

How Does Monetary Policy Affect Income and Wealth Inequality?

Evidence from the Euro Area

Michele Lenza Jirka Slacalek

European Central Bank

Barcelona GSE Summer Forum: MP and Central Banking Workshop

June 2018

Motivation:

Recent public debate on impact of quantitative easing on inequality

- ECB has since 2014 undertaken **quantitative easing (QE)** (“Asset Purchase Programmes”)
- **Various perspectives on why QE affects inequality:**
 - ▶ Younger households, net borrowers benefited as interest rates fell, older households with interest-bearing assets lost (eg McKinsey, 2013)
 - ▶ QE boosted asset prices and financial wealth, it “made the rich richer” (eg FT, Oct 21, 2014)
- **ECB (various speeches)**
 - ▶ Expansionary mon policy **reduces unempl**, benefits poorer households most
 - ▶ QE also **boosted house prices**: these gains are more widely spread, as homeowners more evenly distributed than stock-holders

This paper

- Estimate how **individual households** are affected by QE
- What are the effects of such monetary policy on **inequality**?
 - ▶ Income vs wealth inequality
- Simple, reduced-form estimation / simulation
- Use **aggregate and household-level data** on income/wealth:
European Household Finance and Consumption Survey, HFCS
- **Main results:**
 - ▶ **QE reduces income inequality**
Key role of employment effects ($Un \rightarrow Emp$)
 - ▶ Effect on wealth inequality very small

Next steps

Step 1: Aggregate data

- a Estimate **multi-country VAR** with aggregate unempl & asset prices
- b Quantify **impulse responses** of asset prices / unemployment to QE

Step 2: Household-level data

- c Transpose IRFs over **household-level HFCS data** on wealth, income and their components
- d For employment, use simulation based on a probit for empl status
- e Estimate effects of QE on wealth **and income** inequality (Gini ...)
- f (Implications for transmission of MP to **consumption**)

Existing literature

- **Macro effects of nonstandard MP—VARs:**

Baumeister and Benati (IJCB, 2013); Altavilla et al. (IJCB, 2016); ...

- **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); Doepke et al. (2016)

- ▶ Assume **hypothetical scenarios**, eg “10% increase in price level”

- **Model-based simulations:**

Casiraghi et al. (2018) [Bdl]; Bunn et al. (2018) [BoE]

- ▶ More calibrated than estimated

- **So far little quantitative, estimated work on effects of nonstandard MP on inequality**

Gaps in existing work

Not much work with micro data on:

- House prices / housing wealth
- Employment effects / income inequality
- Little estimated quantitative evidence in general
- Even less on non-standard MP

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

$$y_t = C + B_1 y_{t-1} + \dots + B_p y_{t-p} + \epsilon_t$$

$$\epsilon_t = N(0, \Sigma)$$

- 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 defl, **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; Giannone, Lenza and Primiceri, 2015)
- Quarterly data: 1999Q1–2016Q4, $p = 5$ lags

VAR: Identification à la Baumeister and Benati (2013)

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

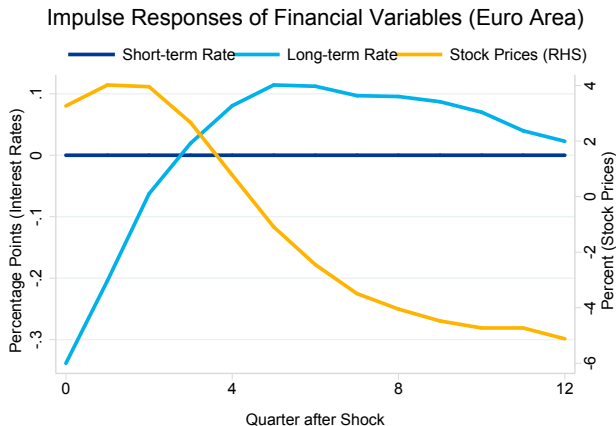
Sign restrictions—Expansionary **QE (APP) shock** on impact:

- ▶ Decreases term IR spread
- ▶ 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

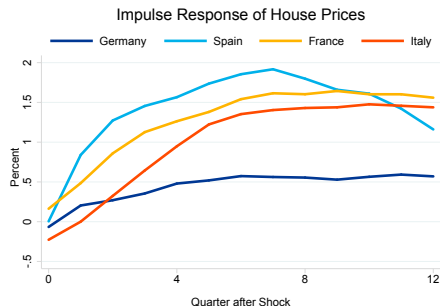
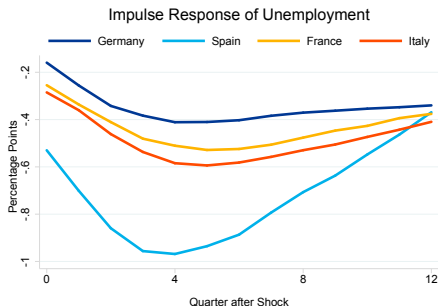
Impulse responses—QE shock

- 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 key aggregate variables

- UR, HP responses stronger in ES, milder in DE
- Link to ARM, mortgage / labor market institutions?

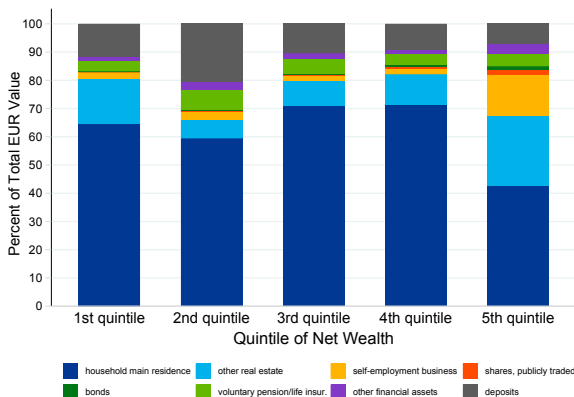


- Stock prices included at EA level

Step 2: Bringing IRFs to HFCS micro data—Wealth

- Estimate effects on household-level net wealth using holdings of **housing wealth, stocks and bonds** (in €) [▶ Detail](#)
- Housing, stock, bonds account for about 80% of value of wealth
- Assumes no rebalancing of portfolios [May be reasonable (?)]

Composition of total assets



Step 2: Bringing IRFs to HFCS micro data—Income

Income / Employment: ‘Unemployment simulation’

1 Extensive margin

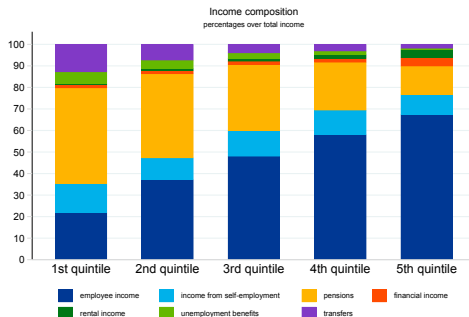
Distribute aggregate decline in unemployment across people using a simple probit simulation

- Some unemployed become employed—**quantitatively of key importance**

2 Intensive margin

Empl income of empl people goes up by amount given in IRF for wages

Composition of income



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

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

Some unemployed become employed and receive wage given by Heckman

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, edctn, age, mar status, chldrn)

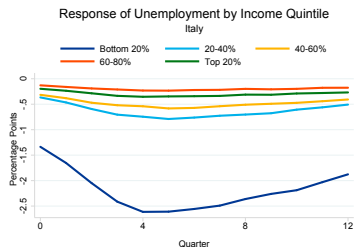
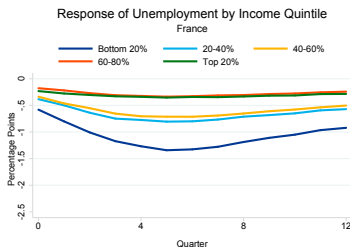
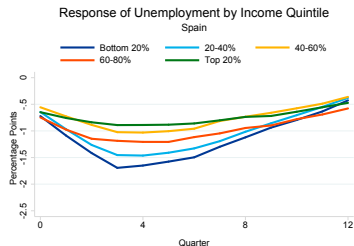
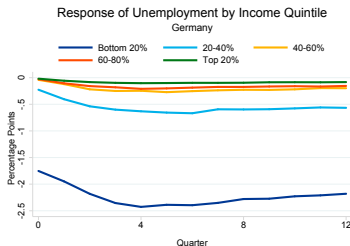
- Collect fitted values $\hat{Y}_{c,i}$; draw **uniformly distributed** shock $\epsilon_{c,i}$
- If $\epsilon_{c,i}$ sufficiently below $\hat{Y}_{c,i} \Rightarrow$ unempl individual i becomes employed
- \sum newly employed people = aggregate decline in unempl implied by VAR
- Repeat many times for different 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

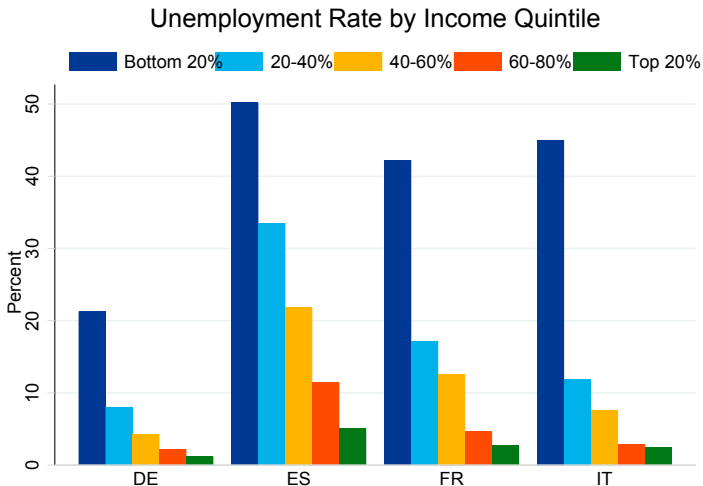
Disproportionate decrease for low income



Unemployment

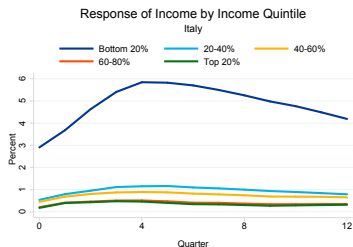
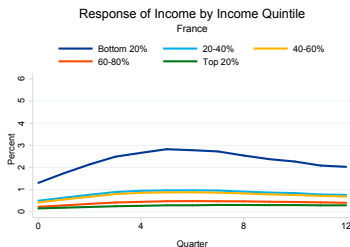
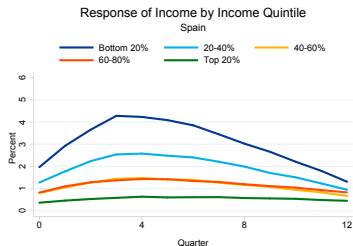
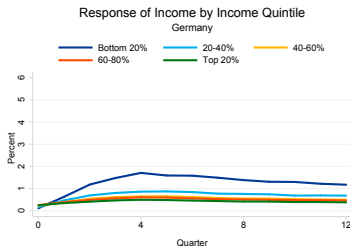
ES: Unemployed affected in all quintiles b/c distributed more evenly

DE: UR strongly skewed toward lowest income quintile



Income inequality

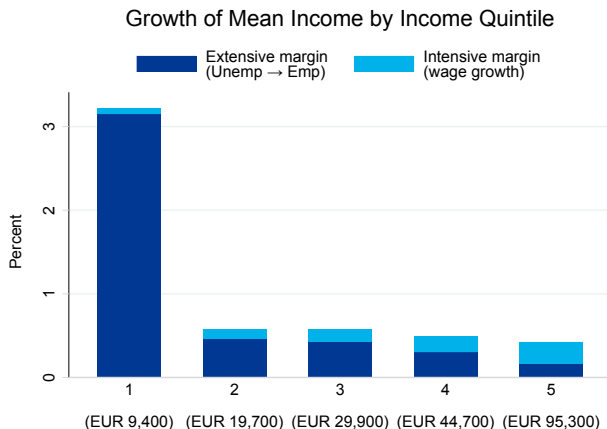
Unempl benefits more generous in DE, FR than in ES and IT



EA Income inequality

Lower inequality: Gini goes down from 43.1 to 42.8

Key importance of extensive margin (Unemp → Emp)



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

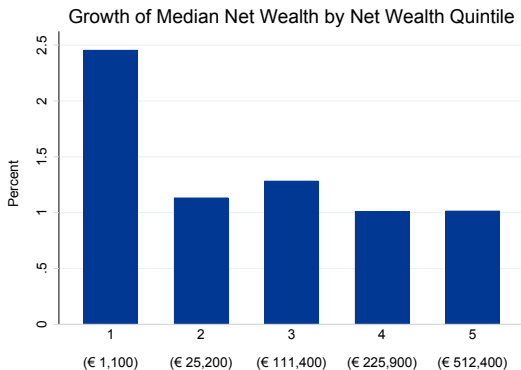
Wealth inequality

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; Biliias et al. (2010))]



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 \uparrow by 5%
- Portfolio rebalancing—some trading in stocks:
Buy 15% of your stock holdings

Implications:

Consumption behavior & MP transmission

- Consensus in recent lit on C [also HANK; Brinca & Krusell (2016); ...]: Many households (20–30%) are **constrained**
- Constrained Hhs have **large MPCs: ≥ 0.3**
- This paper: **Employment of constrained Hhs responsive to MP**
- “ **$\text{MPC} \times \Delta \text{Employment}$** ” matters for strength of **indirect channel of monetary transmission** (aggregate demand)
- Other effects (via wealth effects, net nominal positions) probably less important in EA

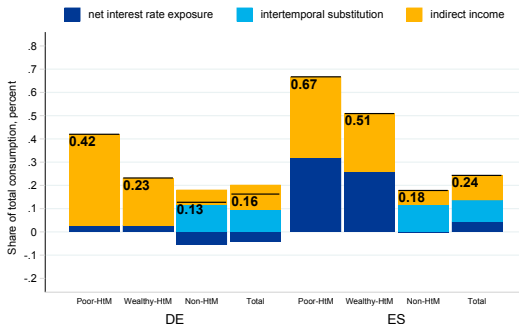
Effects of MP on consumption:

HANK decomposition à la Kaplan et al. (2018), Auclert (2017)

$$\frac{\Delta C}{C} = \underbrace{MPC \cdot \frac{\text{Interest Exposure}}{C} \cdot \Delta R}_{\text{Direct Effects}} - \underbrace{\sigma \cdot (1 - MPC) \cdot \Delta R}_{\text{Intertemporal Substitution}} + \underbrace{MPC \cdot \frac{Y}{C} \cdot \frac{\Delta Y}{Y}}_{\text{Indirect Effect}}$$

(Net) Interest Rate-Sensitive Assets Intertemporal Substitution Reaction of Income to ΔR

Effects of 100 bp cut in R on C , by hand-to-mouth status (Ampudia et al., 2018)



Note: share of total population.

Poor-HIM: 12.82% (DE), 6.09% (ES); Wealthy-HIM: 11.81% (DE), 18.60% (ES); Non-HIM: 75.37% (DE), 75.31% (ES).

Source: HFCS 2nd wave. Countries: DE and ES.

Summary

- **Main results**

- ▶ QE reduces income inequality; effect on wealth inequality small
- ▶ Substantial impact on employment at bottom tail

- Quantitatively in line with HANK-type structural models (Bayer et al., 2016; Lütticke, 2017; ...)

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
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)

Impact of QE on long-term IR—Literature review

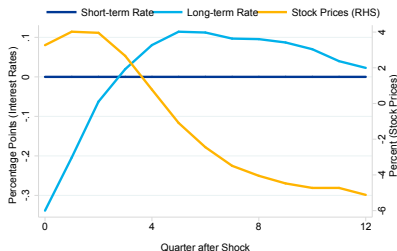
Table 1 Empirical Estimates of the Effects of Nonstandard Monetary Policy Using Event Studies

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

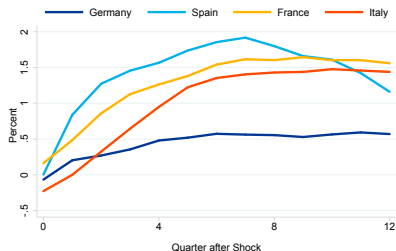
Notes: See also Andrade et al. (2016), Appendix B for other studies and details.

Impulse responses of aggregate variables

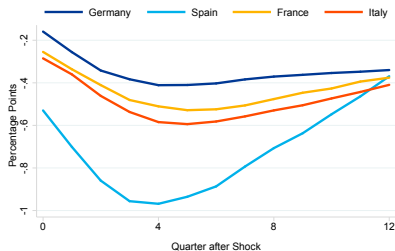
Impulse Responses of Financial Variables (Euro Area)



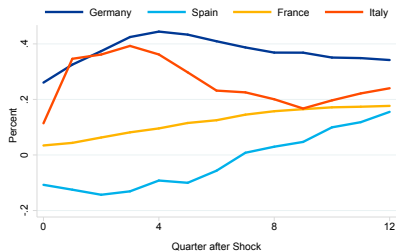
Impulse Response of House Prices



Impulse Response of Unemployment

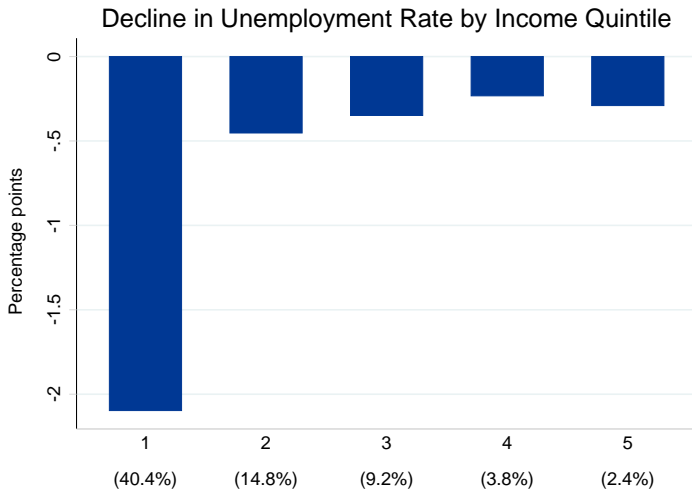


Impulse Response of Wages



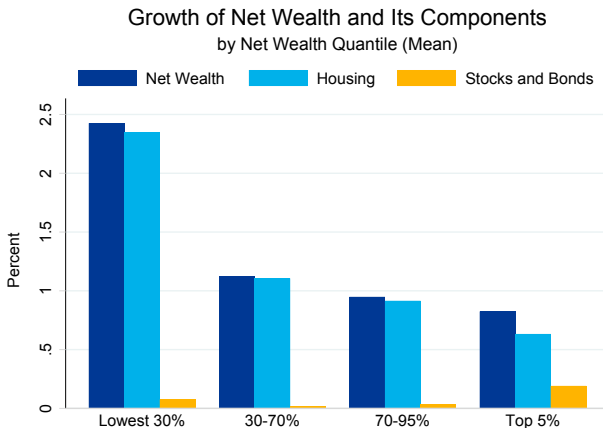
EA unemployment

Disproportionate decrease for low income



Decomposition of changes in net wealth

Key role of housing [▶ Back](#)

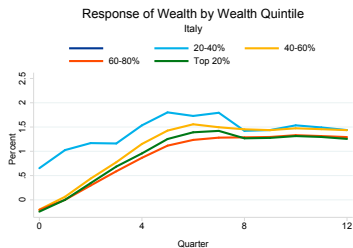
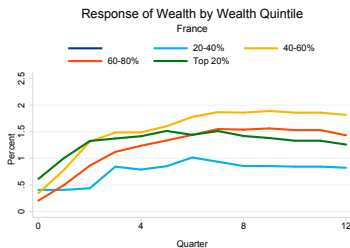
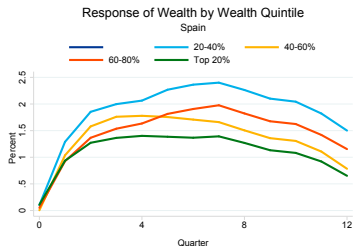
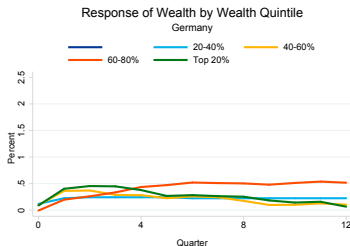


Response of mean net wealth and its components 4 quarters after QE shock.

Net wealth

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

Lower percentiles: Role of leverage

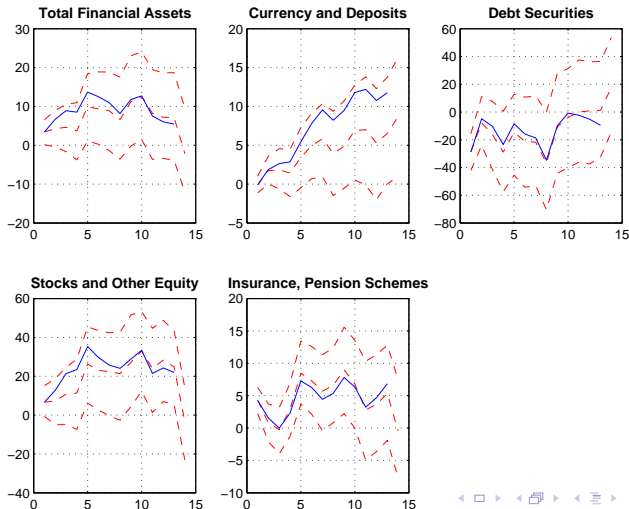


Local linear projection:

ES holdings of wealth components (flow of funds)

[▶ Back](#)

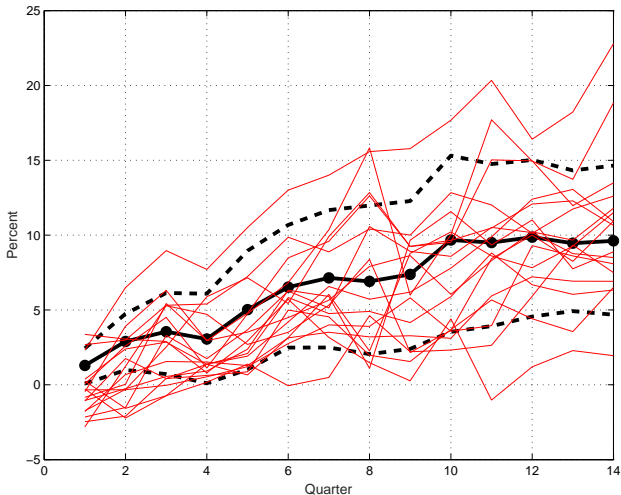
Total fin assets $\uparrow \approx 5\text{--}10\%$; stocks \uparrow by a lot ($\approx 15\%$), debt \downarrow a bit



Local linear projection: ES regional house prices

[Back](#)

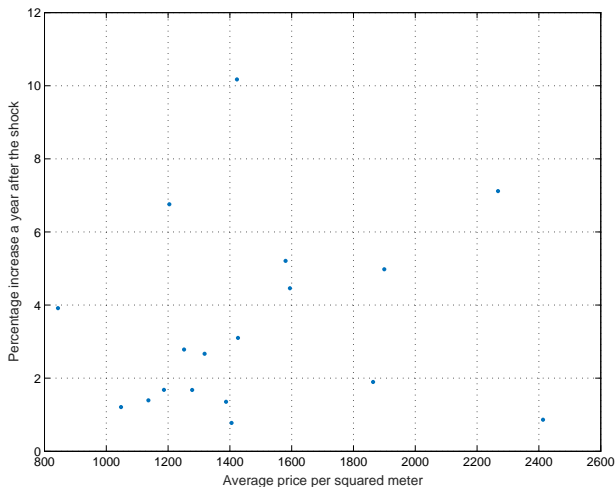
Some, but not overwhelming heterogeneity



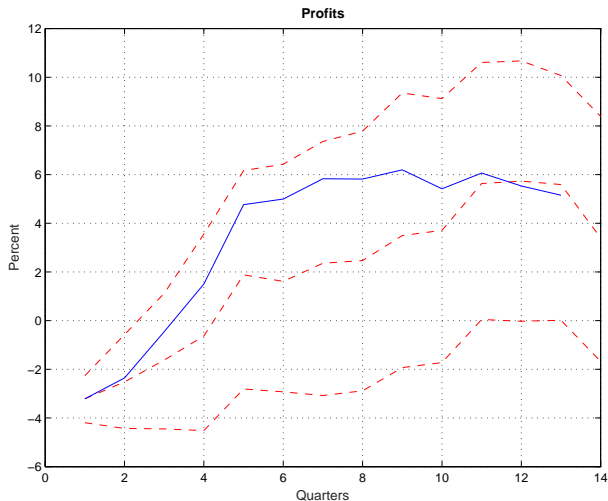
ES regional house prices: IRF vs level

[▶ Back](#)

Positive relationship b/w level and response of HP



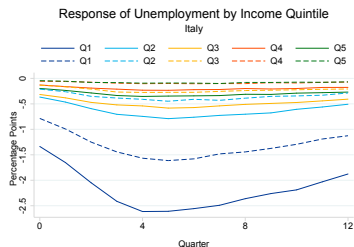
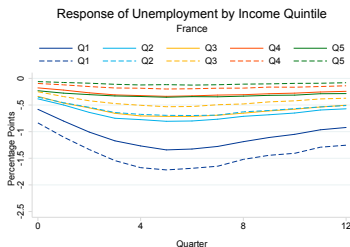
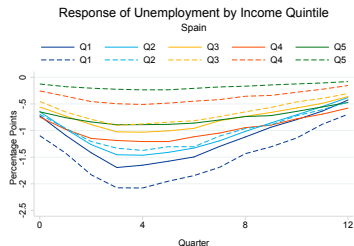
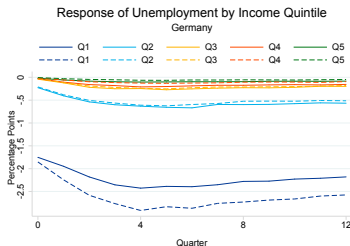
Local linear projection: Profits \uparrow by 5% [▶ Back](#)



Robustness: Uniform employment probability

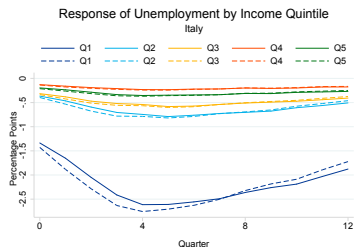
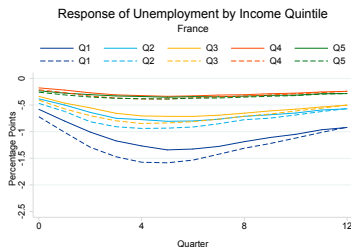
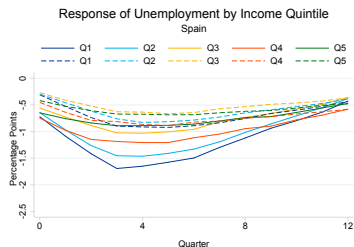
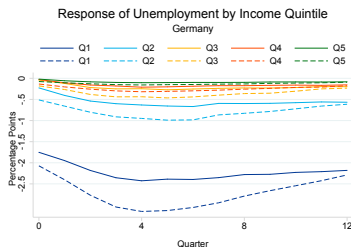
Baseline IRFs (Solid) vs IRFs under uniform probability of getting employed (Dashed)

[Back](#)



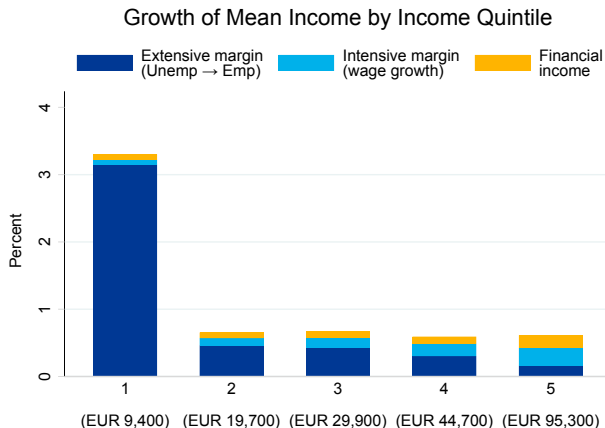
Robustness: Same VAR response in all countries

Baseline IRFs (Solid) vs IRFs restricted to be the same across countries (Dashed) [► Back](#)



Robustness: Financial income \uparrow by 5%

Financial income matters most in the upper tail [▶ Back](#)

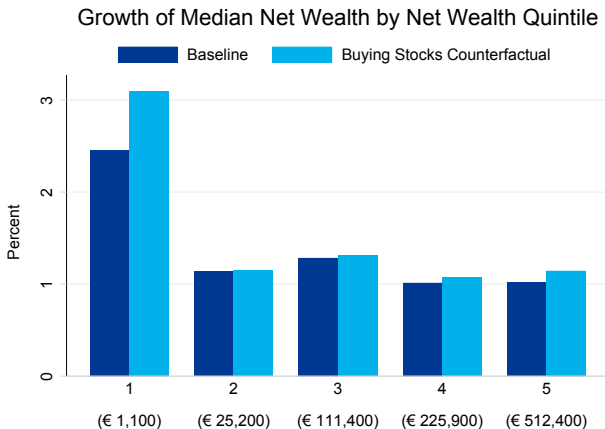


Numbers in brackets: Initial levels of mean gross Hh income.

Robustness: Holdings of stocks \uparrow by 15%

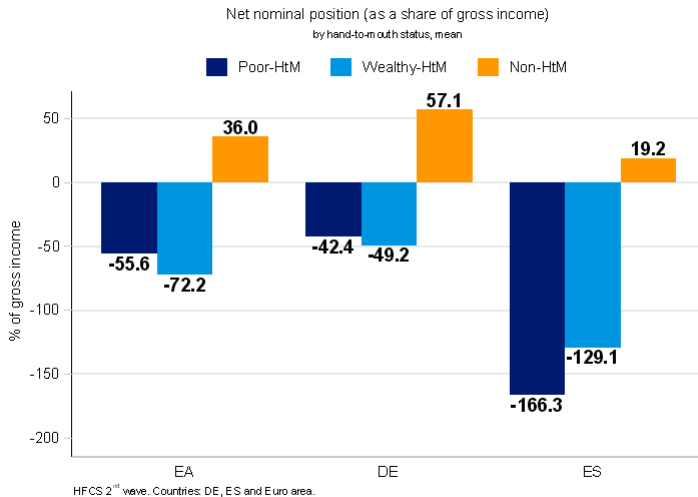
Similar overall results [▶ Back](#)

High leverage at the bottom



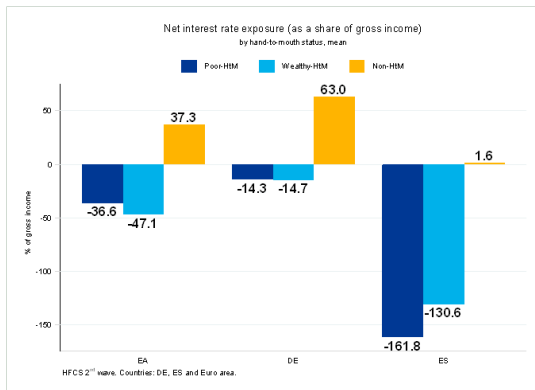
Numbers in brackets: Initial levels of median net wealth.

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 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, ...)