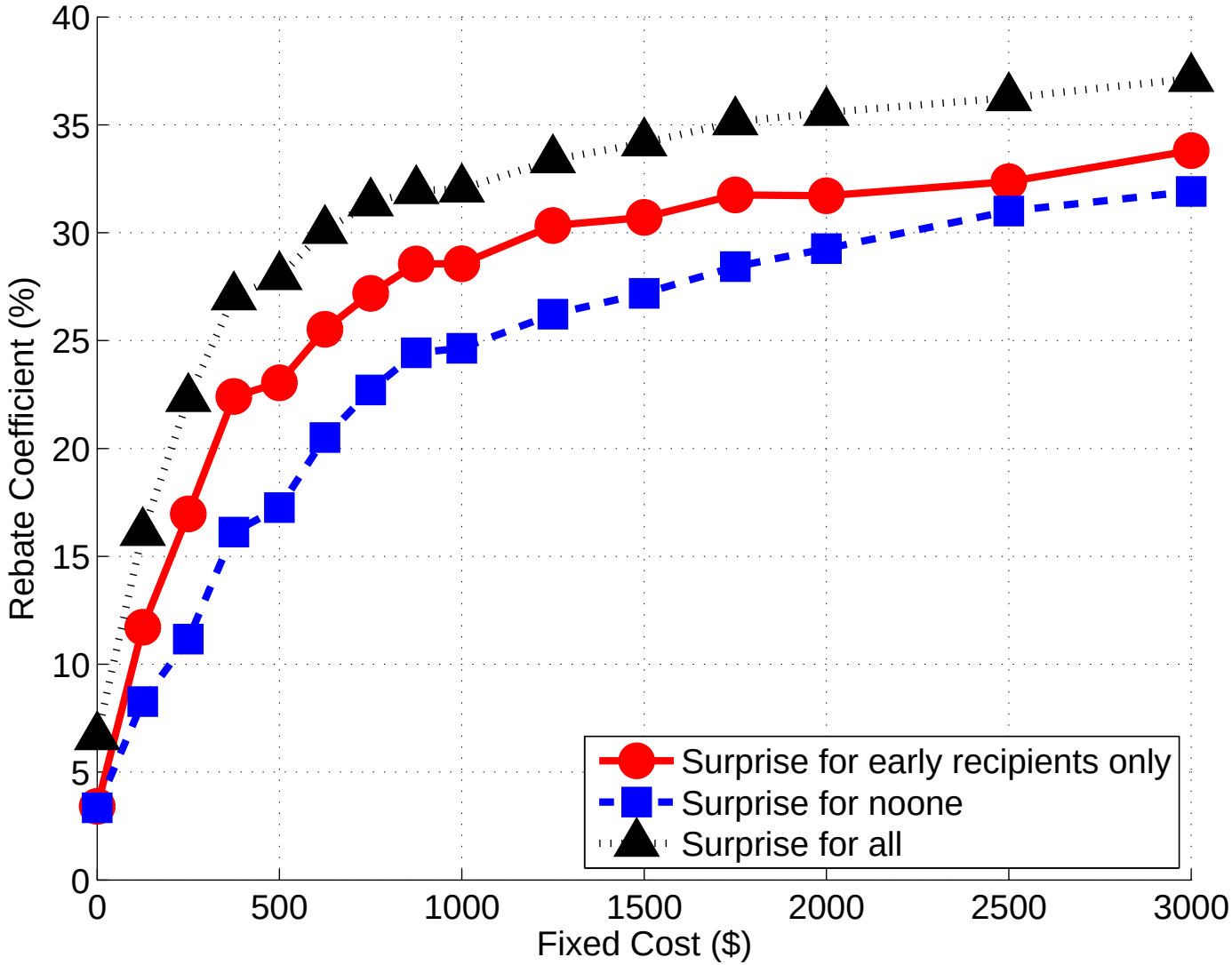
Timing of announcement



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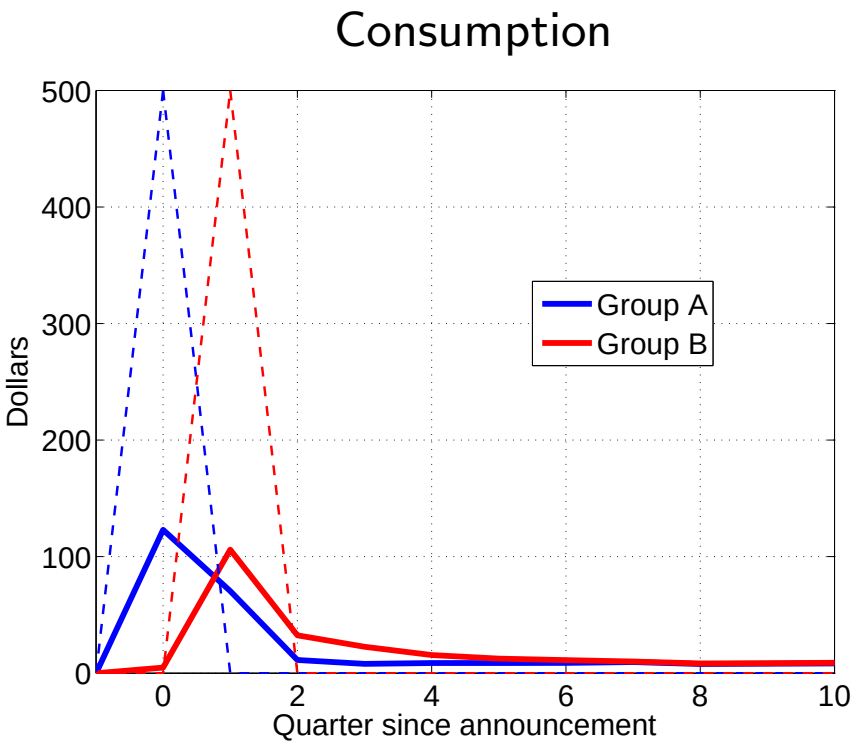
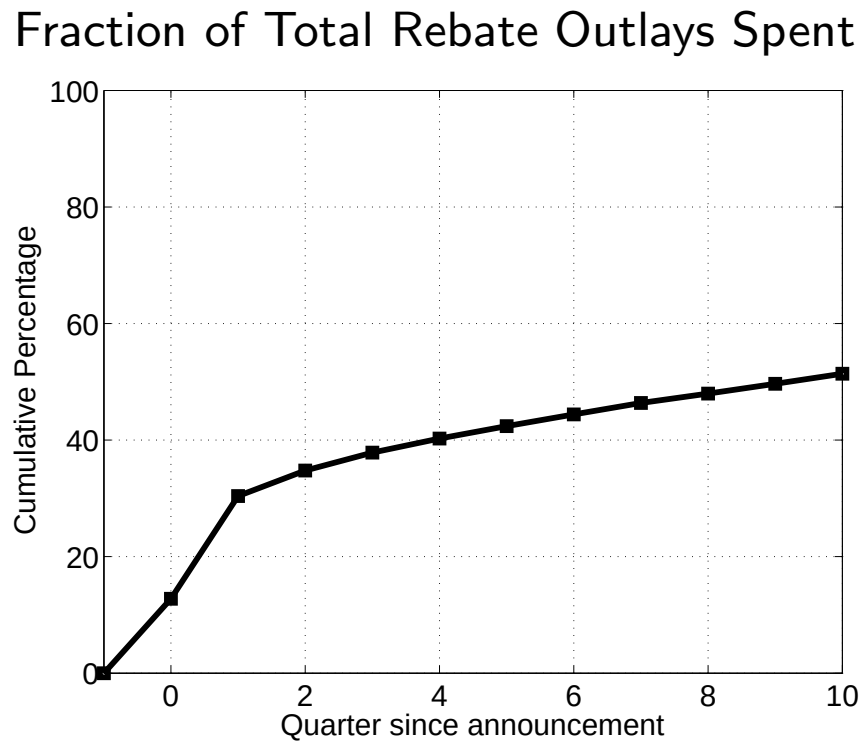
Aggregate consumption response





- Around 40% of rebate outlays are spent in first year
- ND consumption up by 0.5% compared to counterfactual

[return]

Credit

Credit means ability to hold negative amounts of the liquid asset by paying a rate $R^b > R^m$ on balances

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(2) Group B borrows upon announcement and consumes as much as group A $\rightarrow$ smaller rebate coefficient

Conjecture (1): fewer constrained, small MPC

- Since $R^b > R^m$, households still face a corner at $m = 0$ which is potentially binding for many

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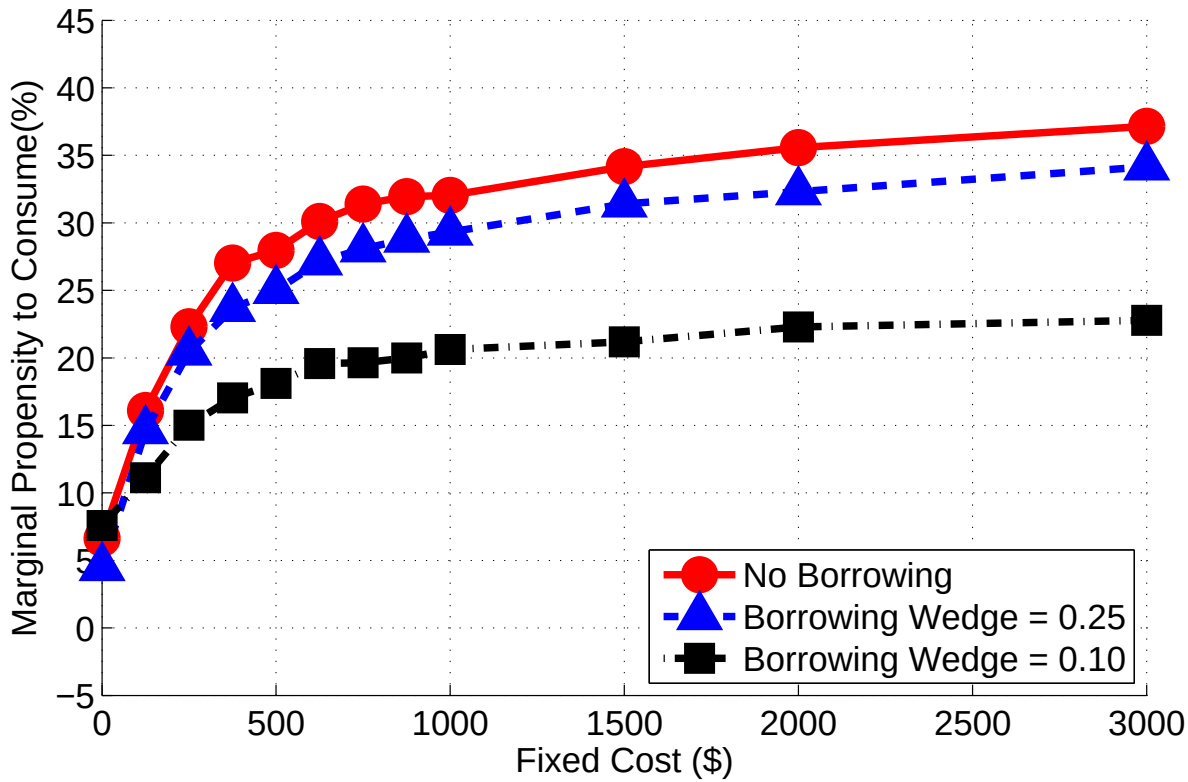

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Conjecture (2): group B borrows upon news

1. Expensive credit: many in group B prefer waiting
2. Cheaper credit: true, but still significant amplification

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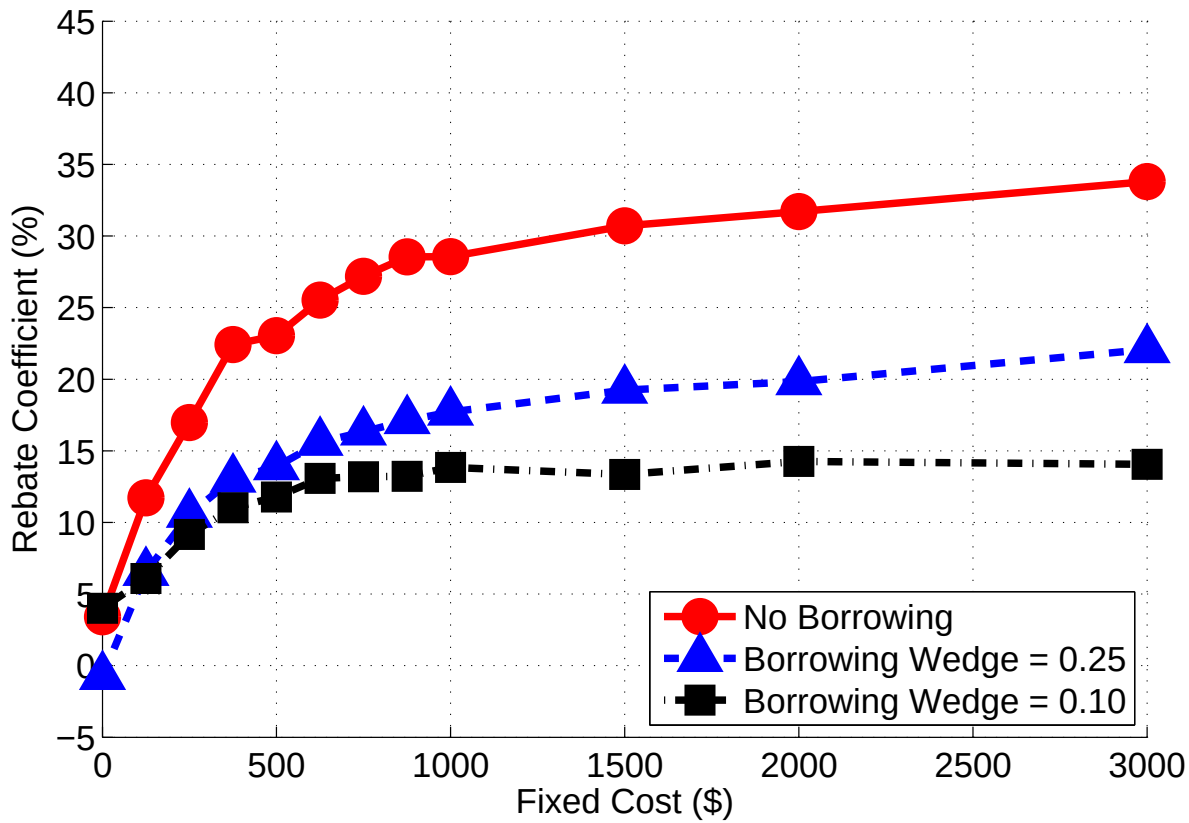

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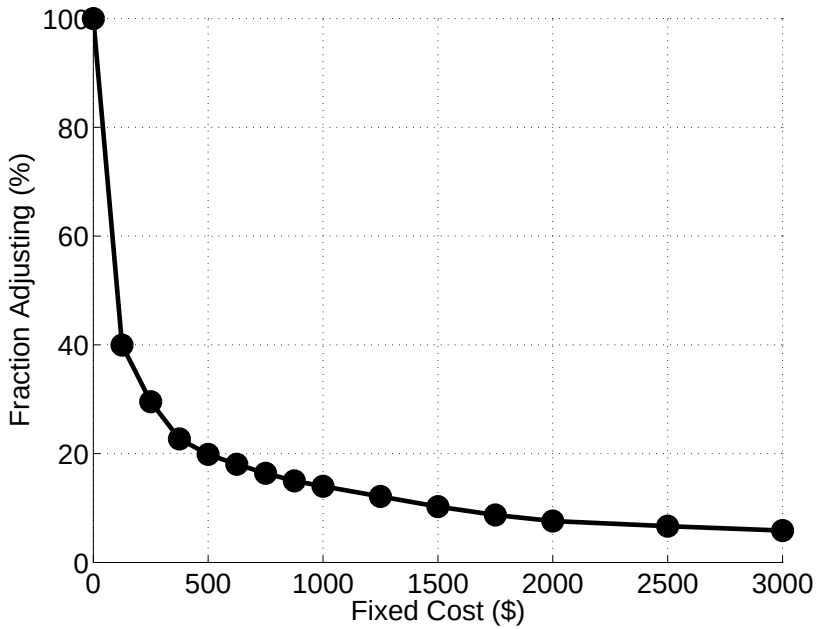
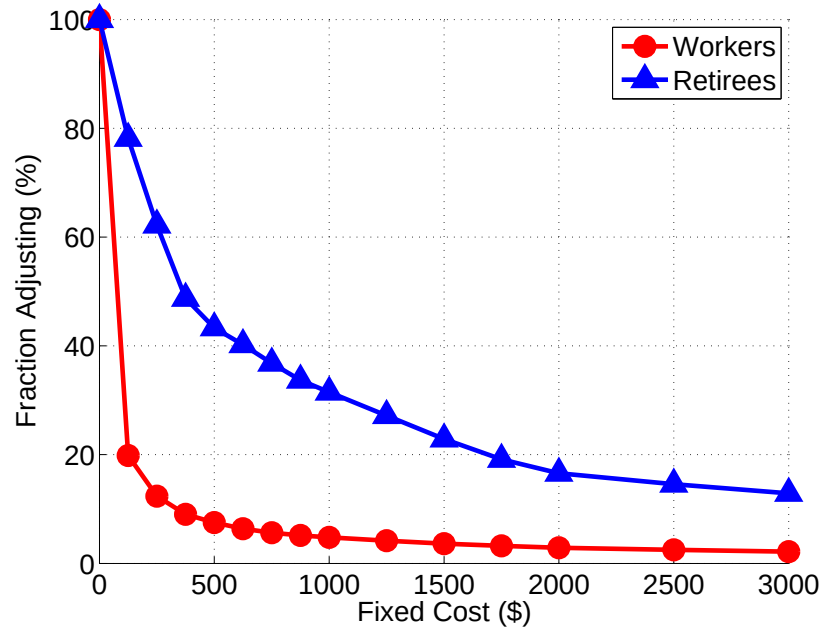
Fraction of agents adjusting in the model

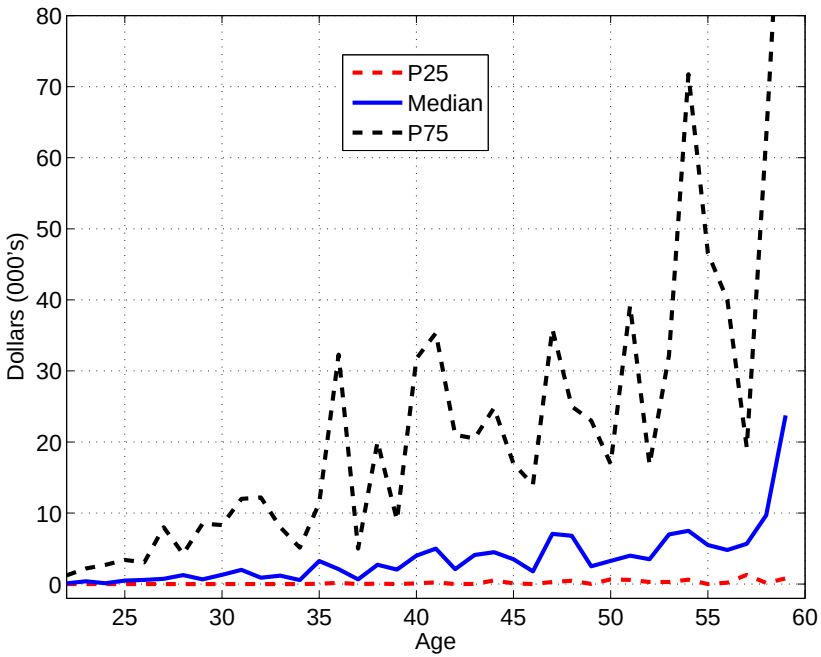




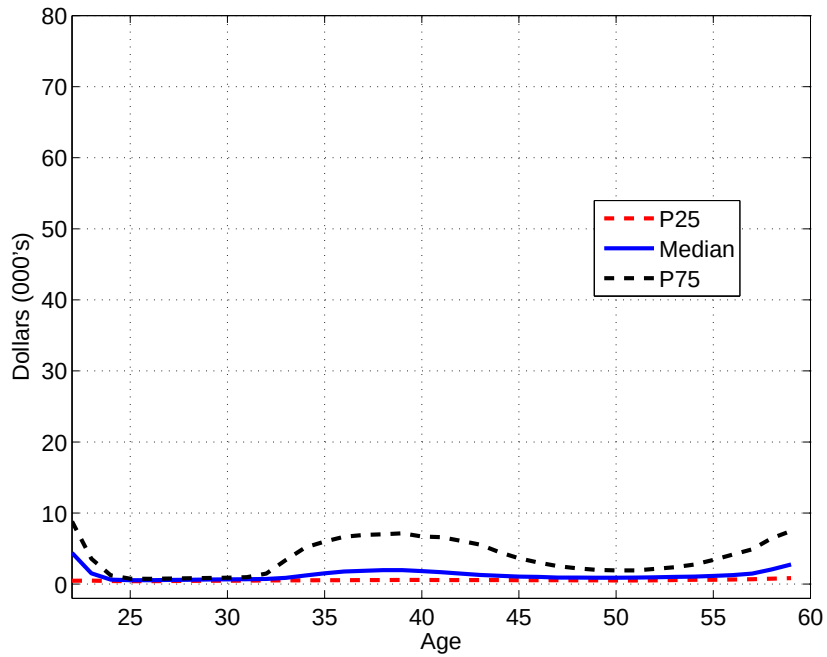
[return]

Distribution of liquid wealth in data and model

Data (SCF 2001)



Model



[return]

Liquid and illiquid wealth in SCF 2001

	50th pct	Mean	Fraction Positive	After-Tax Real Return
Earnings + benefits (22-59)	41,000	52,696	–	–
Net worth	77,100	164,463	0.95	5.5
Net liquid wealth	2,700	30,531	0.77	-1.1
Cash, checking, saving, MM	1,880	12,026	0.87	-2.0
MF, stocks, bonds, T-Bills	0	19,920	0.28	4.1
Revolving credit card debt	0	1,415	0.33	–
Net illiquid wealth	70,000	133,932	0.93	6.2
Housing net of mortgages	31,000	72,585	0.68	7.1
Vehicles net of loans	11,000	14,562	0.86	5.8
Retirement accounts	950	34,431	0.53	4.5×1.35
Life insurance	0	7,734	0.27	0.5
Certificates of deposit	0	3,805	0.14	1.3
Saving bonds	0	815	0.17	0.5

[return to wealth data]

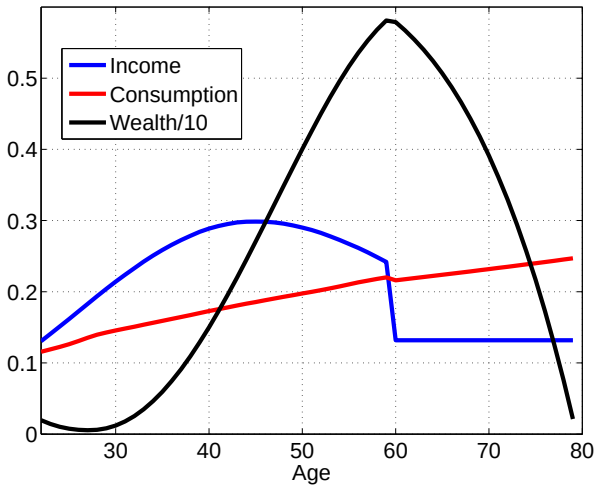
Calibration of asset returns

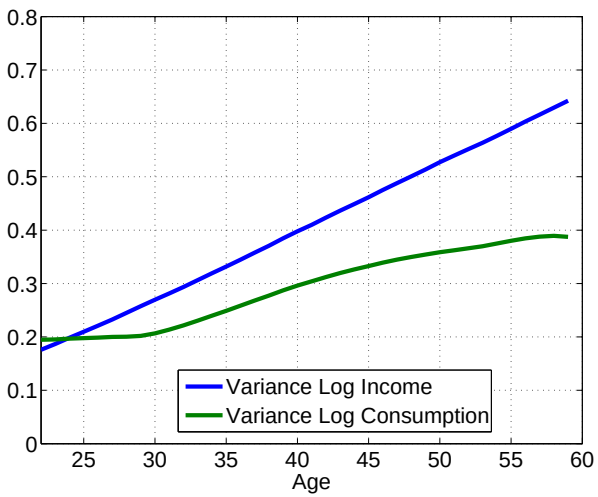
1. Construct average returns by asset class from 1960-2009:
   - Checking accounts: zero nominal return
   - Money market and savings accounts: 3 month treasury bills
   - Stocks: CRSP value-weighted portfolio incl dividends
   - Bonds: 3 month treasury bills
   - Housing: NIPA data adjusted for flow of consumption services
   - Vehicles: User cost approach
   - Retirement accounts: Return $\times 1.35$ (employer contribution)
   - Certificates of deposit: Federal Reserve Board database
2. Use observed portfolios in SCF to construct household-specific returns on liquid and illiquid wealth
3. Use resulting cross-sectional mean return

[return to calibration]

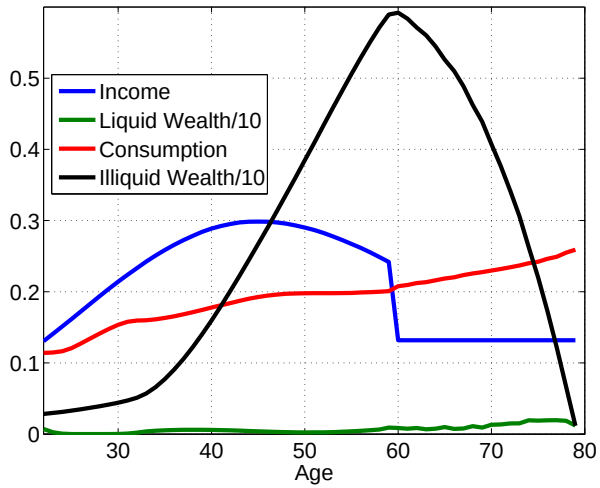
Equivalence of lifecycle profiles

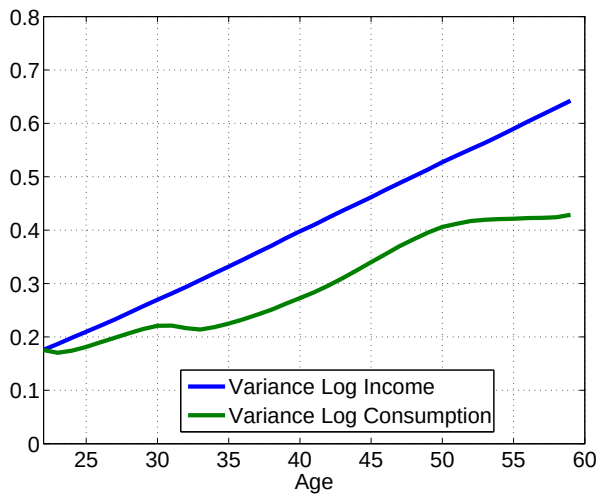
One-asset model





Two-asset model





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