Household Balance Sheet Channels of Monetary Policy: A Back of the Envelope Calculation for the Euro Area

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Introduction

What we do: Quantifying heterogeneity in MP transmission to C

- Use a toy HANK model to ...
- Quantify size and heterogeneity in MP transmission channels to consumption
- Reducing Hh heterogeneity to three 'hand-to-mouth' groups, which differ in:
  - Marginal propensities to consume (MPC) out of income and wealth
  - Composition of wealth and income
  - Sensitivity of their own earnings to fluctuations in aggregate labor income
- Use micro (HFCS, EU LFS) and macro data for European countries

Preview of results

- Indirect general equilibrium channels account for 60% of the total, IES only 40%
- Wealthy and poor HtM (constrained) benefit the most from easing
- Mostly via indirect income and housing channels
- Cross-country heterogeneity: Spain more sensitive than Germany

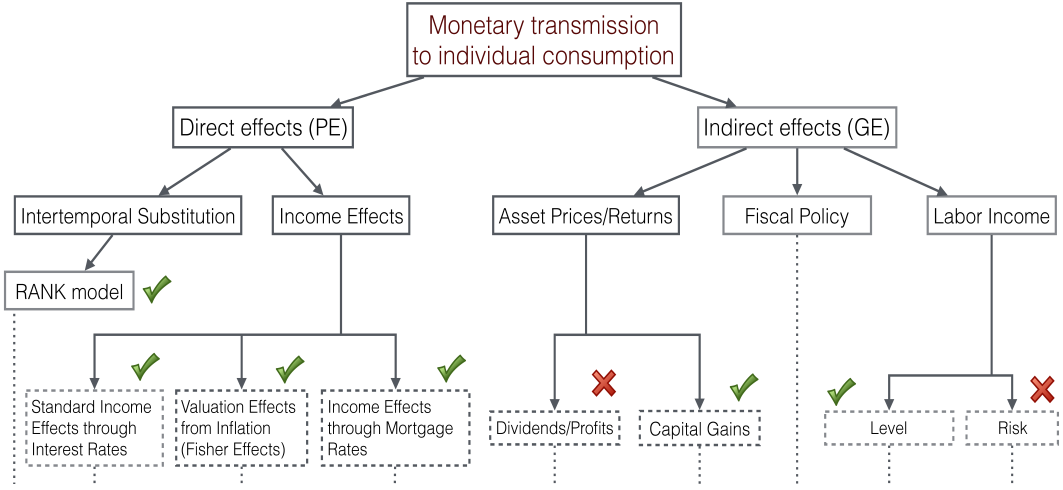
Quantifying heterogeneity in MP transmission channels to C

- Direct, partial equilibrium effects [40%]
  - Intertemporal substitution (IES)—standard New Keynesian 'RANK'
  - Net interest rate exposure (NIE)—Auclert
- Indirect, general equilibrium effects [60%]
  - Income effect (INC)
  - Net nominal positions (NOM)—Fisher
  - Housing and Stock wealth effects out of capital gains (CAP)

$$dc^{TOT} = \underbrace{dc^{IES} + dc^{NIE}}_{\text{Direct, PE effects}} + \underbrace{dc^{INC} + dc^{NOM} + dc^{CAP}}_{\text{Indirect, GE effects}}$$

Quantifying MP transmission channels in HANK

Moll (2019)



Framework

Approach

- One-time, transitory unexpected 'MIT' shock to policy rate $r \to C$ a la Auclert (2019)
- Household problem without uncertainty:
  - CRRA utility (IES $= 1/\gamma$)
  - Inelastic labor supply / demand-determined hours
  - FOCs + budget constraints + differentiation [3 HtM groups of households]
  - Closed form expression for each transmission channel
- Separate analysis for non-, poor- and wealthy hand-to-mouth (HtM) households
  - Different MPCs, portfolios, exposures to aggregate fluctuations
- Cross-sectional micro data + VAR to measure key objects

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Non-hand-to-mouth households [aka 'unconstrained']

$$dc_n^{TOT} = \underbrace{dc_n^{IES} + dc_n^{NIE}}_{\text{Direct, PE effects}} + \underbrace{dc_n^{INC} + dc_n^{NOM} + dc_n^{CAP}}_{\text{Indirect, GE effects}}$$

Direct effects of a change in r: IES and NIE

- Direct effects (DIR): keeping all other prices fixed

1. Intertemporal substitution (IES)
2. Net interest rate exposure (NIE)

$$\Big\} \quad dc^{DIR} = dc^{IES} + dc^{NIE}$$

$$dc^{IES} = -\frac{1}{\gamma}(1-\mu)c\ dr$$

$$dc^{NIE} = \mu\,(y - c + b)\ dr$$

- y: earnings, c: consumption, b: interest-rate sensitive assets minus liabilities
- μ: marginal propensity to consume out of transitory income
- dc^{IES} as in rep agent NK models
- dc^{NIE} 'cash flow channel' (similar to Auclert)

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Indirect effects through labor income y

- Aggregate demand effects (INC):

$$\begin{aligned} dc^{INC} &= \mu \, dy \\ &= \mu \, \varepsilon_{y,Y} \left(\frac{y}{Y} \right) dY \end{aligned}$$

- dY: change in aggregate labor income induced by dr
- $\varepsilon_{y,Y}$: elasticity of individual income y to aggregate labor income Y
- Heterogeneous sensitivity to cycle (age, industry, occupation, etc)
- Large if elasticity is positively correlated with MPC μ and y/Y share
- As in Bilbiie, Patterson, ...

Indirect effects through inflation

- Fisher effect (NOM):

$$dc^{NOM} = -\mu \; m \; \frac{dp}{p}$$

- m: nominal net worth (ie, cash + bank deposits − total debt)
- dp/p: inflation induced by the monetary policy shock
- As in Doepke and Schneider, ...

Indirect effects through capital gains on illiquid assets

- Capital gains (CAP) on real assets (ie housing, stocks)
- Only fraction $\lambda \ll 1$ of households adjusts (others unaffected); for adjusters:

$$dc^{CAP} = \mu \, k \, dq$$

- dq: capital gain induced by dr, k: units of the asset, q: its price
- $\lambda \times \mu$: aggregate MPC out of the illiquid capital gains
- MPC for illiquid gains $\ll$ MPC for liquid assets: $\lambda \times \mu \ll \mu$, as in Ganong and Noel

Summary of monetary transmission to 'unconstrained' households (c_n):

$$dc_n^{TOT} = dc_n^{IES} + dc_n^{NIE} + dc_n^{INC} + dc_n^{NOM} + dc_n^{CAP}$$

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Poor and wealthy hand-to-mouth

$$dc^{TOT} = \underbrace{dc^{NIE}}_{\text{Direct, PE effect}} + \underbrace{dc^{INC} + dc^{NOM} + dc^{CAP}}_{\text{Indirect, GE effects}}$$

Poor hand-to-mouth households

- Small holdings of liquid assets (if positive) or close to the credit limit (if negative) and no holdings of illiquid assets
- Consumption is dictated by their budget constraint with unsecured debt limit $b = -\underline{b}$ binding:

$$c = -r\underline{b} + y$$

- $\mu = 1$ because hand-to-mouth
- **Monetary transmission to poor HtM households (c_p):**

$$dc_p^{TOT} = dc_p^{NIE} + dc_p^{INC} + dc_p^{NOM}$$

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Wealthy hand-to-mouth households

- Small holdings of liquid assets (if positive) or close to the credit limit (if negative), but positive holdings of illiquid assets
- On their collateral constraint: $\Delta = \theta q k$
- **Monetary transmission to wealthy HtM households (c_w):**

$$dc_w^{TOT} = dc_w^{NIE} + dc_w^{INC} + dc_w^{NOM} + dc_w^{CAP}$$

with:

$$dc_w^{CAP} = \lambda \, \mu \, \theta \, k \, dq$$

  - $\lambda \times 1 \times \theta$: aggregate MPC out of the illiquid capital gains (because $\mu = 1$, again, because HtM)

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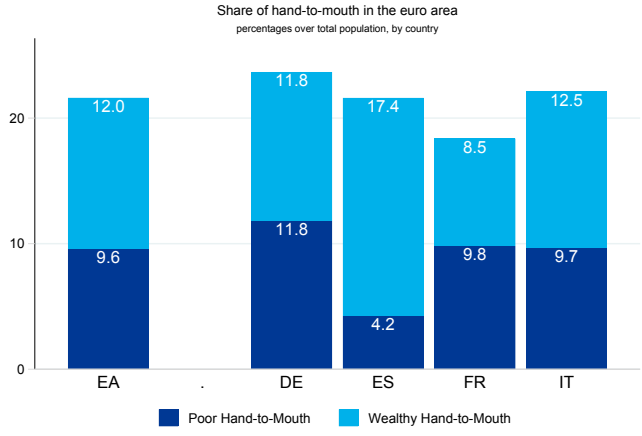
Empirical implementation

Ingredients of the decomposition

1. Shares of three types of households
2. Their MPCs (μ)
3. Their balance sheet composition ($b, m, k, \dots$):
    a. NIE: 'Auclert'
    b. NOM: 'Fisher'
    c. CAP: Housing and stock-market wealth
4. Exposure of their earnings to the cycle ($\varepsilon_{y,Y}$)
5. The aggregate response of prices to the monetary shock

1. Shares of hand-to-mouth households



Source: HFCS wave 2. Countries: DE, ES, FR, IT and Euro area.

- US: Poor HtM: 10% and Wealthy HtM: 25%

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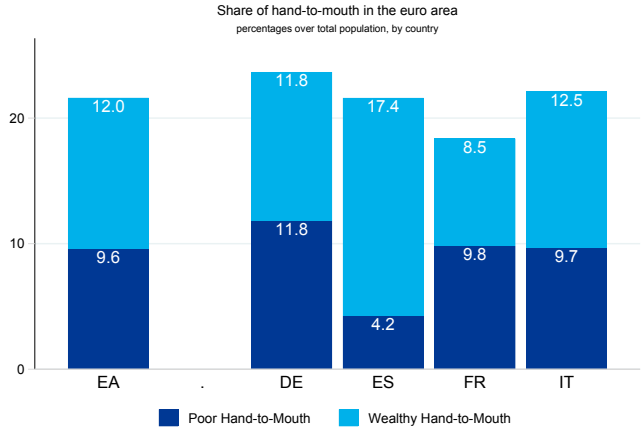

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2. MPCs out of income and wealth

	Marginal Propensity to Consume (annual)		
Household Type	Income μ	Housing $\lambda\,\mu\,\theta$	Stocks $\lambda\,\mu\,\theta$
Poor HtM	0.50	–	–
Wealthy HtM	0.50	0.07	0.07
Non HtM	0.05	0.01	0.01

- Calibrated from existing literature
- Implied aggregate MPC out of transitory income $\simeq 0.20$ (low end)
- Implied aggregate MPC out of housing/stocks $\simeq 0.025$
- IES $= 0.5$

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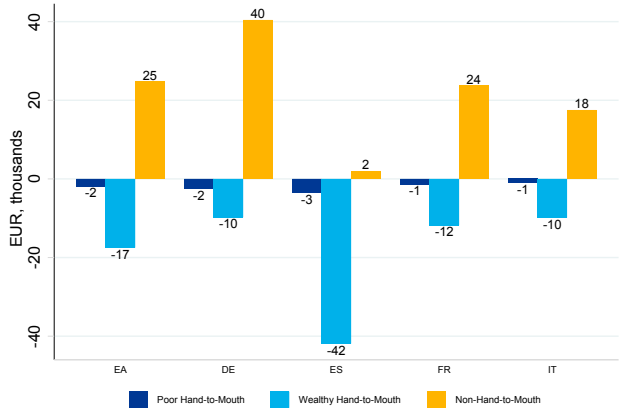
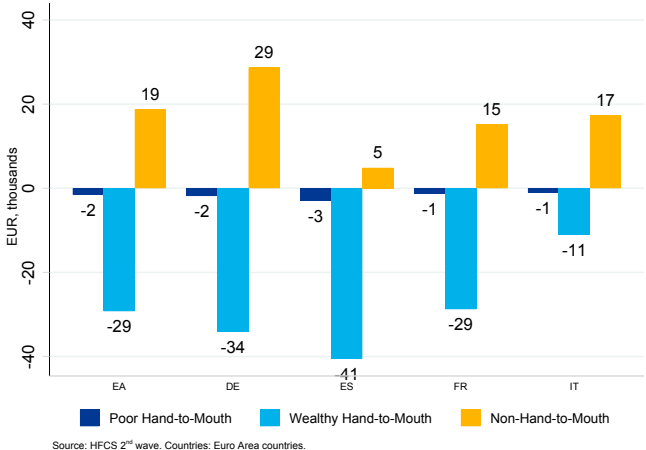
3.a Balance sheet: Net interest rate exposures (NIE)



Source: HFCS 2nd wave. Countries: Euro Area countries.

- Germany (DE): large liquid savings [nHtM] + FRMs [wHtM]
- Spain (ES): many homeowners + large ARMs [wHtM]

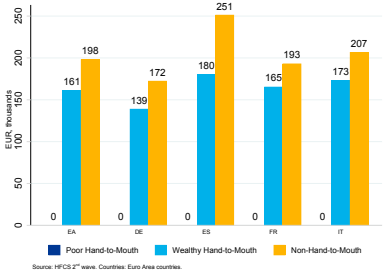
3.b Balance sheet: Net nominal positions (NOM)



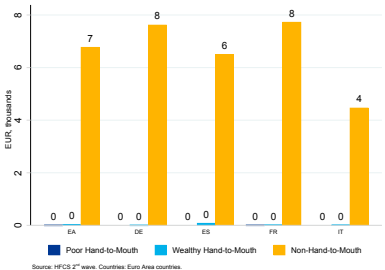
Source: HFCS 2nd wave. Countries: Euro Area countries.

- In Italy, most households are outright homeowners

3.c Balance sheet: Stock-market and housing wealth (CAP)



Housing



Stocks

- All illiquid household wealth is in housing
- Stocks are a smaller share of net worth in EA compared to US
- Missing stock-market wealth ($\sim$20–40%) boosted to match aggregates

4. ε: Systematic exposure to aggregate fluctuations E_t

1. From HFCS, estimate *Prob*(HtM type) as function of (persistent) observables
2. Impute *Prob* to each individual in quarterly EU Labour Force Survey
3. Estimate, for employment rates, by each HtM group g: Figure

$$e_t(g) = \alpha(g) + \beta(g) \cdot t + \varepsilon(g) \cdot E_t + \nu_t(g)$$

	Germany	Spain	France	Italy
Poor HtM	1.7	2.9	1.3	2.1
Wealthy HtM	0.3	1.6	1.6	1.7
Non-HtM	1.0	0.7	0.8	0.8

5. VAR responses of aggregates to monetary shock

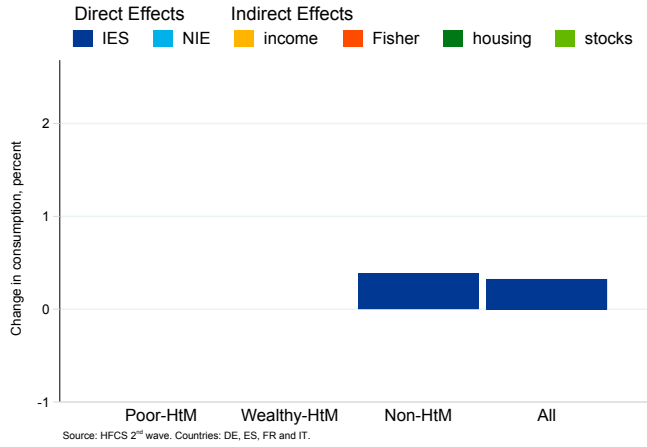
- High-frequency identification, external instruments *(Gertler–Karadi)*
- *Altavilla et al.* dataset: Euro Area Monetary Policy Event Study Database
- Responses to 100BP easing in policy rate (60BP averaged over first year) ▸ VAR IRFs

	Germany	Spain	France	Italy
Earnings (%)	0.5	1.6	0.7	1.8
Inflation Rate (p.p.)	0.1	0.6	0.3	0.1
House Prices (%)	0.0	5.0	0.3	1.4
Stock Prices (%)	27.0	21.0	24.0	26.0

- Spanish macroeconomy much more sensitive than German one (like in *Calza et al.*)
- Huge response of stock prices (common, *Corsetti et al.*)

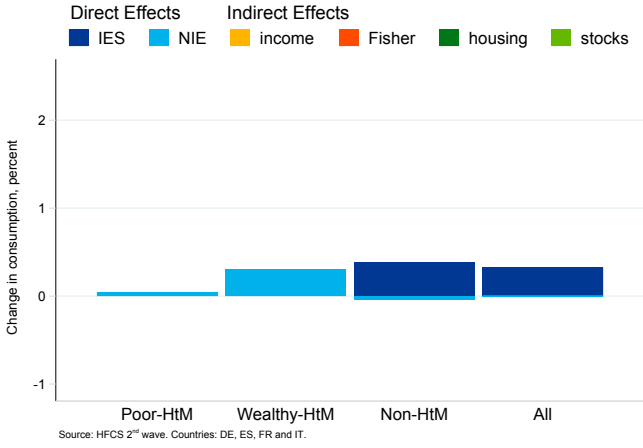
Decomposition results

Decomposition: Euro area



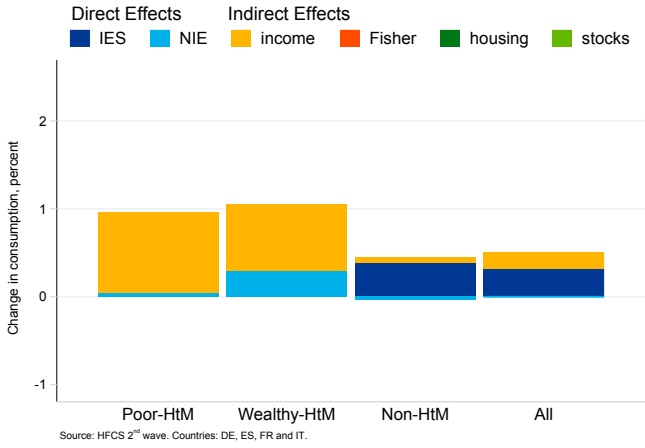
- Direct IES channel relevant for non-HtM

Decomposition: Euro area



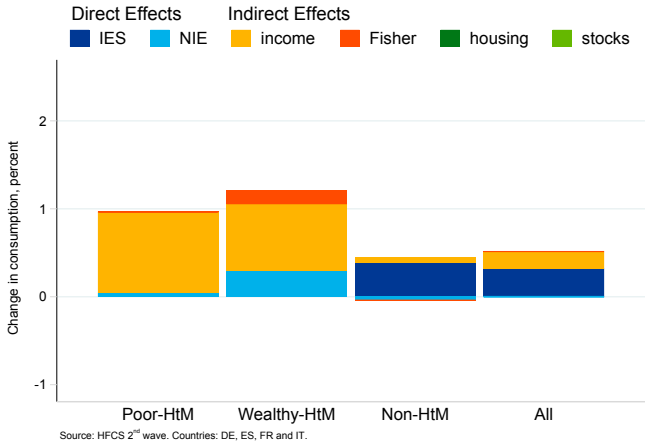
- Direct net interest rate exposure (NIE) stimulates wealthy HtM, 'ARMs'

Decomposition: Euro area



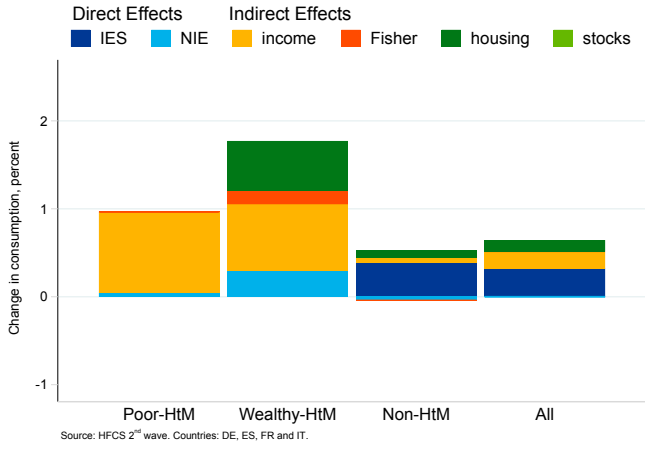
- Indirect income channel stimulates poor and wealthy HtM

Decomposition: Euro area



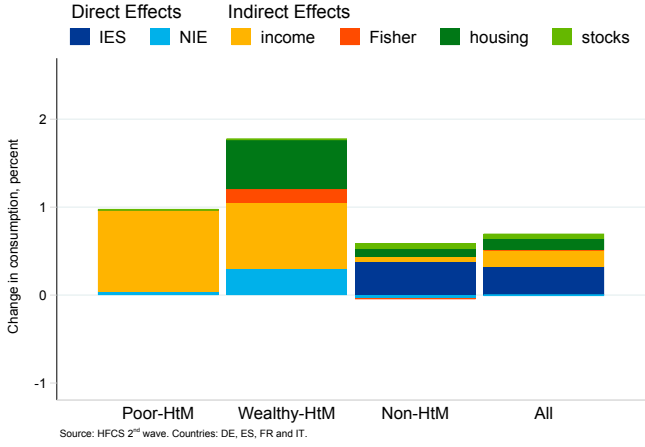
- Indirect Fisher channel small, matters a bit for wealthy HtM

Decomposition: Euro area



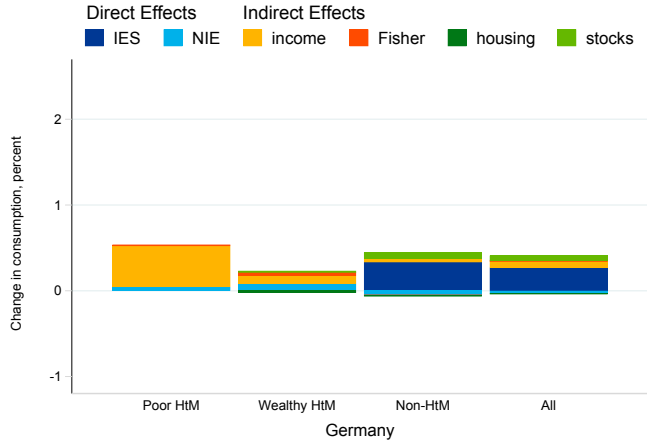
- Indirect housing channel matters for wealthy HtM and non-HtM

Decomposition: Euro area



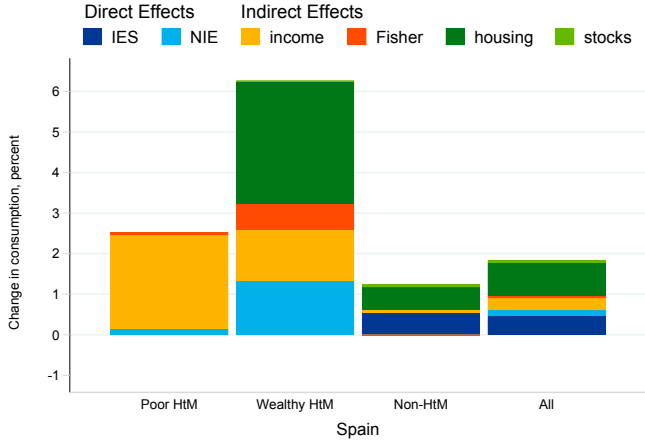
- Indirect GE channels account for 60% of the total
- Wealthy and poor HtM benefit the most from easing via indirect channels
- Mostly income and housing

Decomposition: Germany



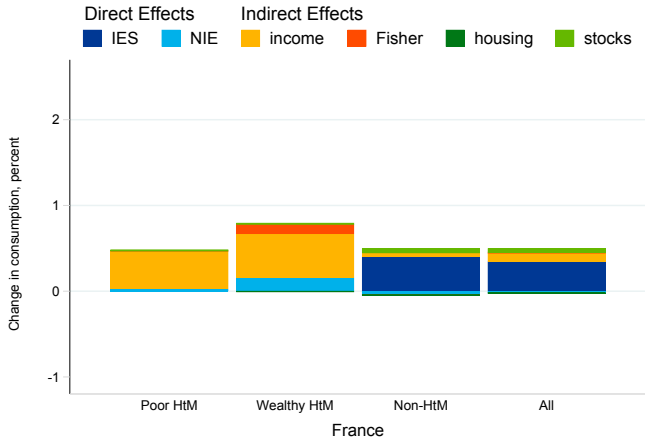
- Traditional transmission mechanism dominated by IES
- Roughly equal impact across all groups

Decomposition: Spain



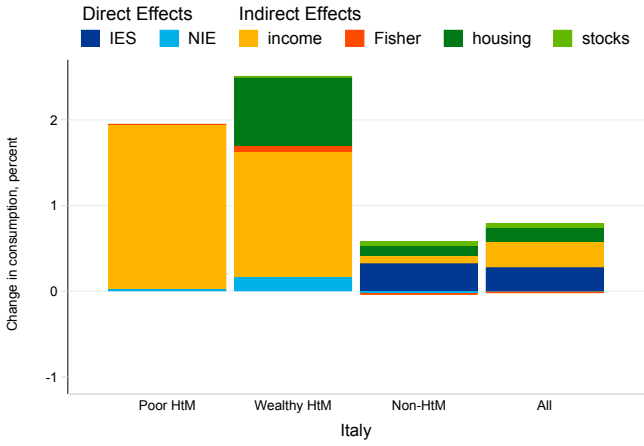
- Housing wealth effect is dominant; income effect also strong
- NIE (ARMs) and Fisher effects matter for debtors, wealthy HtM
- HtM households benefit the most from easing

Decomposition: France



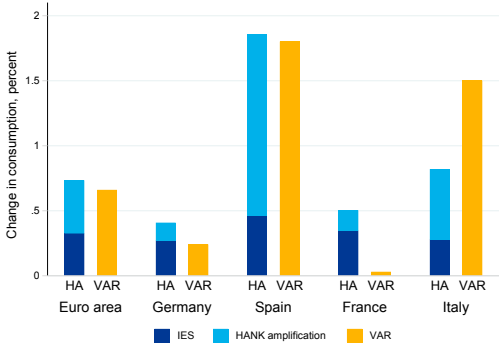
- Similar to Germany

Decomposition: Italy



- Similar to Spain, large income effect

Impact on aggregate C: VAR vs HA model decomp vs RA (IES)



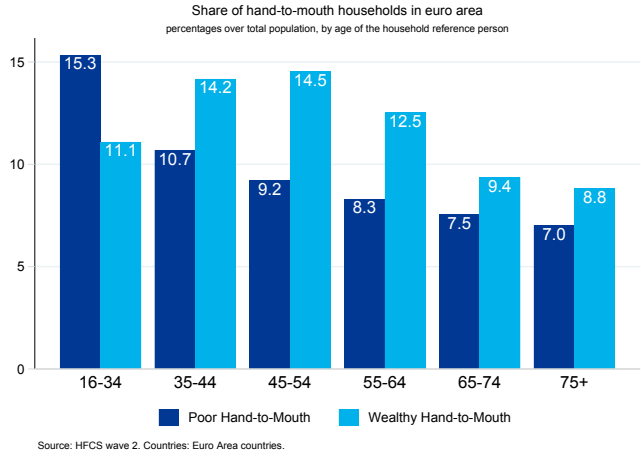
- Two 'independent' estimates of the impact on aggregate C: HA model and VAR
- Obtained with different methodologies
- VAR and HA line up, which offers some credibility to the exercise
- The HANK block amplifies the shock compared to the RA model

Conclusions

- Household balance sheet channels of monetary policy
- Simple back of the envelope calculation that offers guidance on:
  - Relative size of various transmission channels [Indirect $>$ Direct]
  - Heterogeneous impact across types of households [Constrained $>$ Unconstrained]
  - Heterogeneous impact across countries hit by same shock [ES $>$ DE]
  - Role of housing, mortgage market and labor market institutions
- Lesson for big DSGE models
  - Model both the top and bottom of distribution accurately
  - Enrich HANK with credible asset price dynamics

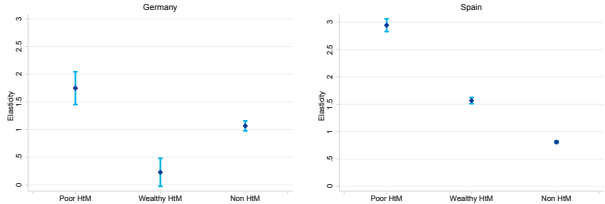
Thanks!

1. Shares of hand-to-mouth households by age



Poor HtM: young Wealthy HtM: middle-aged [own a house]

Exposure of household earnings to the cycle $\varepsilon_{y,Y}$, by HtM status



(a) Germany (b) Spain

(c) France (d) Italy

Source: EU Labour Force Survey, 2005–2018

Back

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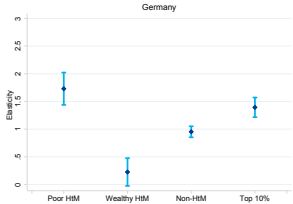

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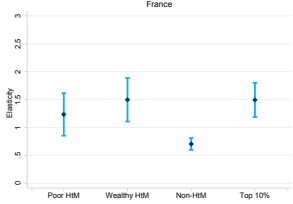
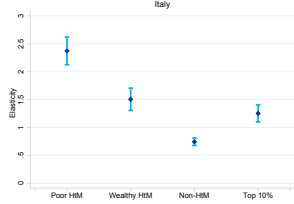


(c) France



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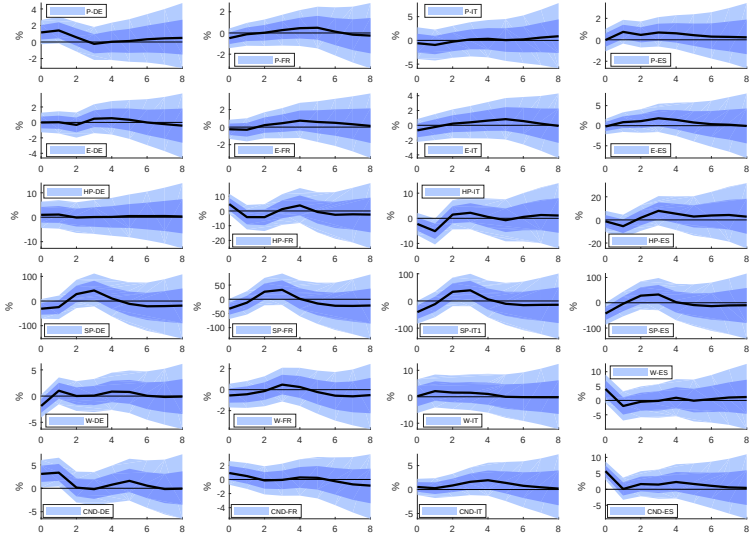
Impulse responses

Back



Impact on aggregate C:
VAR responses vs HA model decomposition vs RA

- Two 'independent' estimates of the impact on aggregate C: HA model and VAR
- Obtained with different methodologies

Aggregate Consumption	Germany	Spain	France	Italy
VAR response (%)	0.24	1.8	0.03	1.5
HA Model Decomposition (%)	0.3	1.8	0.4	0.8
Representative Agent—IES only (%)	0.2	0.2	0.2	0.2

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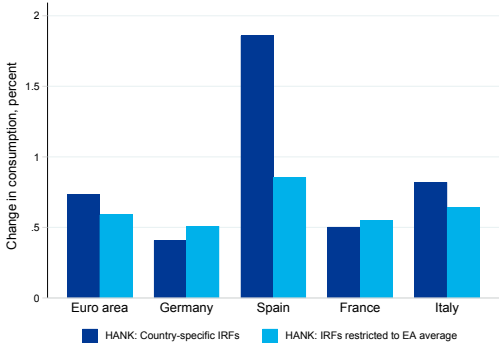
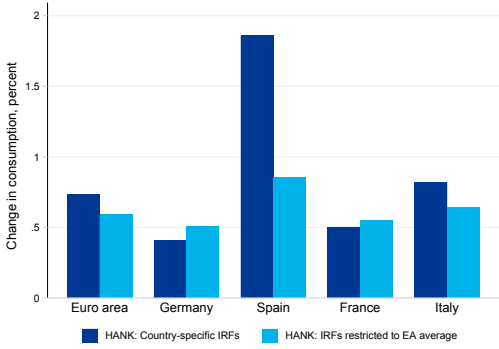
Role of heterogeneity: Aggregate responses vs household portfolios



- HANK: Bulk of cross-country differences in aggr C driven by differences in IRFs
- But HANK amplifies RA even for restricted impulse responses...
- ...and more so in Spain than in Germany

Role of heterogeneity: Aggregate responses vs household portfolios



- HANK: Bulk of cross-country differences in aggr C driven by differences in IRFs
- But HANK amplifies RA even for restricted impulse responses...
- ...and more so in Spain than in Germany

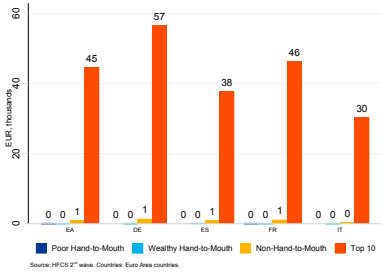
Zooming in on the top 10%

Top 10%: Isolating the rich from the rest

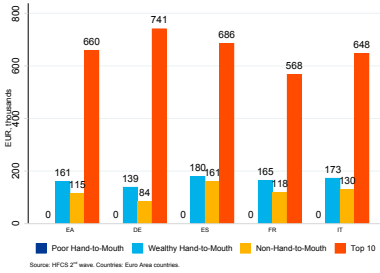
- Separate the top 10% in net worth from the rest of the non HtM
- Same (low) MPC as Non-HtM
- Impute to them the missing stock-market wealth
- Recompute their earnings exposures to aggregate cycle

	Germany	Spain	France	Italy
Poor HtM	1.7	2.9	1.3	2.1
Wealthy HtM	0.3	1.6	1.6	1.7
Non-HtM	0.9	1.0	0.7	0.7
Top 10%	1.4	0.4	1.5	1.2

Top 10%: Stock-market and housing wealth



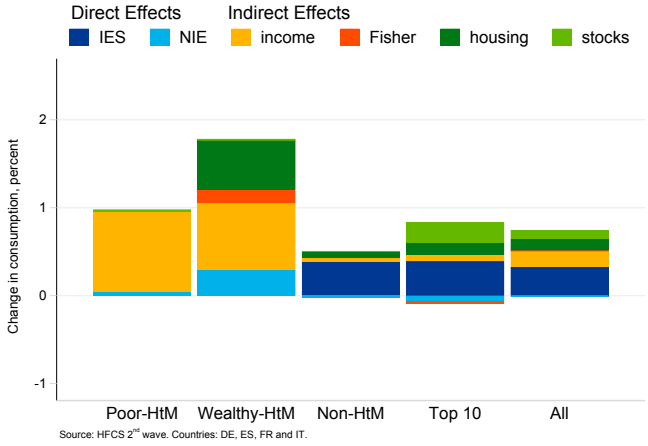
Stocks



Housing

- Stock-market wealth is small even for the richest in the EA
- The wealth of the richest in the EA is all in housing

Top 10%: Decomposition for the euro area



- Richest lose somewhat from NIE + NOM (Fisher)
- They gain a lot through asset prices (but small MPC)