Economics 704a Bonus Lecture 2: Household Balance Sheets, Redistribution, and Monetary Policy

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[1]These slides borrow from Adrien Auclert's excellent slide deck.

Auclert (2019): Redistribution Chanel of Monetary Policy

- How does monetary policy affect the real economy, and in particular consumption?
  - Traditional view: inter-temporal substitution.
  - Redistribution across households induced by monetary policy "nets out."
- Auclert (2019) argues that redistribution does *not* net out.
  - Wealth effects matter because differential by MPC:
    1. Differential response of household incomes to monetary policy.
    2. Differential exposure of household balance sheets to inflation.
    3. Differential exposure of household balance sheets to changes in the real interest rate.
  - Quantifies importance of redistribution channels.

Auclert (2019): Redistribution Chanel of Monetary Policy

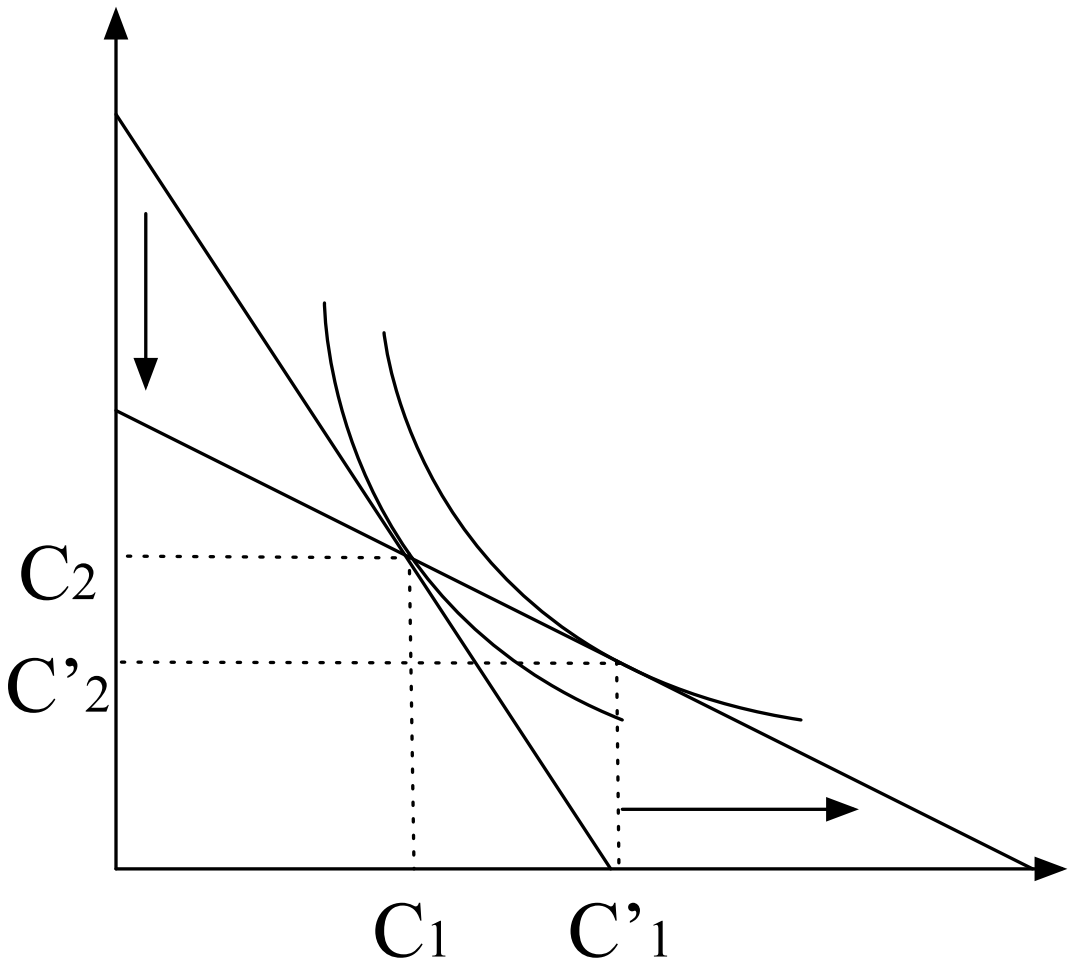
Aggregation would not matter if we could be sure the marginal propensities to spend from wealth were the same for creditors and debtors. But...the population is not distributed between debtors and creditors randomly. Debtors have borrowed for good reasons, most of which indicate a high marginal propensity to spend from wealth or from current income.

- James Tobin

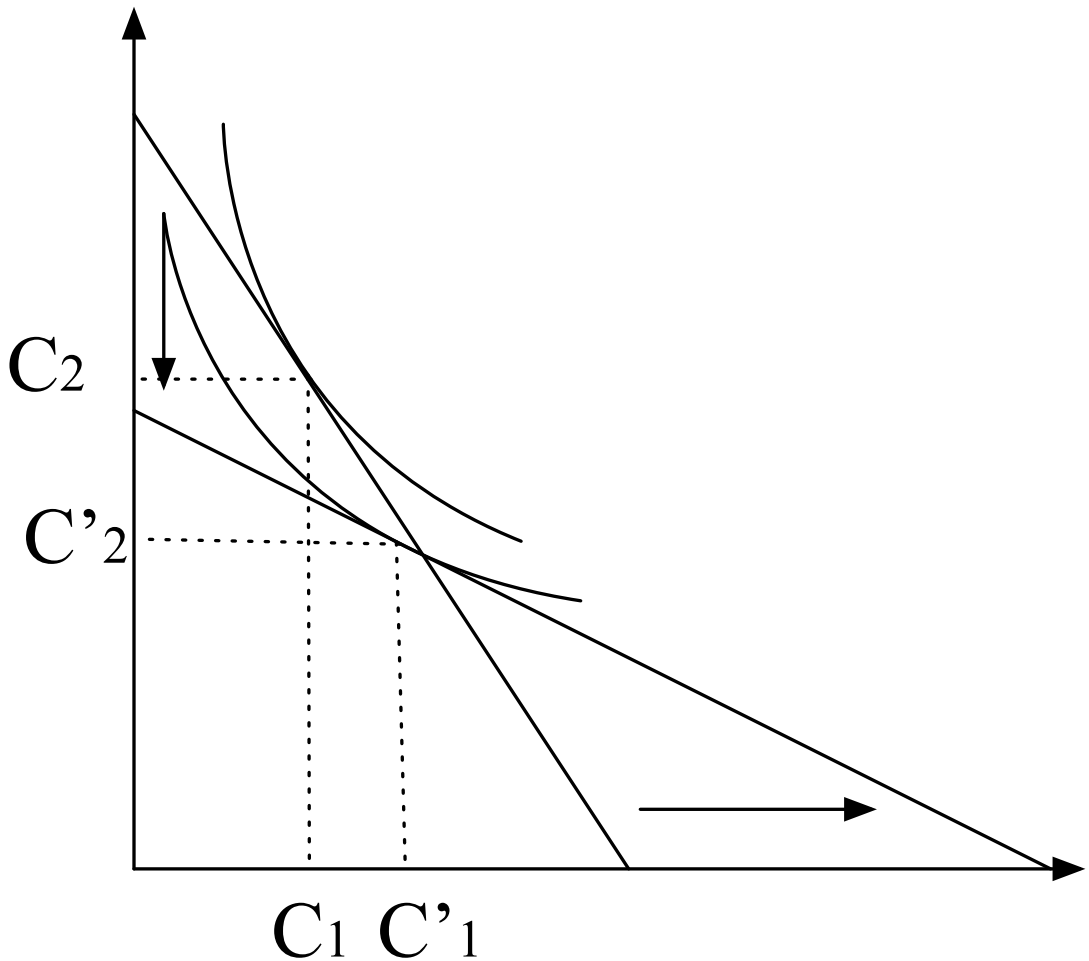
Auclert (2019): Structure of Paper

1. Simple yet novel "sufficient statistics" approach.
   - Partial equilibrium analysis of household with rich balance sheet in complete and incomplete markets.
   - Aggregate to general equilibrium.
     - Covariances of MPC and "balance sheet exposures" matter.
   - Limited structure to identify channels at work and their magnitudes in a broad class of models.
     - While leaving particulars of GE closure of model unspecified.
2. Empirical Evidence: Interest rate exposure channel as strong as inter-temporal substitution channel.
3. Calibrated heterogeneous agents model (cut by AER from JMP version).

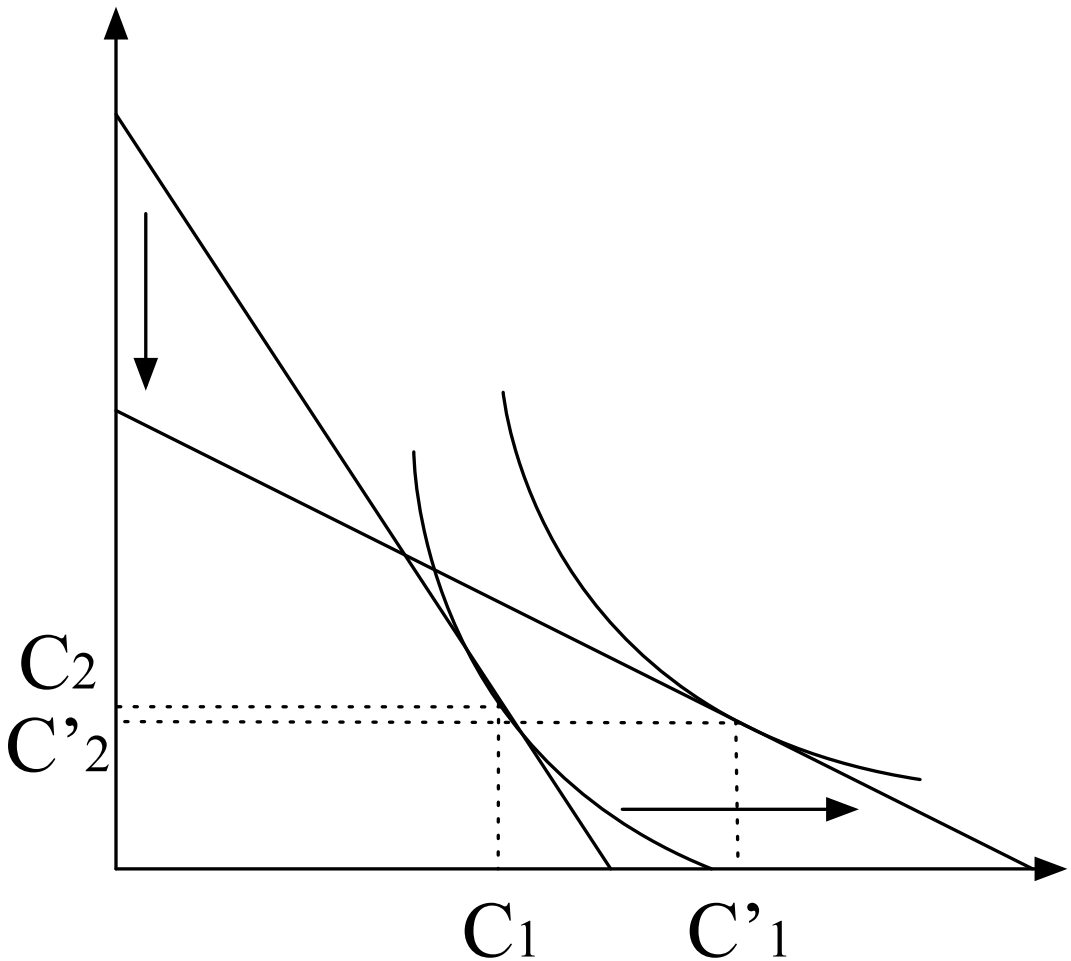
Basic Idea: Decline in Interest Rate With Zero Net Savings Generates No Wealth Effect



Basic Idea: Decline in Interest Rate For Net Saver Generates Negative Wealth Effect



Basic Idea: Decline in Interest Rate For Net Borrower Generates Positive Wealth Effect



Auclert (2019): Intuition of Interest Rate Exposure Channel

- *Net saving/borrowing position relative to consumption plan is what matters for income effect when interest rate changes.*
- Auclert generalizes pictures to dynamic, many-asset case.
  - Key measure of balance sheet exposure is *unhedged interest rate exposure*.
  - Difference between all maturing assets and liabilities at point in time (for one-period unanticipated shock, today).
  - Includes income as asset and consumption plan as liability.
- $r \downarrow \Rightarrow$ redistribution towards negative UREs (net borrowers), who Auclert argues has higher MPC.

Redistribution and Monetary Policy: Outline

1. Auclert (2019): Households
   - 1.1 Complete Markets
     - 1.1.1 Without Nominal Assets
     - 1.1.2 With Nominal Assets
   - 1.2 Incomplete Markets
2. Auclert (2019): General Equilibrium
3. Redistribution Channels
   - 3.1 Earnings Heterogeneity Channel: Auclert (2019)
   - 3.2 Fisher Channel: Doepke and Schneider (2006)
   - 3.3 Interest Rate Exposure Channel: Auclert (2019)
4. Implications: Monetary Policy Transmission With Adjustable-Rate Mortgages

Complete Markets Setup With No Nominal Assets

- Model of household with access to rich set of financial assets.
  - Real income stream $\{y_t\}$, wages $\{W_t\}$, prices $\{P_t\}$ (certain).
  - Hold at beginning of period zero $\{{}_{-1}b_{t+s}\}_{s\geq 0}$ long-term real assets maturing at $t \Rightarrow$ real term structure $\{{}_{-1}q_t\}_{t\geq 0}$.

$$\max \sum_t \beta_t \left[u\left(c_t\right) - v\left(n_t\right)\right]$$

$$\text{s.t. } P_t c_t = P_t y_t + W_t n_t + \textstyle\sum_{s\geq 1} \left({}_t q_{t+s}\right) P_{t+s} \left({}_{t-1} b_{t+s} - {}_t\, b_{t+s}\right)$$

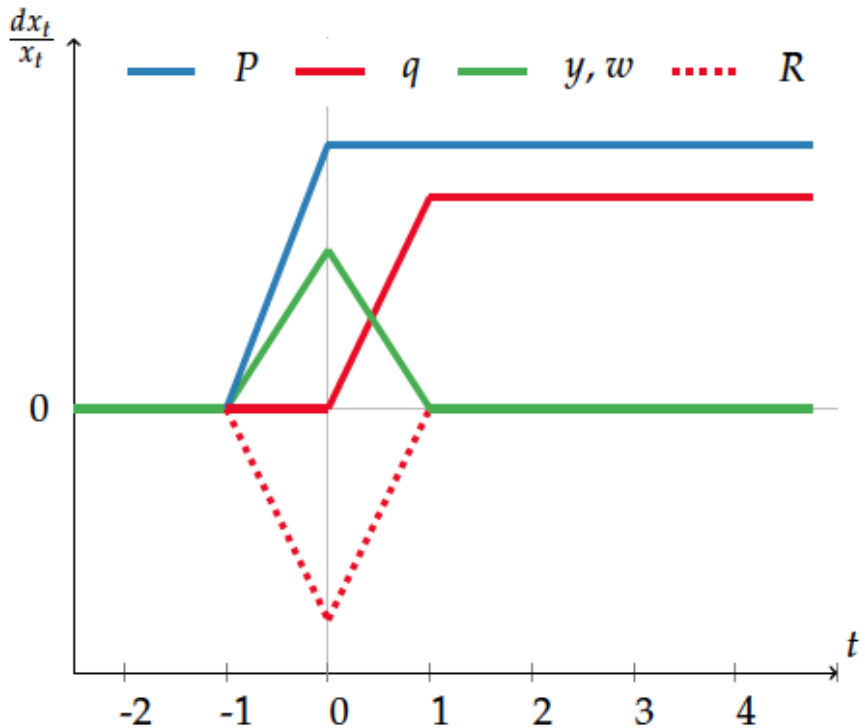
- Intertemporal budget constraint:

$$\sum_{t\geq 0} q_t c_t = \underbrace{\sum_{t\geq 0} q_t \left(y_t + w_t n_t\right)}_{\text{Human Wealth}} + \underbrace{\sum_{t\geq 0} q_t \left({}_{-1} b_t\right)}_{\text{Financial Wealth}}$$

- Corollary: Financial assets with same present value deliver same solution to consumer problem.

Auclert (2019): Transitory Monetary Shock

- Keeping *balance sheets fixed* $\{_{-1}b_t\}_{t\geq 0}$, R falls for one period.
  1. All nominal prices rise in proportion $\frac{dP_t}{P_t} = \frac{dP}{P}\ \forall t \geq 0$
  2. Present-value real discount rates rise in proportion $\frac{dq_t}{q_t} = -\frac{dR}{R}\ \forall t \geq 1$
  3. Unearned income at $t = 0$ rises by dy and real wage $w = \frac{W}{P}$ rises by dw.



Auclert (2019): First-Order Response of Consumption

$$dc = MPC \times \underbrace{\left[dy + (1+\psi)\, ndw + (y + wn +_{-1} b_0 - c)\, \frac{dR}{R} \right]}_{\text{Wealth Change}} - \underbrace{\sigma c MPS \frac{dR}{R}}_{\text{Sub Effect}}$$

- Proof: Slutsky decomposition and Taylor approx (see website).

$$\frac{\partial x_i}{\partial p_j} = \frac{\partial h_i}{\partial p_j} - \frac{\partial x_i}{\partial w} x_j$$

  - p_j is R, the real interest rate, and $x_i = c_0$.
  - $\frac{\partial h_i}{\partial p_j}$ is written as Hicksian elasticity (EIS $\sigma = -\frac{u'(c_0)}{c_0 u''(c_0)}$) appropriately adjusted for consumption-savings times $\frac{dR}{R}$.
  - $\frac{\partial x_i}{\partial w} = \frac{\partial c}{\partial w} = MPC$.
  - x_j is the wealth change resulting from $\frac{dR}{R}$, which is change in earned and unearned income $dy + (1+\psi)\, n \times dw$ (ψ is Frisch) plus change in wealth from $\frac{dR}{R}$ affecting balance sheet.

Auclert (2019): Unhedged Interest Rate Exposure

$$dc = MPC \times \left[dy + (1+\psi)\, ndw + (y + wn +_{-1} b_0 - c)\, \frac{dR}{R} \right] - \sigma c MPS \frac{dR}{R}$$

- Balance sheet hedged in period 0 when $_{-1}b_0 = c - (y + wn)$.
  - In this case, not a net borrower or saver.
  - dR generates no income effect beyond GE effect on income.
- Define *unhedged interest-rate exposure*:

$$URE = y + wn +_{-1} b_0 - c$$

  - $y + wn +_{-1} b_t$ are maturing assets (if long bonds).
  - $_{-1}b_t - c$ are maturing liabilities (if short bonds).
- *URE measures balance sheet exposure to change in R.*
  - Effect of interest rate is fall in price of $t = 0$ goods.
  - Benefits net purchasers of $t = 0$ goods, hurts net suppliers.
  - Exposure thus determined by mismatch of assets and liabilities in period of change.

Auclert (2019): Who Has High URE?

- Savers with large holdings of short-term assets have positive UREs.
- Households with large adjustable-rate debt (e.g., mortgages) have negative UREs.
  - ARM is long-term instrument, but changes value as interest rate changes
  - So think of it as asset with short maturity that is continually "rolled over."
- By contrast, fixed-rate mortgages have URE≈ 0
  - Assuming income covers consumption and mortgage payments.
  - Not revalued and thus "maturing" as interest rates change.

Auclert (2019): Adding in Nominal Assets

- Add nominal asset holdings $\{_{-1}B_t\}_{t\geq 0}$ at prices $\{_{-1}Q_t\}_{t\geq 0}$.
- Fisher equation holds for entire term structure:

$$_tQ_{t+s} = {}_tq_{t+s}\frac{P_t}{P_{t+s}} \forall t, s$$

- Household problem is then:

$$\max_{\{c_t\}\{n_t\}} \sum_t \beta_t \left[u\left(c_t\right) - v\left(n_t\right)\right] \text{ s.t.}$$

$$P_t c_t = P_t y_t + W_t n_t +_{t-1} B_t + \sum_{s\geq 1} \left({}_tQ_{t+s}\right)\left({}_{t-1}B_{t+s} -_t B_{t+s}\right)$$

$$+ P_t \left({}_{t-1}b_t\right) + \sum_{s\geq 1} \left({}_tq_{t+s}\right) P_{t+s} \left({}_{t-1}b_{t+s} -_t b_{t+s}\right)$$

Auclert (2019): First-Order Response With Nominal Assets

$$dc = MPC\left(d\Omega + \psi n \times dw\right) - \sigma cMPS\frac{dR}{R}$$

$$dU = u'\left(c\right)d\Omega$$

- $d\Omega$ is net of consumption wealth change:

$$d\Omega = dy + n \times dw + \underbrace{\left(y + wn + \frac{{}_{-1}B_0}{P_0} + {}_{-1}b_0 - c\right)}_{\text{URE}}\frac{dR}{R}$$

$$- \underbrace{\sum_{t\geq 0} {}_0Q_t\left(\frac{{}_{-1}B_t}{P_0}\right)}_{\text{Net Nominal Position}}\frac{dP}{P}$$

- *Net Nominal Position*: $-$ present value of nominal liabilities.
  - Exposure of nominal liabilities on balance sheet to inflation.
  - Inflation helps nominal debtors, hurts nominal lenders.

Auclert (2019): Incomplete Markets

- Perhaps surprisingly, Auclert shows that these formulae hold in an incomplete markets setting with liquidity constraints:
  - Define $dY = dy + n \times dw + w \times dn$
  - Define MPC adjusted for labor supply as $\hat{MPC} = \frac{MPC}{MPC+MPS}$.
    - If reduce n with positive income effect, $MPC + MPS < 1$.
  - Theorem:

$$dc = \hat{MPC}\left(dY + URE\frac{dR}{R} - NNP\frac{dP}{P}\right) - \sigma c\left(1 - \hat{MPC}\right)\frac{dR}{R}$$

- Intuition:
  - With nonbinding liquidity constraint, $\hat{MPC}$ summarizes way in which consumer reacts to *all* balance sheet revaluations.
  - When liquidity constraint does bind, $MPS = 0 \Rightarrow \hat{MPC} = 1$ and only income effects matter (hand to mouth).
- However welfare result on dU no longer holds hold.

Auclert (2019): Aggregation

- Consider a class of GE heterogeneous agent models with $i = \{1, ..., I\}$ households as described above.
  - Discount rate, utility, disutility of labor, and borrowing limit can be individual-specific.
  - Rational expectations.
  - Closed economy, with government with no debt and period-by-period balanced budget.
  - Note: This nests "spender-saver" model from last class.
- In equilibrium, zero net supply of nominal assets:

$$E_I [NNP_i] = \frac{1}{I} \sum_{i=1}^{I} NNP_i = 0$$

- Combine with market clearing $C = E_I [c_i] = E_I [Y_i] = Y$:

$$E [URE_i] = 0$$

Auclert (2019): GE Sufficient Statistic

$$dC = \underbrace{E_I\left[\frac{Y_i}{Y}\hat{MPC}_i\right]dY}_{\text{Agg Income Channel}} + \underbrace{Cov_I\left(\hat{MPC}_i, dY_i - Y_i\frac{dY}{Y}\right)}_{\text{Earnings Heterogeneity Channel}}$$
$$\underbrace{- Cov_I\left(\hat{MPC}_i, NNP_i\right)\frac{dP}{P}}_{\text{Fisher Channel}}$$
$$+ \underbrace{Cov_I\left(\hat{MPC}_i, URE_i\right)\frac{dR}{R}}_{\text{Int Rate Exposure Channel}} \underbrace{- E_I\left[\sigma_i c_i\left(1 - \hat{MPC}_i\right)\right]\frac{dR}{R}}_{\text{Substitution Channel}}$$

- $dC \simeq E_I[dc_i]$. Plug in previous result and:
  1. Decompose $dY_i = \frac{Y_i}{Y}dY + \left(dY_i - \frac{Y_i}{Y}dY\right)$
  2. Use $E_I[URI_i] = E_i[NNP_i] = E_I\left[dY_i - \frac{Y_i}{Y}dY\right] = 0$ to transform expectations of products into covariances.

How Does Sufficient Statistic Relate to Full Model?

$$dC = \underbrace{E_I\left[\frac{Y_i}{Y}MPC_i\right]dY}_{\text{Agg Income Channel}} + \underbrace{Cov_I\left(M\hat{P}C_i, dY_i - Y_i\frac{dY}{Y}\right)}_{\text{Earnings Heterogeneity Channel}}$$
$$- \underbrace{Cov_I\left(M\hat{P}C_i, NNP_i\right)\frac{dP}{P}}_{\text{Fisher Channel}}$$
$$+ \underbrace{Cov_I\left(M\hat{P}C_i, URE_i\right)\frac{dR}{R}}_{\text{Int Rate Exposure Channel}} - \underbrace{E_I\left[\sigma_i c_i\left(1 - M\hat{P}C_i\right)\right]\frac{dR}{R}}_{\text{Substitution Channel}}$$

- Auclert leaves GE responses $\frac{dP}{dR}$ and $\frac{dY}{dR}$ and $\frac{dY_i}{dR}$ unspecified.
  - Need full GE model to get these responses.
  - But *any* heterogeneous agent model will have these channels.

Comparison With Representative Agent Model

- Representative agent model has:

$$dC = \hat{MPC}\, dY - \sigma \left(1 - \hat{MPC}\right) C \frac{dR}{R}$$

  1. Aggregate Income Channel: Weak PIH $\Rightarrow$ low MPC.
  2. Intertemporal Substitution Channel: Dominant.

- Heterogeneity introduces three redistributive channels:
  1. Earnings Heterogeneity Channel: Earned/unearned income response to monetary policy vary across population.
     - Amplifies monetary transmission if $Cov_I\left(\hat{MPC}_i, dY\right) < 0$
  2. Fisher Channel: Net nominal borrowers win if $P \uparrow$.
     - Amplifies monetary transmission if $Cov_I\left(\hat{MPC}_i, NNP_i\right) < 0$.
  3. Interest Rate Exposure Channel: Net borrowers win if $R \downarrow$.
     - Amplifies monetary transmission if $Cov_I\left(\hat{MPC}_i, URE_i\right) < 0$.

Estimable Moments

- Auclert makes two further simplifications to write things in terms of estimable moments
  1. Individuals have common IES $\sigma_i = \sigma$.
  2. Individuals have a common elasticity of relative income to aggregate income.
- Then:

$$\frac{dC}{C} = (\mathcal{M} + \gamma\varepsilon_y)\frac{dY}{Y} - \varepsilon_P\frac{dP}{P} + (\varepsilon_R - \sigma S)\frac{dR}{R}$$

  - ε_Y,ε_P, and ε_R are *redistribution elasticities* that relate to appropriately normalized covariances.
  - $\mathcal{M}$ is an income-weighted aggregate MPC related to aggregate income elasticity.
  - S is a Hicksian scaling factor.

Earnings Heterogeneity Channel

- Auclert argues the earnings heterogeneity channel amplifies monetary transmission.

1. Some VAR evidence that cutting nominal interest rate reduces income inequality (Coibion et al. 2017).
2. Also, key Guvenen et al. (2017) fact about countercyclical income risk.
   - In recessions, right tail of idiosyncratic income shock distribution shrinks and left tail expands.
   - Particularly for lower-skill individuals.
   - If mon policy reduces tail risk, helps high MPC households.

Fisher Channel: Doepke and Schneider (2006)

- Doepke and Schneider (2006) measure net nominal positions in the data.
  - Flow of Funds and Survey of Consumer Finances.
  - NNP is sum of present value payment streams (not values) of all nominal assets minus the same for all nominal liabilities.
    - Include indirect positions through investment intermediaries and ownership of firms.
- Construct NNP across sectors (household, government, foreign) over time, and in 1989 and 2000, across households by age and wealth.

Fisher Channel: Doepke and Schneider (2006)

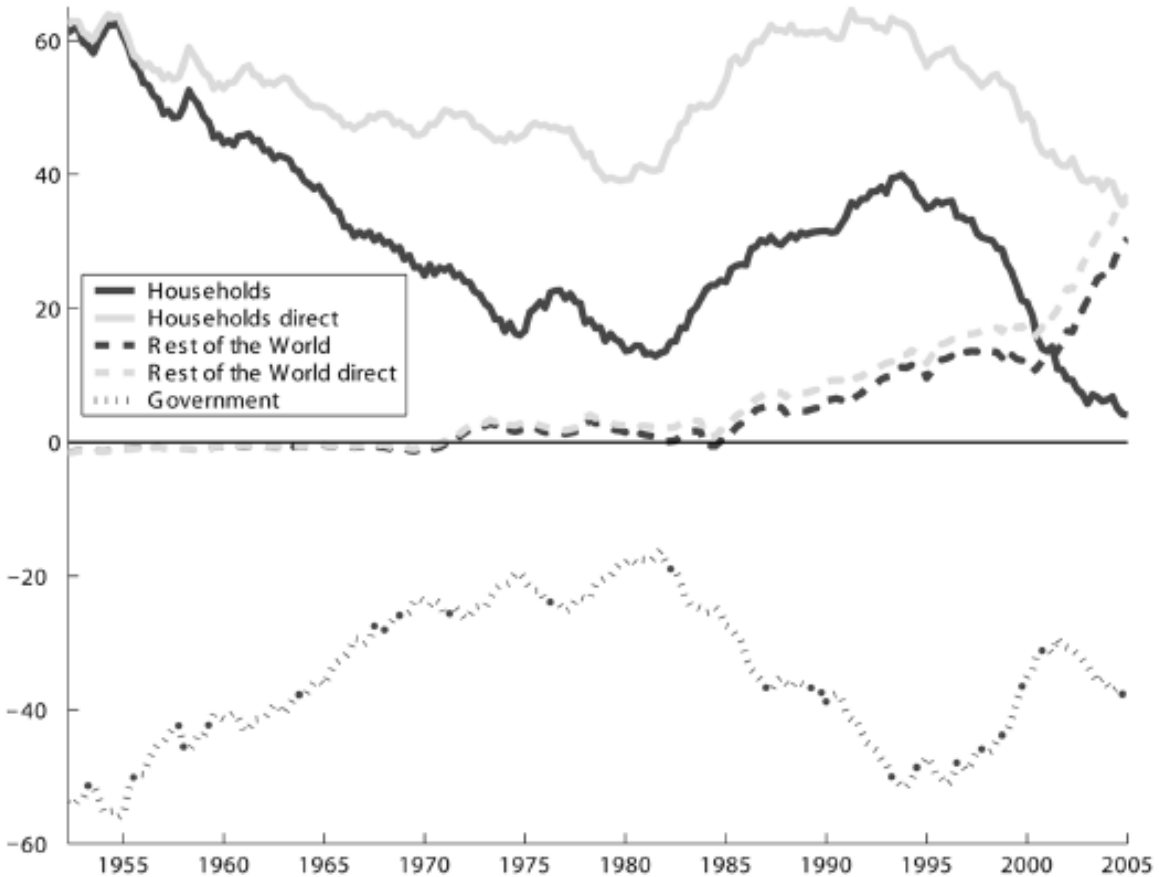


FIG. 1.—NNPs in the United States by sector from 1952 to 2004, as a percentage of GDP. Black lines: total NNP for households (solid), government (dotted), and the rest of the world (dashed). Grey lines: DNP for households (solid) and the rest of the world (dashed).

Fisher Channel: Doepke and Schneider (2006)

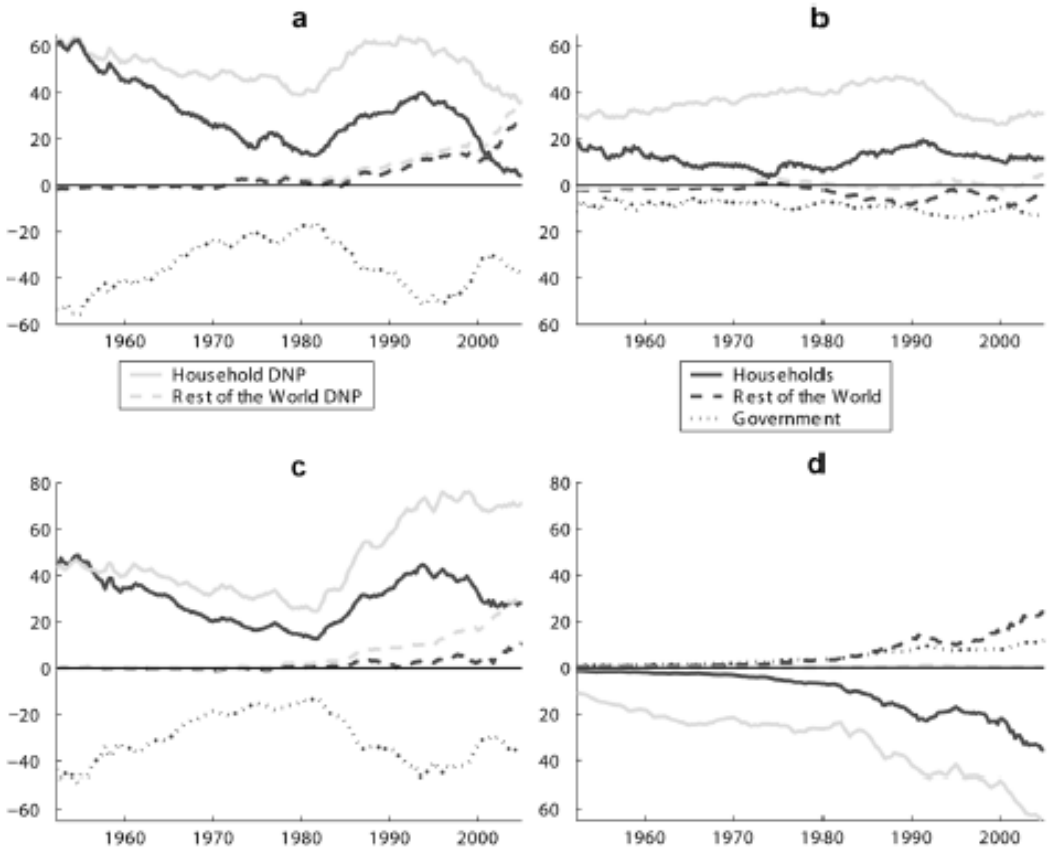


FIG. 2.—NNPs in the United States by sector and class of instrument, 1952–2004, as a percentage of GDP: *a*, total positions by sector (fig. 1); *b*, subtotals for short instruments with maturity up to one year; *c*, bonds with maturity above one year; *d*, mortgages. All panels are drawn to the same scale.

Fisher Channel: Doepke and Schneider (2006)

NET NOMINAL POSITIONS OF U.S. HOUSEHOLDS IN 1989

TYPE OF INSTRUMENT	AGE COHORT					
	≤ 35	36–45	46–55	56–65	66–75	> 75
	A. All Households					
Short-term	−2.3	4.4	5.5	10.8	12.4	18.1
Bonds	11.7	13.2	11.4	12.6	12.4	16.4
Mortgages	−47.5	−23.4	−10.5	−4.7	−1.4	−.4
Equity	−4.5	−4.3	−4.1	−3.5	−4.0	−3.5
Total NNP	−42.6	−10.1	2.3	15.2	19.4	30.6
	B. Poor					
Short-term	−35.9	−10.3	.5	8.9	17.7	25.0
Bonds	15.3	5.4	3.0	3.7	5.8	2.0
Mortgages	−13.2	−24.9	−6.5	−3.5	−5.9	−.1
Equity	−2.8	−4.0	−2.5	−1.6	−.1	−.5
Total NNP	−36.6	−33.8	−5.5	7.5	17.5	26.4
	C. Middle Class					
Short-term	−14.6	2.0	6.2	11.0	17.6	31.7
Bonds	14.9	13.7	11.5	13.4	11.2	8.6
Mortgages	−112.6	−45.4	−20.8	−8.7	−2.3	−.9
Equity	−1.7	−1.9	−1.7	−1.7	−1.3	−1.3
Total NNP	−114.0	−31.6	−4.8	14.0	25.2	38.1
	D. Rich					
Short-term	3.6	6.5	5.2	10.8	9.7	11.8
Bonds	10.3	13.4	11.6	12.5	13.2	20.5
Mortgages	−22.2	−10.4	−4.8	−2.5	−.8	−.1
Equity	−5.7	−5.7	−5.4	−4.5	−5.4	−4.7
Total NNP	−14.0	3.8	6.6	16.3	16.7	27.5

Inflation Scenarios: Doepke and Schneider (2006)

- Consider effect of two high inflation scenarios:

1. Full Surprise: One Time jump in price level that leaves nominal rates unchanged.
    - Nominal interest rates do not respond to inflation.
2. "Indexing ASAP": Inflation 5 pp higher for 10 years.
    - Nominal interest rates respond to change in inflation expectations immediately
        - In data may be sluggish, so "lower bound" scenario.
    - Equivalent to assuming that once nominal assets mature, switch to inflation-indexed securities.

Winners and Losers From Inflation: DS (2006)

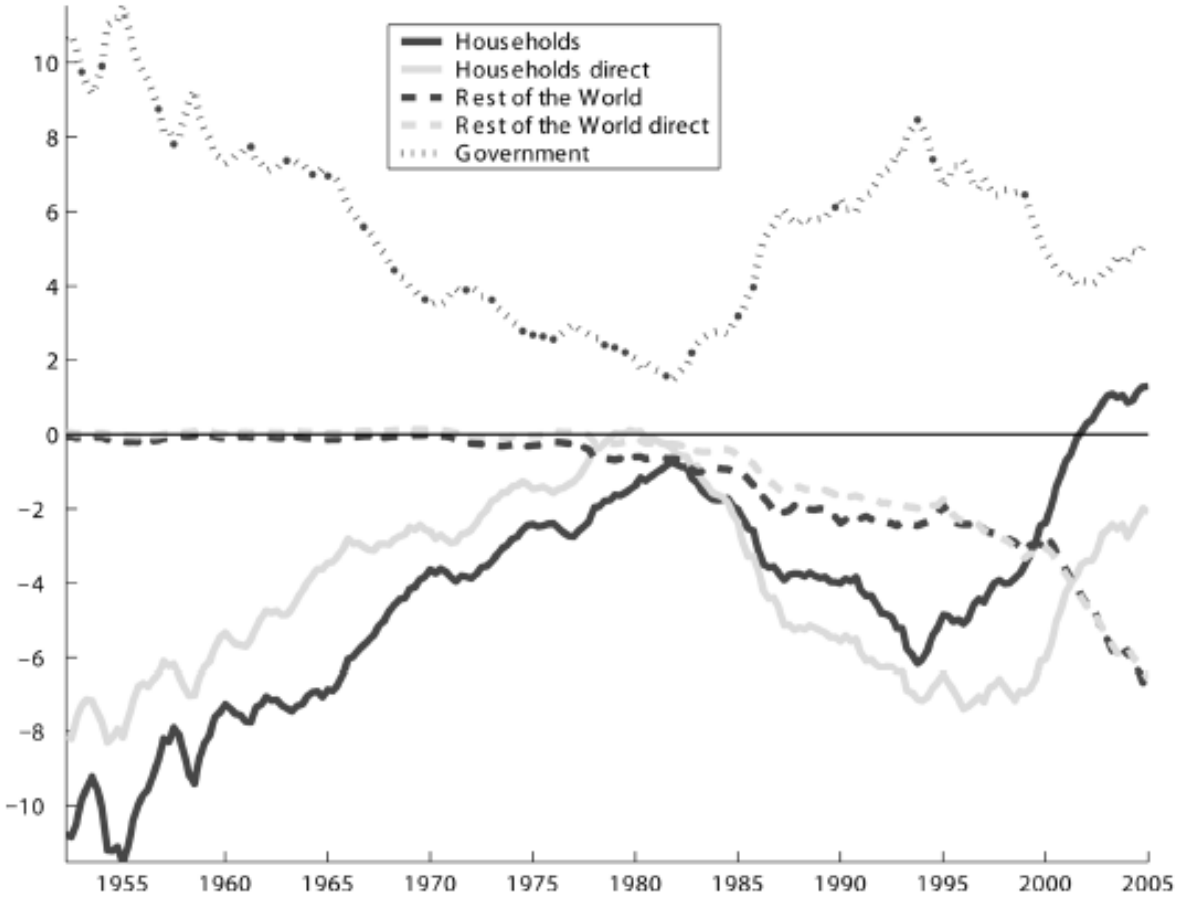


FIG. 5.—Wealth gains or losses by sector under the indexing ASAP scenario for benchmark years 1952–2004. Benchmark years are measured along the horizontal axis. Every experiment is a surprising announcement, at the end of a benchmark year, that inflation will be five percentage points per year higher than previously expected over the next 10 years. Gains and losses are in present-value terms, stated as percentages of benchmark year GDP.

Winners and Losers From Inflation: DS (2006)

WEALTH REDISTRIBUTION ACROSS SECTORS AFTER 5 PERCENT INFLATION EXPERIMENT

					ALL HOUSEHOLDS					
	GOVERNMENT		REST OF THE WORLD		Total		Losses		Gains	
YEAR	FS	IA	FS	IA	FS	IA	FS	IA	FS	IA
1989	+13.0	+5.2	−5.2	−3.2	−7.3	−2.2	−15.2	−5.7	+7.9	+3.5
2001	+10.8	+3.6	−7.7	−4.8	−1.2	+1.1	−8.2	−3.6	+7.0	+4.7

Winners and Losers From Inflation: DS (2006)

1989 Wealth Redistribution across Households after 5 Percent Inflation Experiment Relative to Average Net Worth in Each Group

	Poor		Middle Class		Rich	
Age Cohort	FS	IA	FS	IA	FS	IA
≤ 35	+14.4	+.2	+44.9	+18.9	+5.5	+2.1
36–45	+13.3	+4.0	+12.4	+5.8	−1.5	−.9
46–55	+2.2	+.6	+1.9	+1.4	−2.6	−1.6
56–65	−2.9	−.5	−5.5	−1.4	−6.4	−2.4
66–75	−6.9	−1.3	−9.9	−2.7	−6.6	−2.9
> 75	−10.4	−1.0	−15.0	−2.6	−10.8	−4.7

Note.—Gain or loss after a 5 percent inflation episode lasting 10 years as a percentage of average net worth in each group under two scenarios, full surprise and indexing ASAP, for baseline year 1989.

Winners and Losers From Inflation: DS (2006)

2001 Wealth Redistribution across Households after a 5 Percent Inflation Experiment Relative to Average Net Worth in Each Group

	Poor		Middle Class		Rich	
Age Cohort	FS	IA	FS	IA	FS	IA
≤ 35	+54.4	+19.9	+55.5	+30.9	+2.8	+2.5
36–45	+21.3	+11.5	+16.2	+11.4	+1.4	+1.2
46–55	+12.3	+4.8	+3.7	+2.9	−.8	−.4
56–65	−.1	−.4	−2.2	−1.3	−4.2	−2.2
66–75	−.3	+.1	−5.6	−1.7	−4.6	−2.2
> 75	−7.5	−.4	−9.4	−2.2	−5.4	−2.5

Note.—Gain or loss after a 5 percent inflation episode lasting 10 years as a percentage of average net worth in each group under two scenarios, full surprise and indexing ASAP, for baseline year 2001.

Fisher Channel: Doepke and Schneider (2006)

1. Main losers from inflation are bondholders, who are the old and the rich.
   - These people tend to have low MPCs.
   - In last 25 years, also foreign holders of U.S. nominal debt.
2. Main winners from inflation are young and low-to-middle-class households with fixed-rate mortgage debt.
   - These people tend to have higher MPCs.
   - Also a boon for the government.

- Seems that $Cov_I\left(\hat{MPC}_i, NNP_i\right) < 0$, so Fisher channel amplifies monetary transmission.

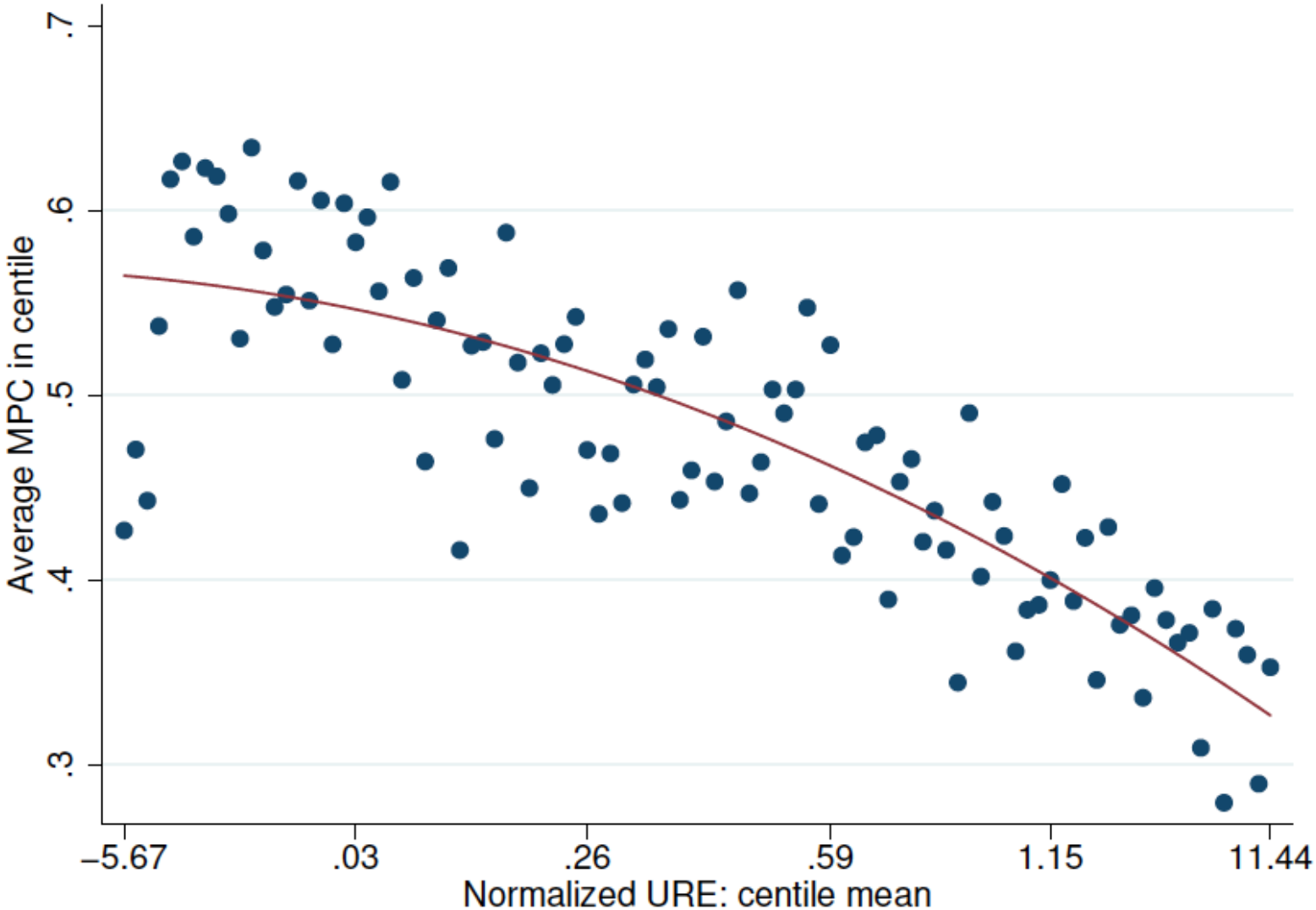
Interest Rate Exposure Channel: Auclert (2019)

- Auclert quantifies interest rate exposure channel using three sources:
  1. Italian Survey of Household Income and Wealth
  2. PSID semi-structural approach.
  3. Johnson et al. (2006) data on 2001 income tax rebate in Consumer Expenditure Survey.
- All three of these are somewhat heroic exercises.
- This is why Auclert downplays the results a bit (the contribution of the paper is the framework).

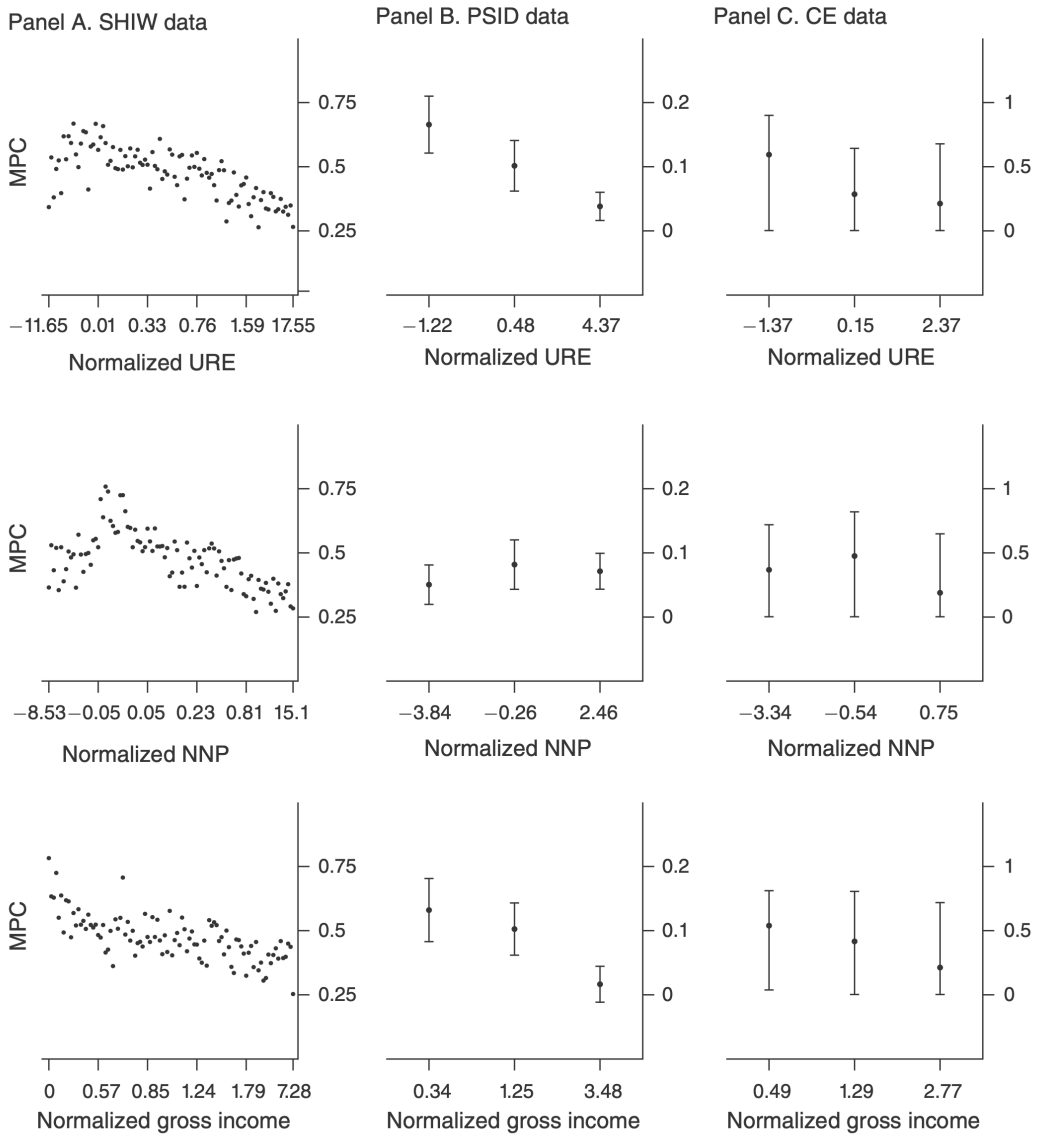
Interest Rate Exposure Channel: Auclert (2019)

- In my view best evidence is from Italy:
  - MPC from question: What fraction of hypothetical windfall would spend immediately? (Jappelli and Pistaferri, 2014)
  - Construct $URE_i = Y_i - C_i + B_i - D_i$
    - Y_i is income
    - C_i is consumption (minus house purchases, mortgage)
    - B_i are assets that mature in a period.
    - D_i are liabilities that mature in a period.
  - Both MPC and URE are noisy measures, but have them for lots of people.
- Other two approaches much noisier.

Interest Rate Exposure Channel: Auclert (2019)



All Channels In Data



Interest Rate Exposure Channel: Auclert (2019)

- To interpret, thought experiment:
  - Assume only two channels are URI and intertemporal substitution.
  - What EIS would generate interest rate exposure channel of equal size to intertemporal substitution channel?
- Estimable elasticities formula tells us compare σ to $-\varepsilon_R/S$.
  - In three studies in data this is between 0.1 and 0.4.
  - Typical estimates of EIS are around $\sigma = 0.5$.
  - Auclert concludes that redistribution effect due to real rate exposures may be as important as substitution effect in explaining aggregate consumption response to a change in real interest rates.

Monetary Transmission With Adjustable-Rate Mortgages

- The United States primarily has fixed rate mortgages.
  - What would happen if switched to adjustable rate?
- URE's would be more negative for people with high mortgage debt (tend to have higher MPC).
  - Adjustable-rate mortgages "mature" each period, so more maturing debt and lower URE.
  - Fixed-rate mortgages do not mature, so URE closer to zero.
- Calibrated heterogeneous agent model: Monetary policy would be twice as powerful with all ARMs.
- Formalizes folk wisdom at Bank of England (where mortgages all ARMs) that monetary policy works through MPCs interacting with wealth effects that occur as size of mortgage interest payments changes.

Auclert (2019): Take Aways

- Important question, fresh sufficient statistic approach.
  - Ideal JMP: Shows broad mix of skills.
  - Importance of having a framework to interpret micro-data.
  - Sufficient statistics may be useful in other contexts.
- Drawbacks
  1. Shocks unanticipated. Why don't people hedge?
  2. Sufficient statistics only works with incomplete markets with transitory shocks.
  3. Focus on change in R. Nothing about credit supply, risk premia, effects of changing collateral prices, or refinancing.
  4. No investment.
  5. Measuring URE in data is difficult and requires lots of assumptions. Best he can, but still heroic.
  6. Sufficient statistics still in some sense "partial equilibrium" because need GE model to get $\frac{dY}{dR}$, $\frac{dY_i}{dR}$, and $\frac{dP}{dR}$.