How Does Monetary Policy Affect Income and Wealth Inequality?

Evidence from the Euro Area

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Disclaimer

The views expressed in this presentation are those of the authors and do not necessarily reflect the views of the European Central Bank and the Eurosystem.

Debate on impact of quantitative easing on inequality

- ECB has since 2015 undertaken quantitative easing (QE) ("Asset Purchase Programmes")
- Various perspectives, sometimes widely diverging, on how QE may affect inequality:
  - QE boosted asset prices and financial wealth, it "made the rich richer" (eg FT, Oct 21, 2014)
  - However, QE also boosted house prices: these gains are more widely spread, as homeowners more evenly distributed than stock-holders
  - Younger households, net borrowers benefited as interest rates fell, older households with interest-bearing assets lost (eg McKinsey, 2013)
  - Expansionary mon policy reduces unemployment, benefits poorer households most
  - (See also Colciago, Samarina and de Haan, 2018)

This paper

- What are the effects of QE on **inequality**?
  - Income vs wealth inequality
  - Estimate how individual households in the euro area are affected by QE
  - Quantify three channels of transmission of QE
    - ⋆ Earnings heterogeneity: Heterogeneous reaction of empl status and hours worked to MP
    - ⋆ Income composition: Heterogenous reaction of income components to MP
    - ⋆ Portfolio composition: Heterogenous reaction of wealth components to MP
- Simple, reduced-form estimation / simulation
- Use aggregate and household-level data on income/wealth:
  European Household Finance and Consumption Survey, **HFCS**

Sketch of the method

Step 1: Aggregate data

- [a] Estimate **multi-country VAR** which includes aggregate unemployment and asset prices
- [b] Quantify **impulse responses** of asset prices / unemployment to QE (nonstandard MP)

Step 2: Household-level data

- [c] Combine IRFs with **household-level data** on components of wealth and income
- [d] For employment, use simulation based on a probit for employment status
- [e] Estimate effects of QE on wealth **and income** inequality (Gini coeff, ...)

Main results

- **QE reduces income inequality**
  - Key role of policy effects on the extensive margin (transitions Unemp $\rightarrow$ Emp)
  - This **earnings heterogeneity channel** accounts for:
    - $\star$ $\approx 75\%$ of total effect overall
    - $\star$ More than 90% of total effect in lowest income quintile
- Effect on wealth inequality very small (portfolio composition channel)

Existing literature

- **Macro effects of nonstandard MP—VARs:**
  Baumeister and Benati (IJCB, 2013); Altavilla et al. (IJCB, 2016); Dell'Ariccia et al. (JEP, 2018); ...
- **VARs with income / consumption Ginis:**
  Coibion et al. (JME, 2017); Mumtaz and Theophilopoulou (EER, 2017)
  - No wealth inequality, don't estimate effects of nonstandard MP
- **Household wealth portfolios, inflation and asset prices:**
  Doepke and Schneider (JPE, 2006); Adam and Zhu (JEEA, 2016); Adam and Tzamourani (EER, 2016)
  - Assume hypothetical scenarios, eg, "10% increase in price level"
- **Model-based simulations:**
  Casiraghi et al. (2018) [BdI]; Bunn et al. (2018) [BoE]
  - More calibrated than estimated

So far little quantitative, estimated work on effects of QE on inequality

Step 1: Multi-country VAR to estimate aggregate effects of QE

$$y_t = C + B_1 y_{t-1} + \cdots + B_p y_{t-p} + \epsilon_t$$
$$\epsilon_t \sim \mathcal{N}(0, \Sigma)$$

- Mix of EA and country-level variables; 4 countries: DE, FR, IT, ES
- $\Rightarrow$ **Common MP + country heterogeneity in responses**
- Variables y_t:
  - Country-specific: real GDP, GDP deflator, **wages, unempl, house prices**
  - EA: short- and long-term interest rates, **stock prices**
  - US: GDP, short-term interest rates
- Large dimension $\Rightarrow$ **Bayesian estimation**
  (Litterman, 1979; Doan et al., 1984; Sims, 1992; Banbura et al., 2010; Giannone et al., 2015)
- Quarterly data: 1999Q1–2016Q4, $p = 5$ lags

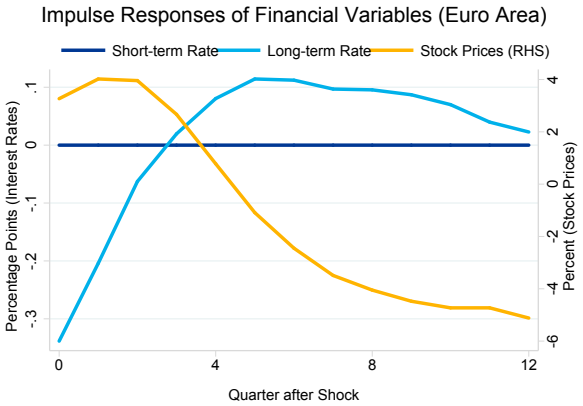
VAR: Identification à la Baumeister and Benati (2013)

1. Identify exog asset purchase shock with **zero and sign restrictions** (Arias et al., 2017)

   Sign restrictions—Expansionary **QE (APP) shock** on impact:
   - Decreases term IR spread (short-term interest rates unchanged)
   - Increases real GDP
2. **Offset response of EA policy rate** via series of standard MP shocks
   - . . . because standard MP did not react to offset effects of asset purchases (policy rate remained at lower bound)
3. Standard MP shock identified via standard zero (Choleski) restrictions

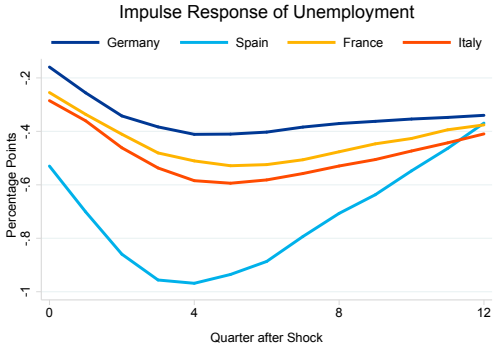
Impulse responses—QE shock

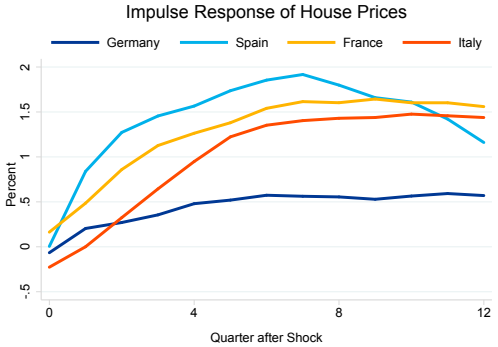
- Size of QE shock to term spread scaled to **30 bp** on impact
  In line with Altavilla et al. (2015) and Andrade et al. (2016)



Impulse responses of some key aggregate variables

- UR, HP responses stronger in ES, milder in DE
- Link to mortgage / labor market institutions? (similar to eg Calza et al., 2013)





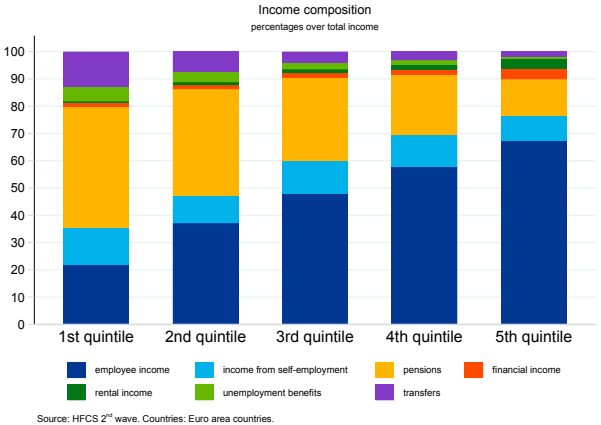
- All other responses roughly as expected (very mild response of prices and wages)

Bringing IRFs to HFCS micro data—Income

Income / Employment: 'Unemployment simulation'

Two effects:

1. Extensive margin (**Earnings heterogeneity channel**)
   Distribute aggregate decline in unemployment across people using a simple probit simulation
   - Some unempl become employed ⇒
     ⇒ Large increase in income
     quantitatively of key importance
2. Intensive margin (**Income composition channel**)
   Employment income of all employed people goes up by amount given in IRF for wages



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

Modelling response of wealth and income components to QE

Wealth / income component	Modeling procedure
Real Assets	
Household's main residence	Multiplied with response of house prices
Other real estate property	Multiplied with response of house prices
Self-employment businesses	Multiplied with response of stock prices
Financial Assets	
Shares, publicly traded	Multiplied with response of stock prices (in the baseline; robustness: some trading)
Bonds	Multiplied with response of bond prices (based on long-term rate)
Voluntary pension/whole life insurance	No adjustment
Deposits	No adjustment
Other financial assets	No adjustment
Debt	
Total liabilities	No adjustment
Gross Income	
Employee income	Multiplied with response of wages (compensation per employee)
Self-employment income	Multiplied with response of wages (compensation per employee)
Income from pensions	No adjustment
Rental income from real estate property	No adjustment
Income from financial investments	No adjustment (in the baseline; robustness: grows by 5%)
Unemployment benefits and transfers	If becomes employed, replace with wage (otherwise no adjustment)

Unemployment simulation—Extensive margin [Ampudia et al. (2016)]

Some unemployed become employed and receive wage given by Heckman model

1. Probit for employment status

- Country (c)-specific at individual level (not Hh):

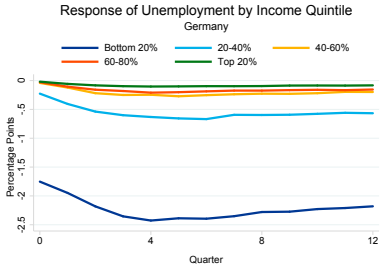
$$\Pr(Y = 1|X = x) = \Phi(x'_{c,i}\hat{\beta}_c)$$

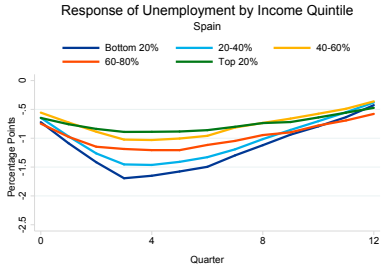
  Y empl status, X demographics (gender, education, age, mar status, children)
- Collect fitted values $\hat{Y}_{c,i}$; draw uniformly distributed shock $\epsilon_{c,i}$
- If $\epsilon_{c,i}$ sufficiently below $\hat{Y}_{c,i} \Rightarrow$ unempl individual i becomes employed
- $\sum$ newly employed people $=$ aggregate decline in unempl implied by VAR
- Repeat many times for different draws of $\epsilon_{c,i}$, average across sims

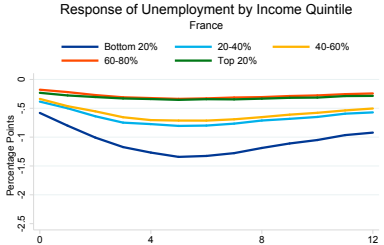
2. Heckman selection model to estimate unobserved wages

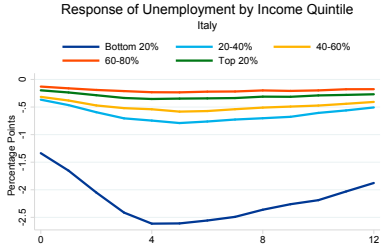
- Income of the newly employed **increases** as implied by Heckman:
  They receive wage instead of (lower) unempl benefits
  Exclusion restrictions: marital status, children

Unemployment: Disproportionate decrease for low income





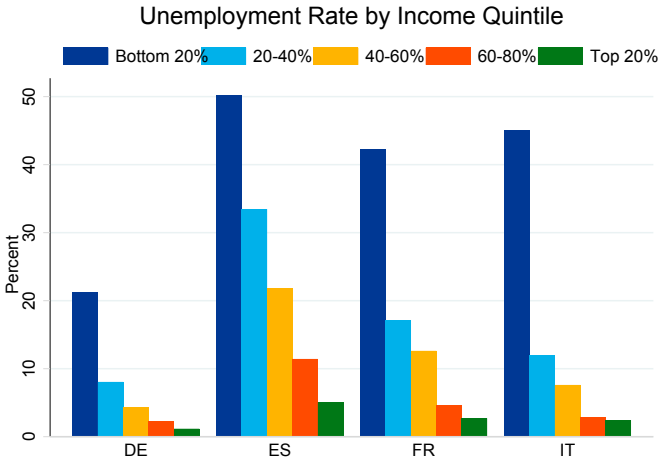




Unemployment

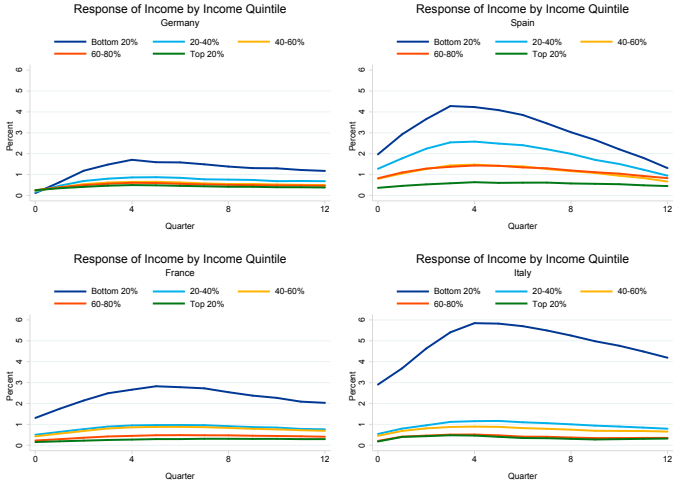
ES: Unemployed affected in all quintiles b/c distributed more evenly

DE: UR strongly skewed toward lowest income quintile



Income inequality

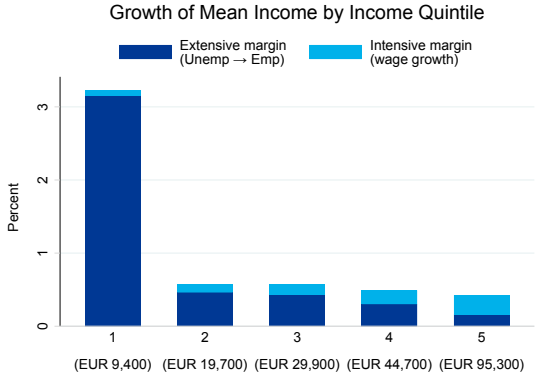
Unempl benefits more generous in DE, FR than in ES and **IT**



Lower income inequality: Gini goes down from 43.1 to 42.8

Key importance of extensive margin—Earnings heterogeneity channel accounts for:

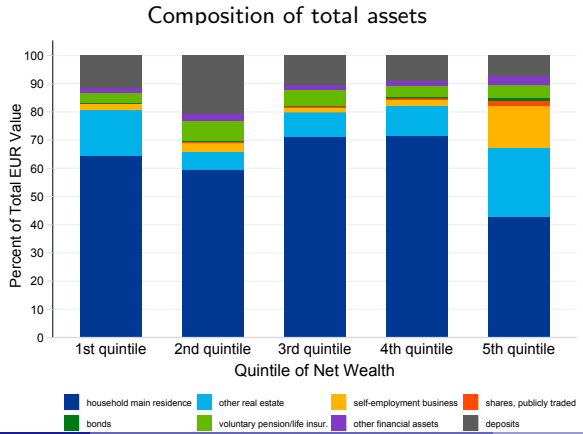
- $\approx$ 75% of total effect overall
- More than 90% of total effect in lowest income quintile



Response of mean income 4 quarters after QE shock. Numbers in brackets: Initial levels of gross Hh income.

Bringing IRFs to HFCS micro data—Wealth

- Portfolio composition channel: Estimate effects on household-level wealth using holdings of housing wealth, stocks and bonds (in €) [assuming no rebalancing of portfolios] ▸ Detail
- Housing, stock and bonds account for about 80% of value of wealth

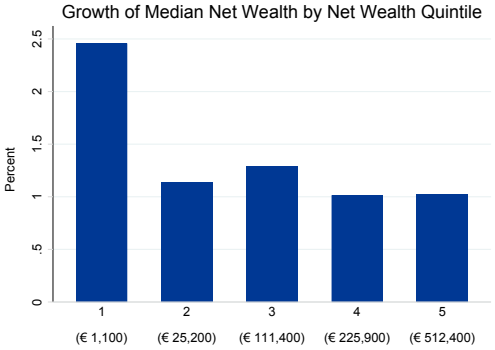


Wealth inequality

Very small effect: Gini goes down from 68.09 to 68.07

Important to account for house prices ▸ Decomposition

[Assumes: no portfolio rebalancing; in line with literature on inertia in Hh portfolios (Ameriks, Zeldes, 2004; . . .)]



Response of median net wealth 4 quarters after QE shock. Numbers in brackets: Initial levels of median net wealth.

Robustness

- Local linear projections (Jordà, 2005):
  How do other variables respond to QE shock?
  - Holdings of wealth components (flow of funds)
  - ES local house prices
  - ES local house prices: IRF vs level
  - Profits / financial income
- Uniform employment probability
- Same VAR response in all countries
- Financial income ↑ by 5%
- Portfolio rebalancing—some trading in stocks:
  Buy 15% of your stock holdings

Conclusions

- **QE reduces income inequality**
  - Mostly due to "earnings heterogeneity channel"
  - Substantial impact on employment at bottom tail
- **The effect of QE on wealth inequality is likely to be small**

Background slides

Modelling response of wealth and income components to QE

Back

Wealth / income component	Modeling procedure
Real Assets	
Household's main residence	Multiplied with response of house prices
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Unemployment benefits and transfers	If becomes employed, replace with wage (otherwise no adjustment)

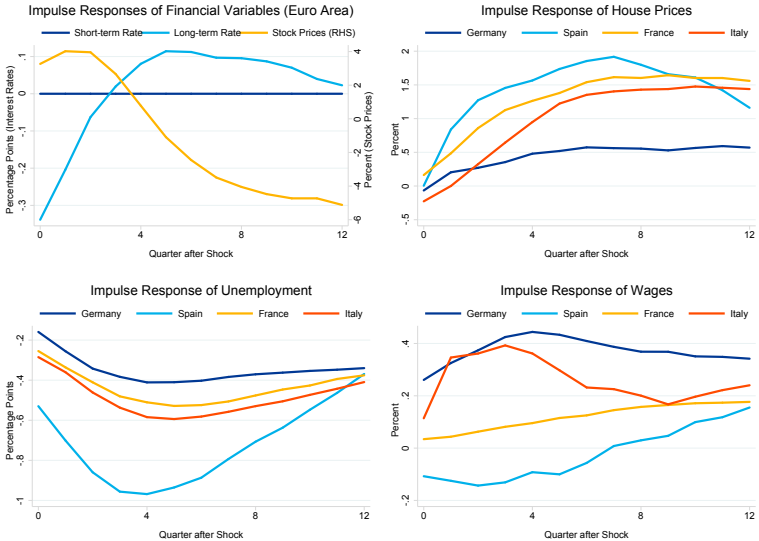
Impact of QE on long-term IR—Literature review

Table 1 Empirical Estimates of the Effects of Nonstandard Monetary Policy Using Event Studies

Authors	Country	Type of Event	Typical Impact on 10-Year Rate (p.p.)	Notes
Altavilla et al. (2016)	DE, ES, FR, IT	OMT	0.2 to 1	
Altavilla et al. (2015)	EA, DE, ES, FR, IT	APP	0.3 to 0.5	
Andrade et al. (2016)	EA	APP	0.45	
Joyce and Tong (2012)	UK	APF1	1	
Christensen and Rudebusch (2012)	UK, US	APF1	0.43 to 0.89	
Lam (2011)	JP	CME+	0.24 to 0.27	
Fukunaga et al. (2015)	JP	QQE	0.33 to 0.47	
Gagnon et al. (2011)	US	LSAP1	0.55 to 1.05	
Krishnamurthy and Vissing-Jorgensen (2013)	US	LSAP1, LSAP2, MEP	0.07 to 1.07	
Bauer and Rudebusch (2014)	US	LSAP1	0.89	
Krishnamurthy and Vissing-Jorgensen (2011)	US	LSAP1, LSAP2	0.3 to 1.07	
Cahill et al. (2013)	US	LSAP1, LSAP2, MEP	0.089 to 0.131	for $100bn purchases

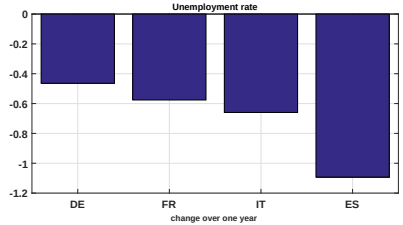
Notes: See also Andrade et al. (2016), Appendix B for other studies and details.

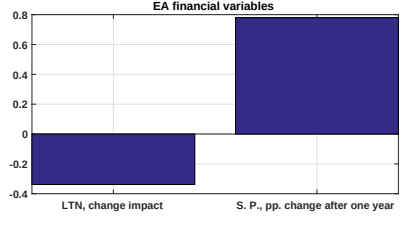
Impulse responses of aggregate variables



Impulse responses 4 quarters after shock

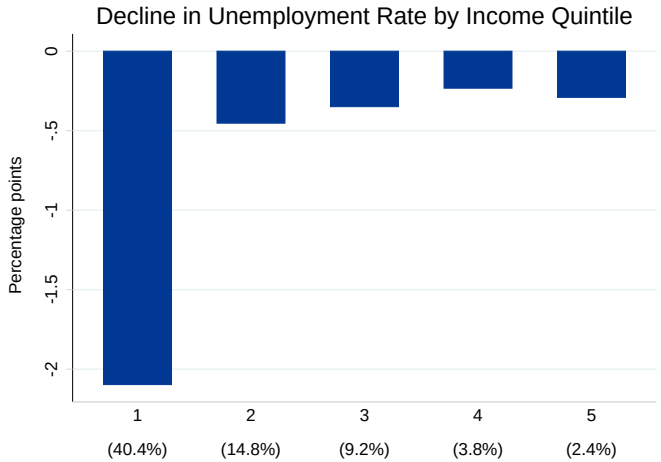
Substantial heterogeneity across countries





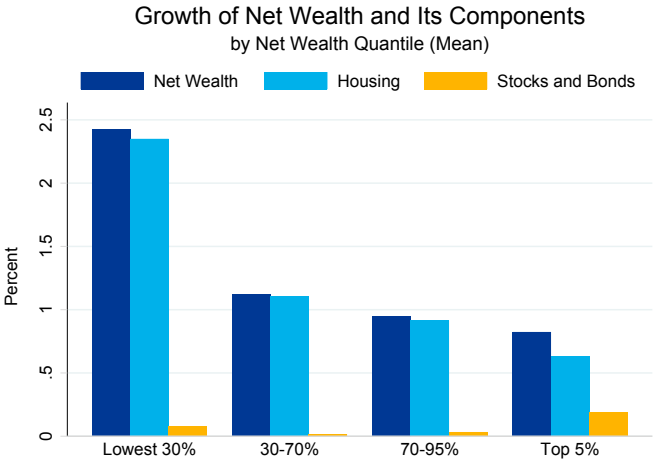
EA unemployment

Disproportionate decrease for low income



Decomposition of changes in net wealth

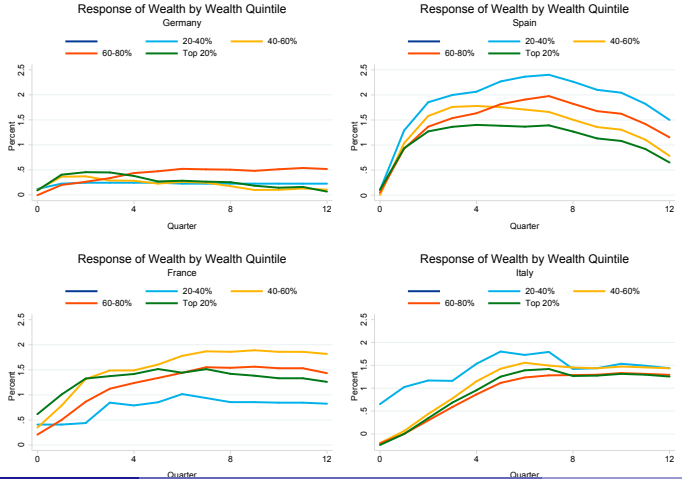
Key role of housing, limited effect of stocks and bonds Back



Net wealth

Caveat: Some increase in wealth above P90, but transitory (see IRF for stock prices)

Lower percentiles: Role of leverage

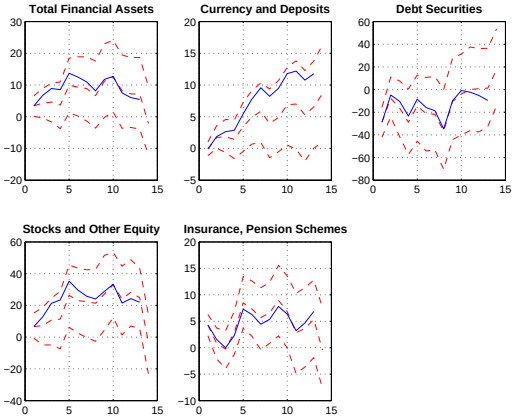


Local linear projection:

ES holdings of wealth components (flow of funds)

Back

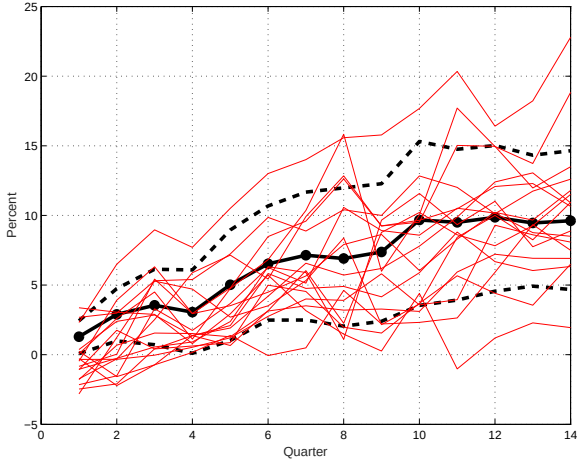
Total fin assets ↑ ≈ 5–10%; stocks ↑ by a lot (≈ 15%), debt ↓ a bit



Local linear projection: ES regional house prices

Back

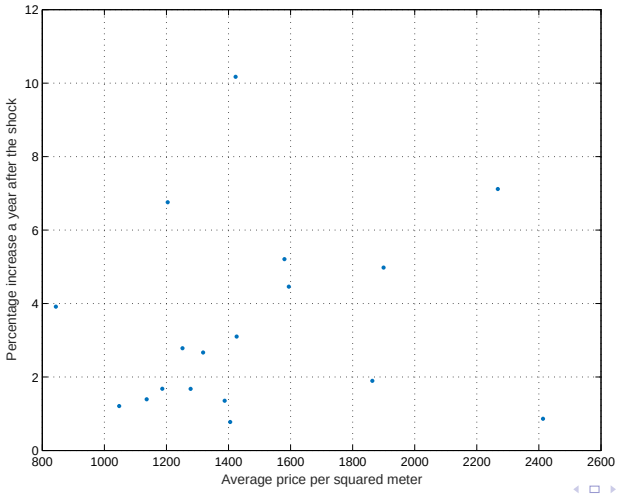
Some, but not overwhelming heterogeneity



ES regional house prices: Response to QE vs price per sqm

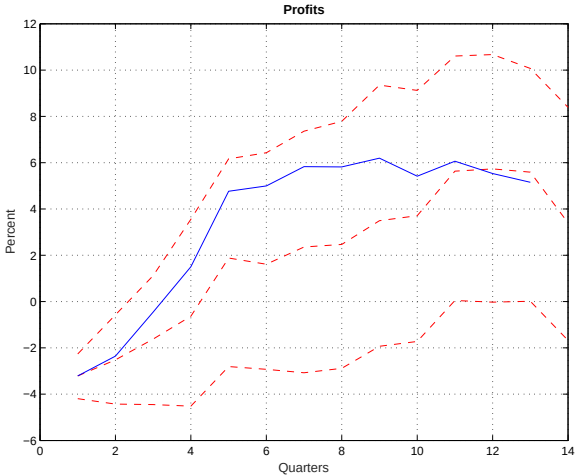
Back

Positive relationship b/w level and response of HP



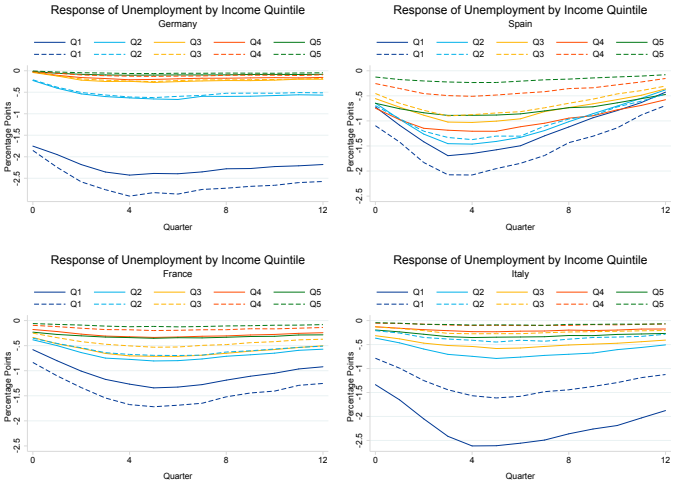
Local linear projection: Profits ↑ by 5%

Back



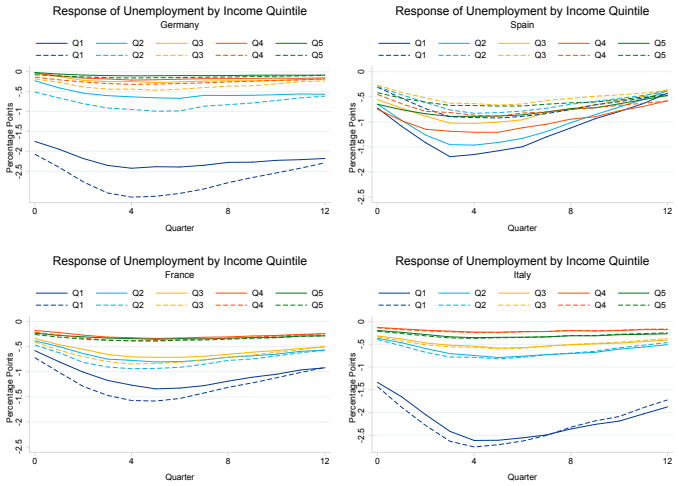
Robustness: Uniform employment probability

Baseline IRFs (Solid) vs IRFs under uniform probability of getting employed (Dashed) Back



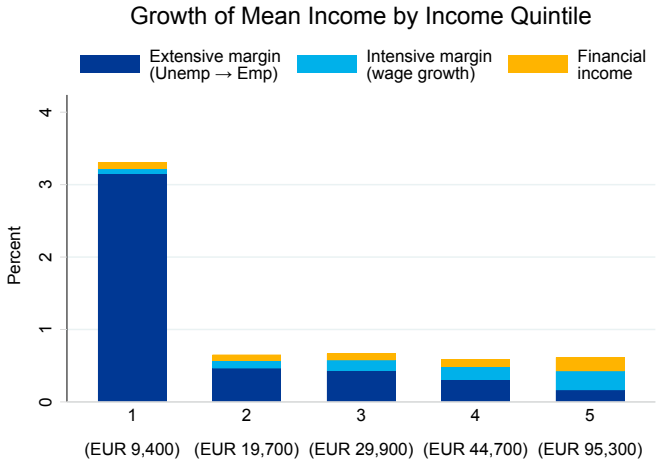
Robustness: Same VAR response in all countries

Baseline IRFs (Solid) vs IRFs restricted to be the same across countries (Dashed) Back



Robustness: Financial income ↑ by 5%

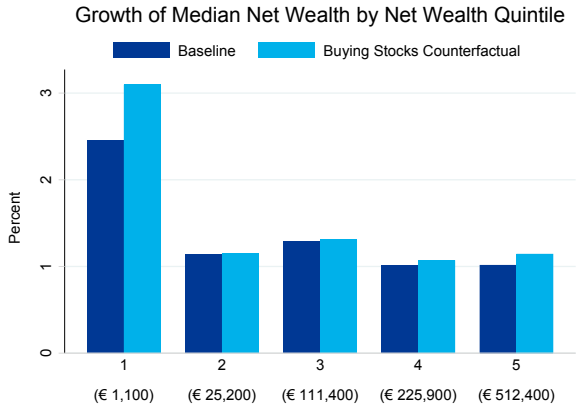
Financial income matters most in the upper tail Back



Robustness: Holdings of stocks ↑ by 15%

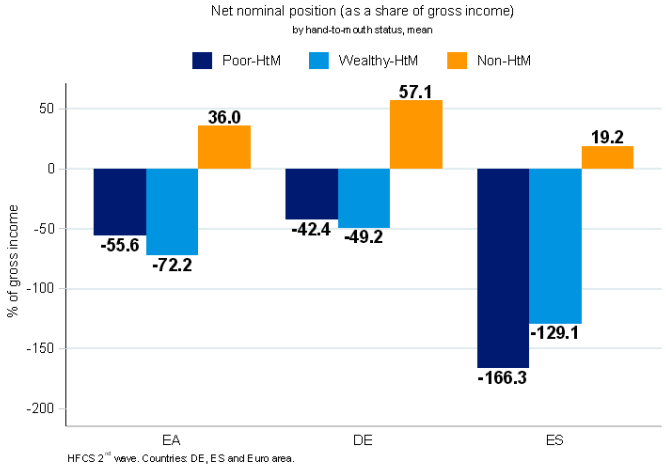
Similar overall results Back

High leverage at the bottom



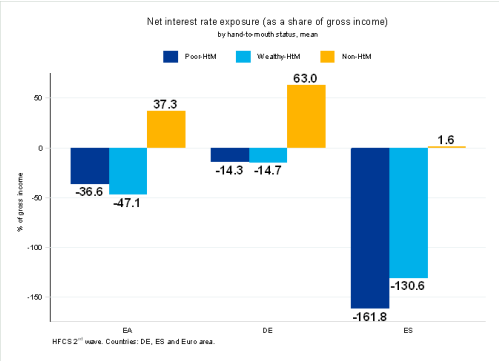
Numbers in brackets: Initial levels of median net wealth.

Net nominal positions



Net interest rate exposure—Auclert (2017)

- Net interest rate exposure = maturing assets - maturing liabilities
- Maturing assets = 25% of value of mutual funds, bonds, shares, managed accounts, money owed to households, other assets + 100% of deposits
- Maturing liabilities = 100% outstanding balance of adjustable-rate mortgages + 100% outstanding balance of other non-collateralized debt



Nonstandard (QE) vs Standard MP

- Targeting the same peak GDP response, VAR gives:
  30 bp change in term spread $\approx$ 100 bp change in policy rate
- BUT also qualitative differences (ZLB, differential effects on prices of specific assets, . . .)