

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

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The views are those of the authors, and do not necessarily reflect those of the European Central Bank.

# 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

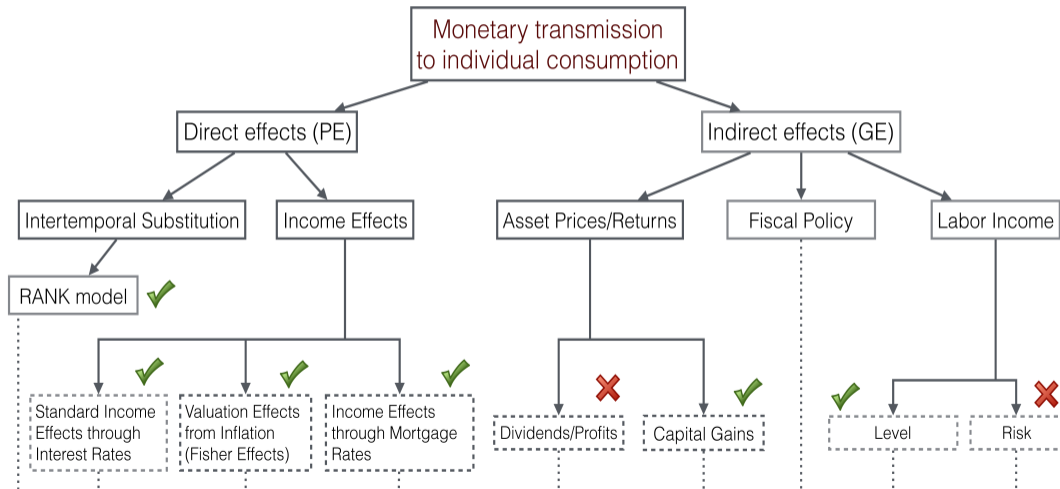
## Preview of results

- ▶ 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)

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



# Framework

# Approach

- ▶ One-time, transitory unexpected 'MIT' shock to policy rate  $r \rightarrow C$  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

$$\left. \begin{array}{l} 1. \text{ Intertemporal substitution (IES)} \\ 2. \text{ Net interest rate exposure (NIE)} \end{array} \right\} dc^{DIR} = dc^{IES} + dc^{NIE}$$

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

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

- ▶  $y$ : earnings,  $c$ : consumption,  $b$ : **interest-rate sensitive** assets minus liabilities
- ▶  $\mu$ : 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  $\mu$  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 ( $c_p$ ):**

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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:

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

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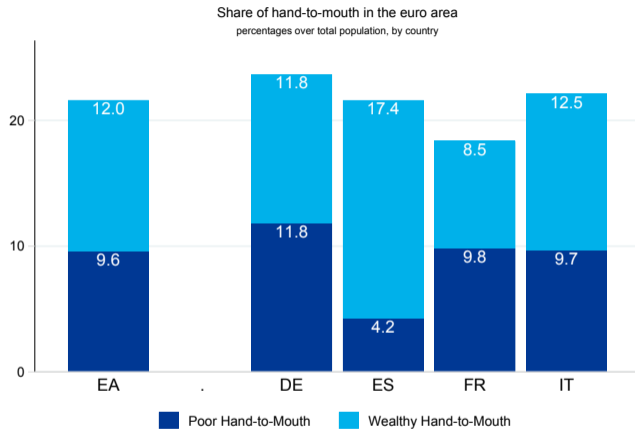
# Empirical implementation



# Ingredients of the decomposition

1. Shares of three types of households
2. Their MPCs ( $\mu$ )
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

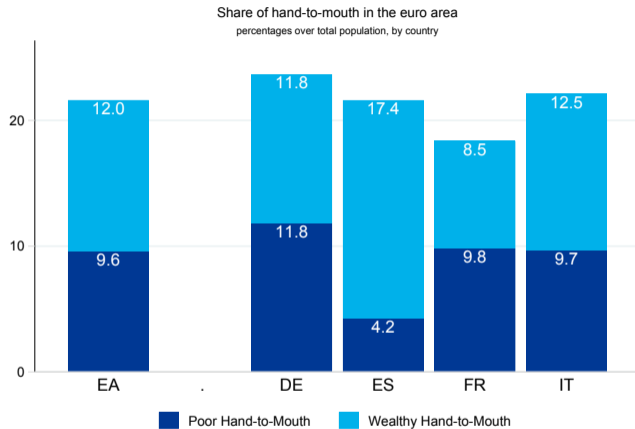
# 1. Shares of hand-to-mouth households



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

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

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## 2. MPCs out of income and wealth

Household Type	Marginal Propensity to Consume (annual)		
	Income $\mu$	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

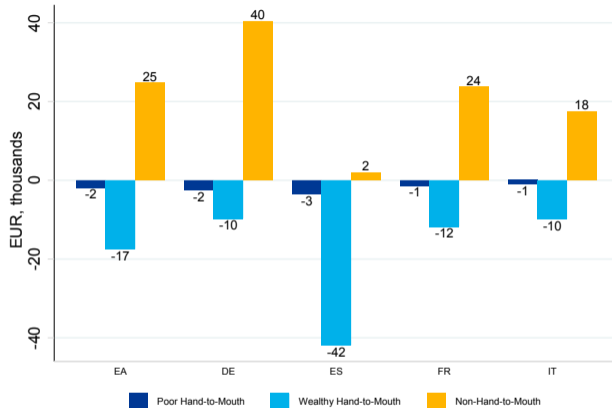
- ▶ Calibrated from existing literature
- ▶ Implied aggregate MPC out of transitory income  $\simeq 0.20$  (low end)
- ▶ Implied aggregate MPC out of housing/stocks  $\simeq 0.025$
- ▶ IES = 0.5

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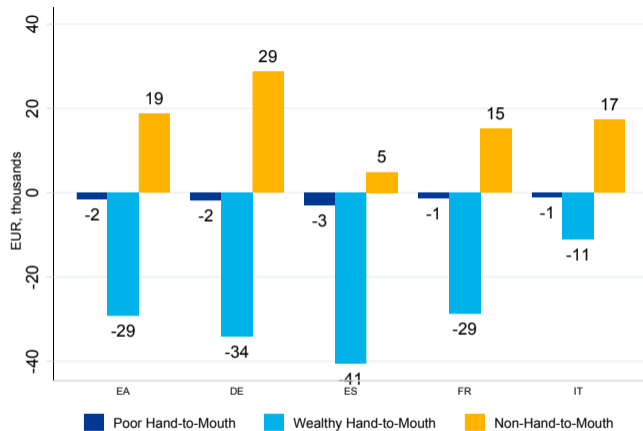
## 3.a Balance sheet: Net interest rate exposures (NIE)



Source: HFCS 2<sup>nd</sup> wave. Countries: Euro Area countries.

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

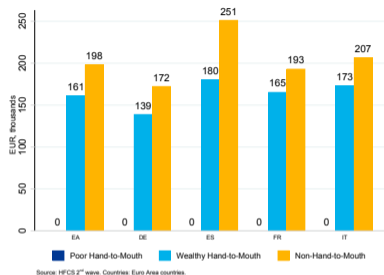
## 3.b Balance sheet: Net nominal positions (NOM)



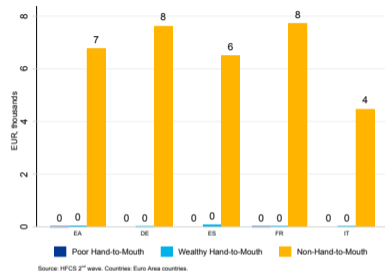
Source: HFCS 2<sup>nd</sup> wave. Countries: Euro Area countries.

- ▶ 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 (~20–40%) boosted to match aggregates



## 4. $\varepsilon$ : Systematic exposure to aggregate fluctuations $E_t$

1. From HFCS, estimate  $Prob(\text{HtM type})$  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

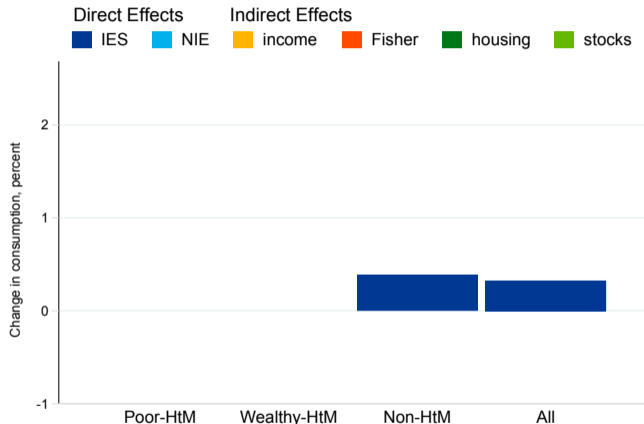
- ▶ High-frequency identification, external instruments (*Gertler–Karadi*)
- ▶ *Altavilla et al.* dataset: Euro Area Monetary Policy Event Study Database
- ▶ Responses to 100BP easing in policy rate (60BP averaged over first year) ▶ VAR IRFs

	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

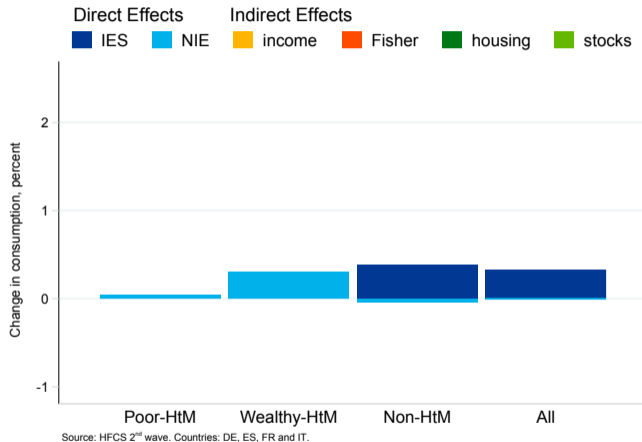
# Decomposition: Euro area



Source: HFCS 2<sup>nd</sup> wave. Countries: DE, ES, FR and IT.

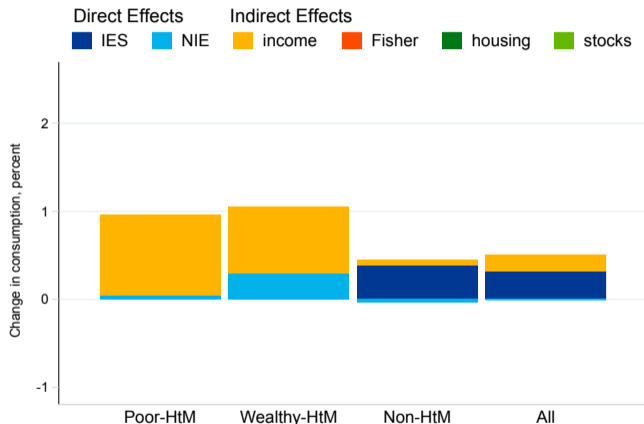
- ▶ Direct IES channel relevant for non-HtM

# Decomposition: Euro area



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

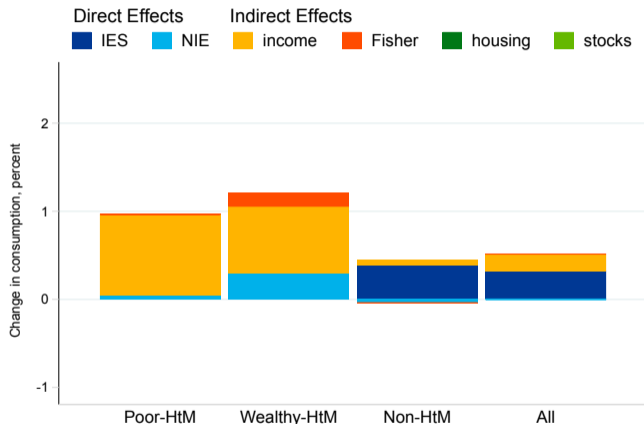
# Decomposition: Euro area



Source: HFCS 2<sup>nd</sup> wave. Countries: DE, ES, FR and IT.

► Indirect **income** channel stimulates poor and wealthy HtM

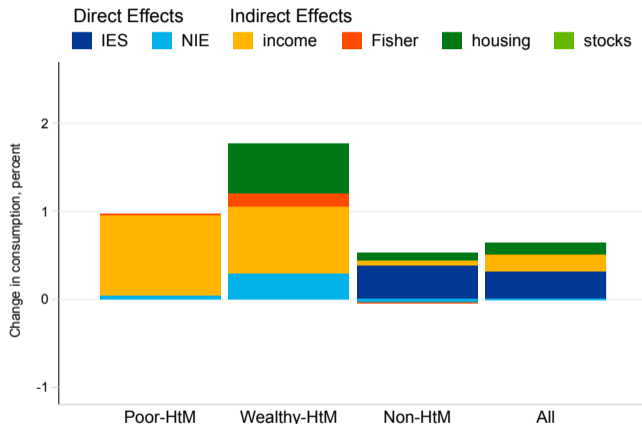
# Decomposition: Euro area



Source: HFCS 2<sup>nd</sup> wave. Countries: DE, ES, FR and IT.

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

# Decomposition: Euro area

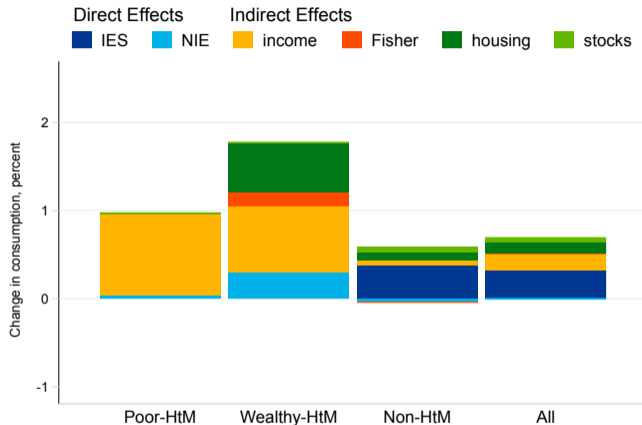


Source: HFCS 2<sup>nd</sup> wave. Countries: DE, ES, FR and IT.

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



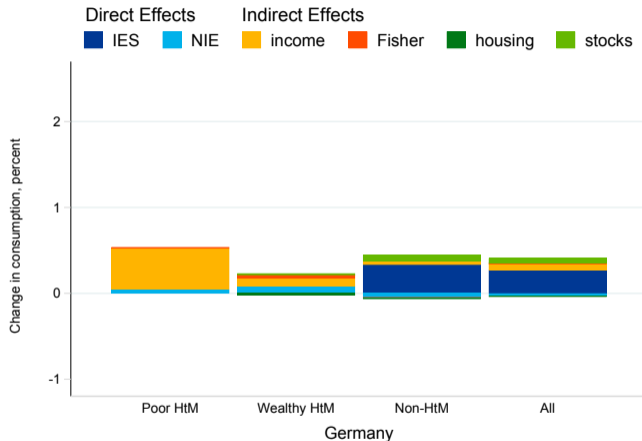
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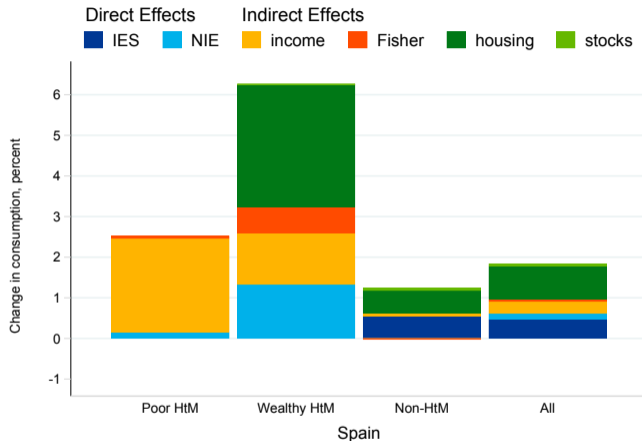
- ▶ Indirect GE channels account for 60% of the total
- ▶ Wealthy and poor HtM benefit the most from easing via indirect channels
- ▶ Mostly income and housing

# Decomposition: Germany



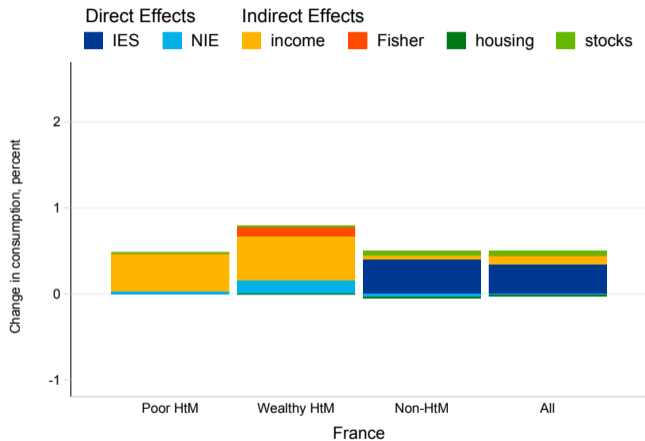
- ▶ Traditional transmission mechanism dominated by IES
- ▶ Roughly equal impact across all groups

# Decomposition: Spain



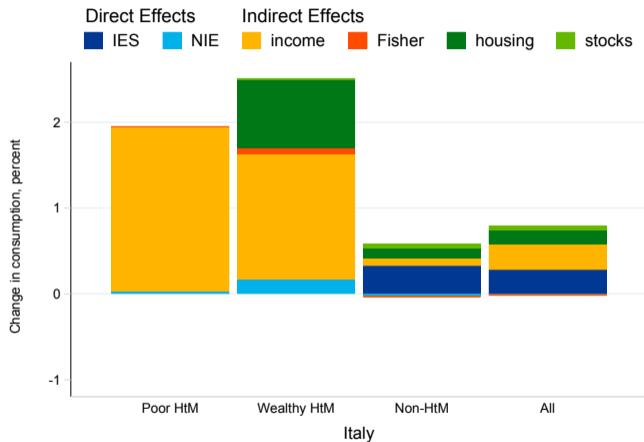
- ▶ Housing wealth effect is dominant; income effect also strong
- ▶ NIE (ARMs) and Fisher effects matter for debtors, wealthy HtM
- ▶ HtM households benefit the most from easing

# Decomposition: France



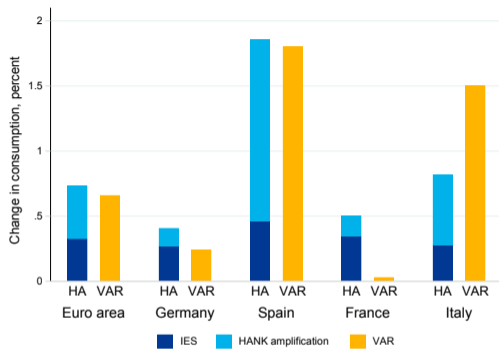
► Similar to Germany

# 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

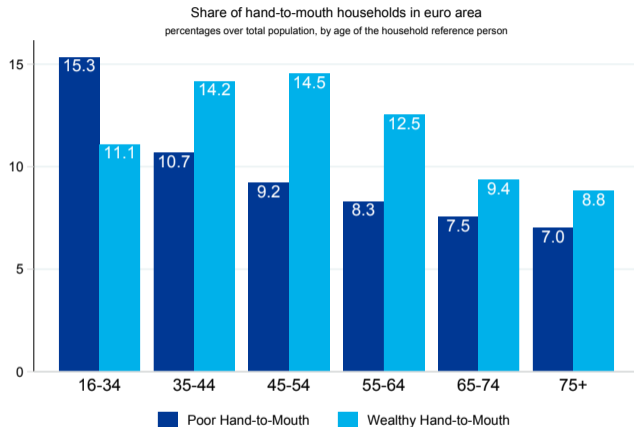
# Conclusions

- ▶ 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

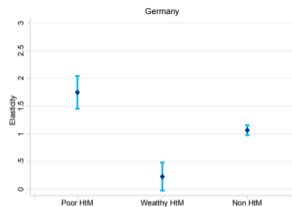


Source: HFCS wave 2. Countries: Euro Area countries.

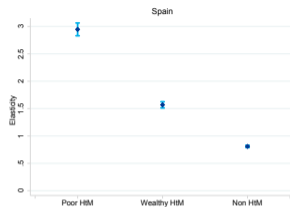
Poor HtM: young

Wealthy HtM: middle-aged [own a house]

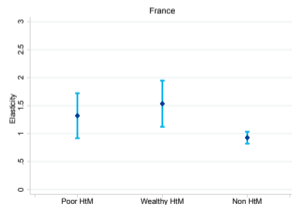
# Exposure of household earnings to the cycle $\varepsilon_{y,Y}$ , by HtM status



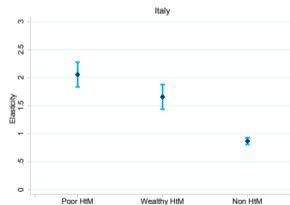
(a) Germany



(b) Spain

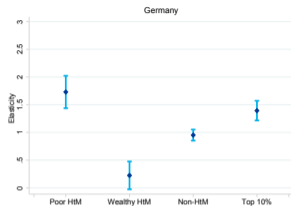


(c) France

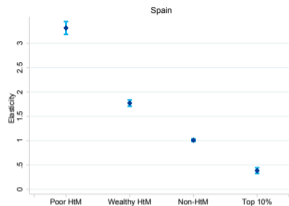


(d) Italy

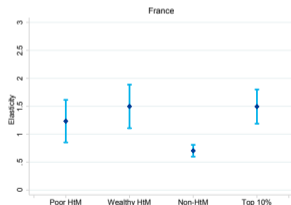
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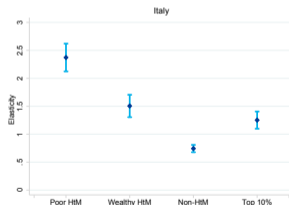
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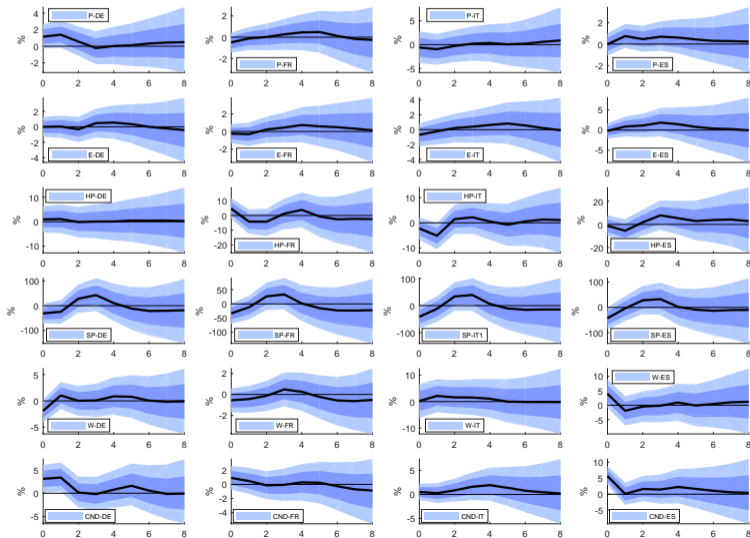
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# Impulse responses

▶ Back



## Impact on aggregate C:

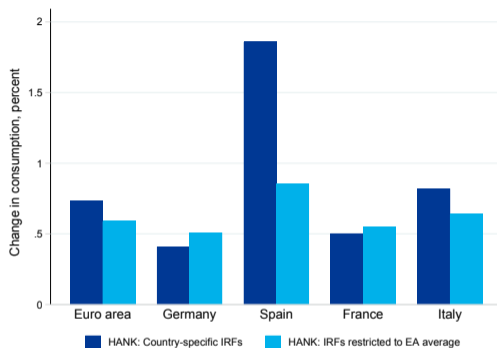
### VAR responses vs HA model decomposition vs RA

- ▶ 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

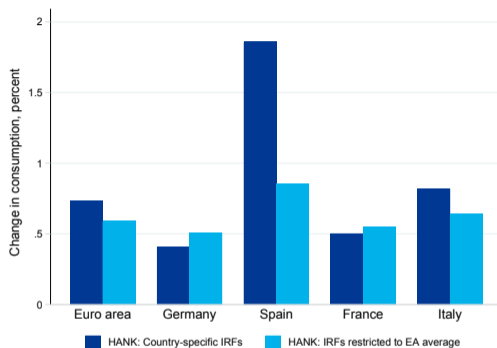
- ▶ VAR and HA line up, which offers some credibility to the exercise
- ▶ The HANK block amplifies the shock compared to the RA model

## 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



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# Zooming in on the top 10%

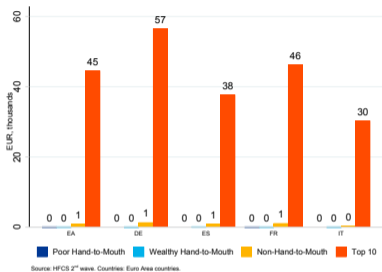


## Top 10%: Isolating the rich from the rest

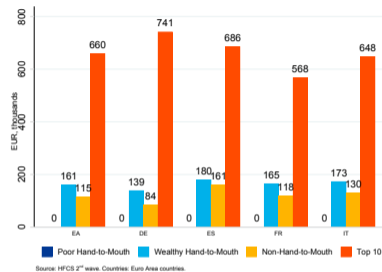
- ▶ Separate the top 10% in net worth from the rest of the non HtM
- ▶ Same (low) MPC as Non-HtM
- ▶ Impute to them the missing stock-market wealth
- ▶ Recompute their earnings exposures to aggregate cycle

	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



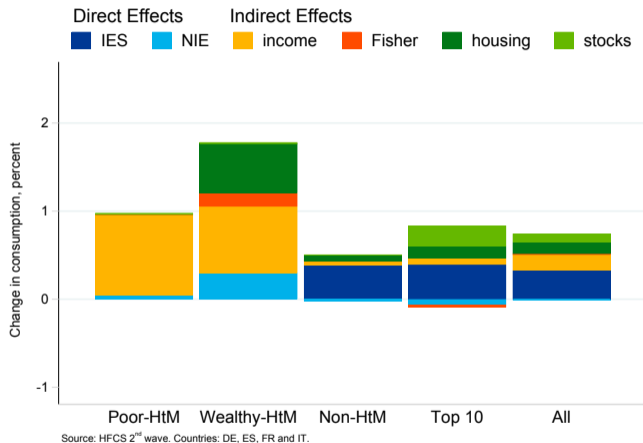
Stocks



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)