Micro-level data for macro models: the distributional effects of monetary policy
Evidence from EU-SILC survey data

Luisa Corrado[1]   **Daniela Fantozzi** [2]

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[1]Department of Economics and Finance, University of Rome Tor Vergata. luisa.corrado@uniroma2.it

[2]National Statistical Institute (Istat), Rome. fantozzi@istat.it

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The question

Motivation

In the aftermath of the global financial crises, **the impact of monetary easing on inequality** has recently attracted increasing attention.

In the present study, we investigate whether monetary policy, both conventional and unconventional, has affected income inequality in Italy focusing on **household disposable income, earnings, financial capital income and financial wealth,** dealing to reflect the income composition channel and the financial channel.

We used the **household survey microdata on Income and Living Conditions (EU-SILC, Istat)** for the first time in a repeated cross-section dimension in order to compute inequality measures over time and for specific incomes useful for macro estimations.

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Related literature

Related evidence using household survey data

Country	Authors	Microdata	MP Shock expan(+)/contr(-)	Effects on Inequality
World	Furceri et al. (2018)	SWIID*	MP −	↑
USA	Coibion et al. (2017)	CEX	MP −	↑
USA	Montecino et al. (2016)	SCF	UMP +	↑
UK	Mumtaz et al. (2017)	FES	MP −	↑
JP	Saiki and Frost (2014)	FIES	UMP +	↑
JP	Inui et al. (2017)	FIES	MP +	↑
EA	Guerello (2016)	EC Survey	MP +	↓
EA	Lenza et al. (2018)	HFCS	UMP +	↓
EA	Samarina et al. (2019)	SWIID*	UMP +	↓

Related evidence from Italy

Casiraghi, Gaiotti et. al. (2016)

They study the distributional implications of non-standard monetary policy for Italian households using the Survey of Household Income and Wealth (SHIW) conducted by Bank of Italy

- The authors only exploit the cross-sectional dimension of the survey 2010. This is the starting point which they applied the changes in the macroeconomic and financial variables estimated with their quarterly model (BIQM).
- They found that **overall the effects of non-standard policies on income and wealth are negligible.**

Motivation

Main questions:

After 2010, is the impact of non-standard monetary policy on Italian households' income distribution still negligible?

In the medium term, are macroeconomic effects able to offset short term financial effects (higher asset prices have a positive effect on capital income held by the wealthier while an increase in GDP, by expanding employment, could have a positive effect on labour income, offsetting the total effect on inequality)?
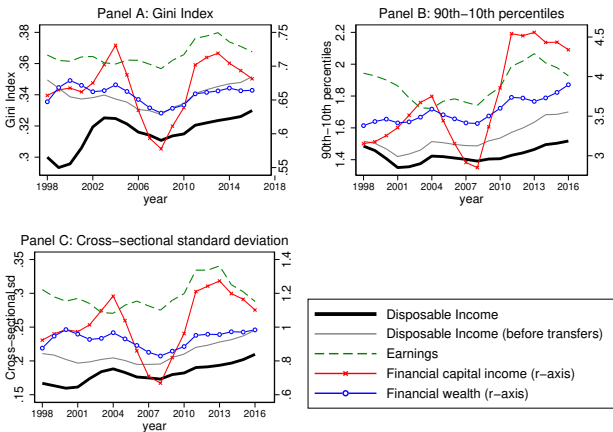
Does QE matter?

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Microdata

EU-SILC Microdata and inequality measures
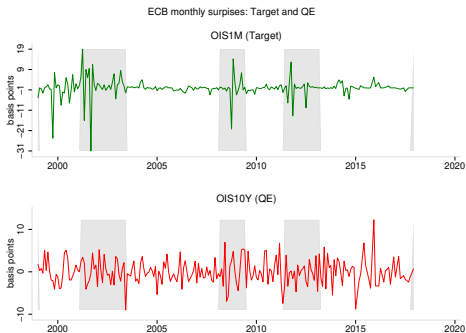
EU-SILC return

1. The EU-SILC data set includes cross-sectional microdata from individual Italian households stacked in 2004-2018 (equivalised income data refer to 2003-2017).

2. We compute more widely used measures of income inequality: the Gini coefficient of levels which takes **values between 0 (perfect equality) and 1 (perfect inequality)**, the standard deviation of log level, the ratios (diff-log) p75/p25 and p90/p10. To analyse the effects on the distribution, we compute the 10th, 25th, 50th, 75th, 90th, and 99th percentiles.

3. Since the ECB monetary policy began in 1999, we need a **back-calculation** of the inequality income measures exploiting the SHIW by the Bank of Italy obtaining a longer time span **1999-2017 yearly data** useful for macro estimates.

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Microdata

Inequality measures: descriptives

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The identification strategy of MP shock

High-frequency MP surprises (1)

ECB monthly surpises: Target and QE

OIS1M (Target)

OIS10Y (QE)

We use, as monetary surprises, intraday interest rate changes OIS (Overnight Index Swap) 1-month, mostly embedding the effect of conventional monetary policy (Target), and OIS 10-years capturing mostly the unconventional monetary policy (QE), around the ECB policy announcements currently available in the **Euro Area Monetary Policy Event-Study Database (EA-MPD)** by Altavilla et al. (2019).

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The identification strategy of MP shock

High-frequency MP surprises (2)

To be confident that the EA-MPD monetary surprises are actually unanticipated, i.e., orthogonal to other macroeconomic variables and potential central bank information shocks (M. Agrippino, Ricco 2021):

- we aggregate interest rate changes (OIS1M, OIS10Y) quarterly $\Rightarrow \epsilon_t^{MP_i,q}$
- we regress $\epsilon_t^{MP_i,q}$ onto the ECB Survey of Professional Forecasters (SPF) available from 1999q1 on GDP, inflation, and unemployment at a quarterly level
- and take the residuals representing **purged-OIS1M/10Y changes**.

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The macro model

The model with macro variables

First, we examine the impact of conventional and unconventional monetary policy on the **macro variables** Y_t (GDP, GDP deflator, employment, ebp, share prices, spread, house prices, wages) at the quarterly level by comparing two different scenarios over the period 1999q1-2017q4 (76 obs.) using the **Local projections**, (Jordá 2005): LP1 return

$$Y_{t+h} = \alpha^{(h)} + \Sigma_{j=1}^{J}\psi_j^{(h)}Y_{t-j} + \beta^{(h)}\hat{\epsilon}_t^{(U)MP,q} + \eta_{t+h} \sim MA(h) \qquad (1)$$

- the endogenous Y_t enters (1) in log-levels
- Y_{t-j} is the control set of lagged variables, with $J = 4$
- $\hat{\epsilon}_t^{MP,q} = [OIS1M]'$ is the MP shock in the conventional case
  $\hat{\epsilon}_t^{UMP,q} = [OIS10Y]'$ is the MP shock in the unconventional case
- LP-IRFs correspond to the sequence of the estimated coefficients $\hat{\beta}^h$, for $h = 0,...,H$ (16 quarters) of the monetary shock $\hat{\epsilon}_t^{(U)MP,q}$

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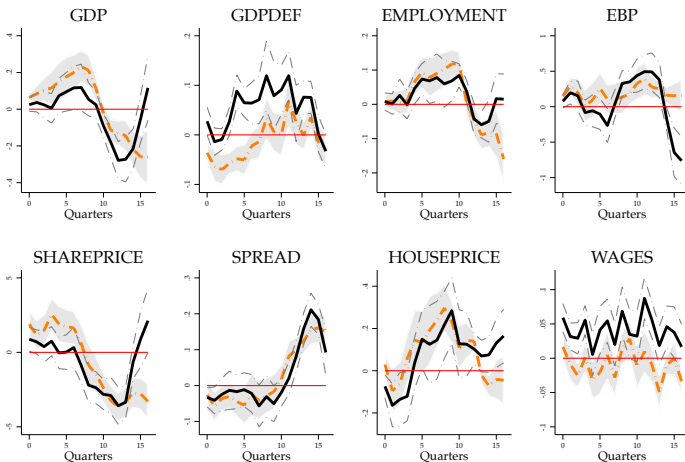
LP-IRFs of macro variables

IRFs of conventional and unconventional monetary policy

VAR LPJK return

MP shock: Target (ois1m surprise) and QE (ois10y surprise black line)

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The macro model with inequality

Mixed-frequency Approach

- The Gini index
- the difference of log-levels between the 90th and the 10th percentile and the 75th and the 25th percentile
- the (log) percentiles of the distribution P10, P25, P50, P75, P90, and P99.

are sampled annually, while macroeconomic and financial variables are sampled quarterly!

From annual to quarterly (Quilis, 2013)

To address this mixed-frequency problem we follow an approach of temporal disaggregation adopting the **Chow-Lin regression models**, which allows us to transform low-frequency data (e.g., annual data) into high-frequency data (e.g., quarterly data)
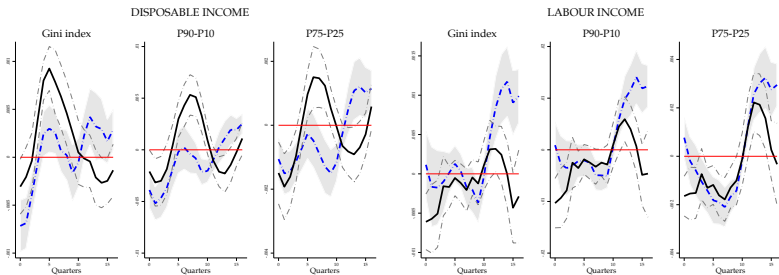
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The macro model with inequality

The model with inequality measures

As a second step, we examine the impact of conventional and unconventional monetary policy on inequality measures Z_i at a quarterly level using a battery of **Local projections**, (Jordá 2005) in the whole sample 1999q1-2017q4:

$$Z_{i,t+h} = \alpha_i^{(h)} + \Sigma_{j=1}^{J} \rho_j^{(h)} X_{i,t-j} + \beta_i^{(h)} \hat{\epsilon}_t^{MP,q} + \eta_{i,t+h}$$

- we trace out the effect of an expansionary conventional monetary policy on inequality as a "counterfactual" scenario using the purged Target monetary surprise ($\hat{\epsilon}_t^{MP,q} = OIS1M$)
- then we compare it with a second scenario that accounts for the effect of an expansionary unconventional monetary policy on inequality using the purged QE monetary surprise ($\hat{\epsilon}_t^{(U)MP,q} = OIS10Y$)
- we use a control set of macro variables $X_{i,t-j}$ up to 4 lags.

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LP-IRFs of inequality measures

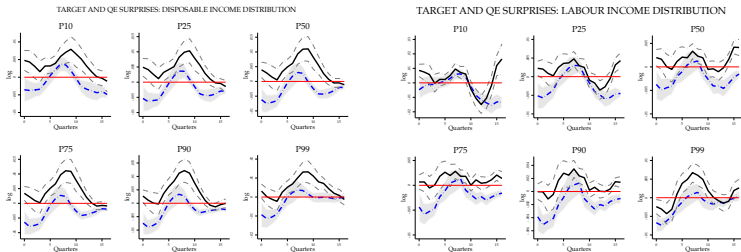# The effect of a positive MP shock on Disposable Income and Earnings

- An expansionary monetary policy shock reduces the inequality of disposable income on impact. Compared to the conventional scenario (blue dash-dotted line), the equalising effect of the non-standard policy exhibits minor intensity (black solid line). savers return
- The dynamics of labour income inequality measures are persistently equalising in the unconventional case favouring the bottom of the distribution. employment return

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LP-IRFs of inequality measures

The effect of a positive MP shock on Capital Income and Financial Wealth
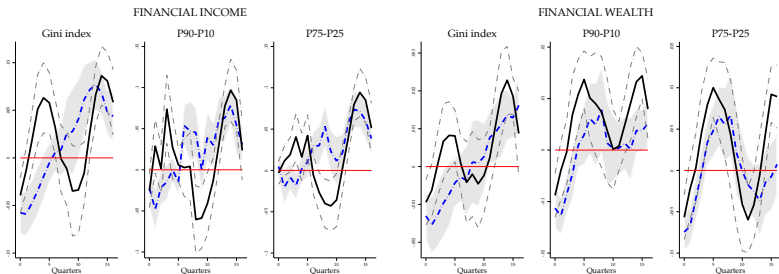
- In the unconventional scenario (black-solid line), the Gini coefficient of financial capital income and financial wealth shows fluctuating dynamics along the horizon, especially in the unconventional case.

- It turns out to be an ambiguous effect, even though it is more disequalizing in the short run.

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LP-IRFs of inequality measures

# The effect of a positive MP shock on the distributions (1)

- The bottom of disposable and labour income distribution (the 10th and 25th), are the ones that benefit the most from the unconventional monetary policy in the short run.

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LP-IRFs of inequality measures

The effect of a positive MP shock on the distributions (2)

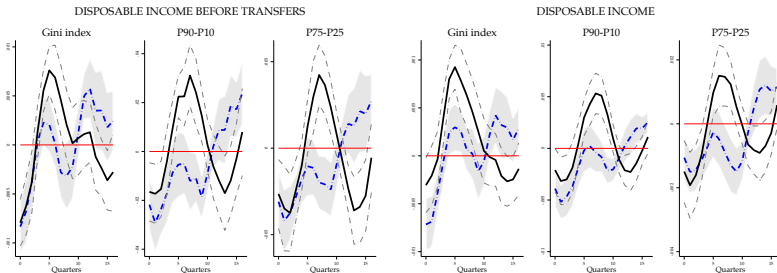

TARGET AND QE SURPRISES: FINANCIAL INCOME DISTRIBUTION
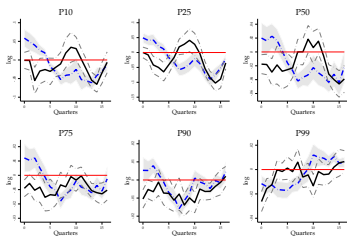
TARGET AND QE SURPRISES: FINANCIAL WEALTH DISTRIBUTION
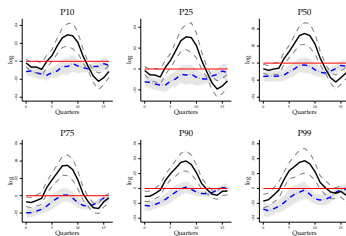
- The financial channel seems to be activated under the non-standard policy in favour of the median and wealthy households only in the medium run. The top 1% of financial wealth distribution reaches higher benefits after 8 quarters.

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LP-IRFs of inequality measures

YD before and after transfers: the role of fiscal policy

- The effect of MP shock on disposable income before transfers (pension excluded) reduces inequality in Italy both in standard and non-standard cases in the first period.
- The size of the effects is larger than for disposable income after transfers, meaning that low-income households have benefited more from the effect of monetary policy other than fiscal transfers over the horizon if anything.

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Main findings and further analysis

- Some evidence suggests that **QE is associated with a decrease in the inequality of Italian households in the short run** even though the impact is modest compared to the conventional scenario and the effects are heterogeneous along the distributions.

- The overall effect is driven by the sharp reduction of labour income inequality measures (in particular those of employees) favouring the bottom of the distribution.

- During QE, the financial channel favours the median and wealthy households in the long run. However, **the negative impact on inequality does not completely offset the positive response of labour income especially for the bottom percentiles.**

Some issues of interest

The key role of fiscal and redistributive policies on inequality and the extent to which the monetary-fiscal mix in Italy has been inadequate.

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EU-SILC survey data

EU-SILC return

- The European Union Statistics on Income and Living Conditions is a survey aiming at collecting a large set of qualitative and quantitative information at individual and household levels.

- It provides some crucial **indicators on income, poverty, and social exclusion in the European Union** (i.e. at risk of the poverty rate and Gini coefficient).

- It is yearly carried out in different EU countries since 2004. In addition, **it provides cross-sectional and longitudinal data**.

The overall sample is statistically representative of the population residing in Italy and, **in 2017, it amounts to 22,226 households (48,819 individuals)**, residing in about 680 municipalities.

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Local Projection (Jordà, 2005)

LP1 return

$$Y_{t+h} = \alpha^h + B_1^{h+1} Y_{t-1} + \cdots + B_p^{h+1} Y_{t-p} + \eta_{t+h}^h \qquad \eta_{t+h}^h \sim MA(h)$$

As shown by Jordá (2005), the direct estimation of the (KxK) autoregressive **coefficients** B_1^{h+1}, **h=0,... H, corresponds to estimating the IRFs** without casting the Wold representation theorem. Hence, the IRF is given by the sequence of regression coefficients of the structural shock. It is **consistent with asymptotic normality properties**.

The errors arising from this projection are VMA processes of order h that is, except for $h = 0$, the **errors are serially correlated**. Due to this issue, the author suggests estimating the variance-covariance matrix using the **Newey-West (1987) heteroskedasticity and autocorrelation consistent estimator (HAC)**
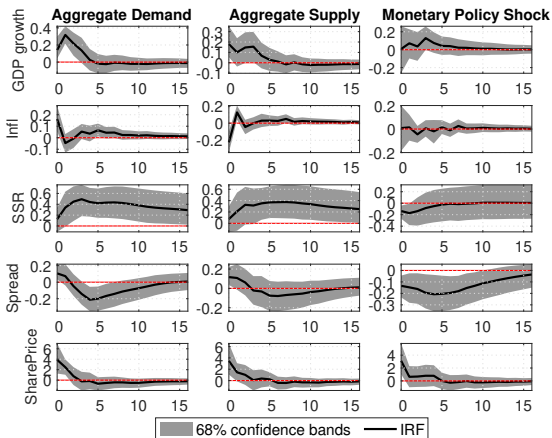
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IRFs: VAR with sign restrictions

VAR   return

The MP shock is the short-term shadow rate for the EA (Krippner, 2013)
sign restrictions: share price $(+)$, spread $(-)$

68% confidence bands —— IRF

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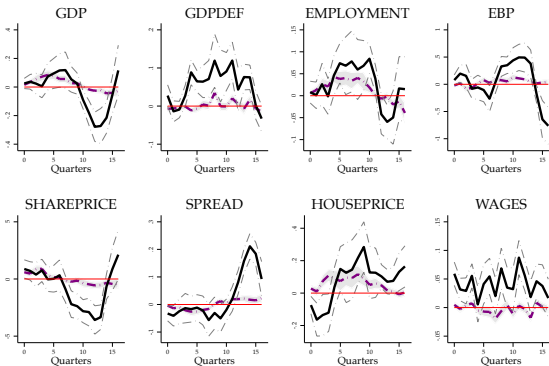
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LP-IRFs: Jarocinsky-Karadi MP shock

LPJK return

MP shocks are the Euro area monetary surprises (purple dashed line) by Jarocinsky and Karadi (AEJ,2020) compared to OIS10Y surprises

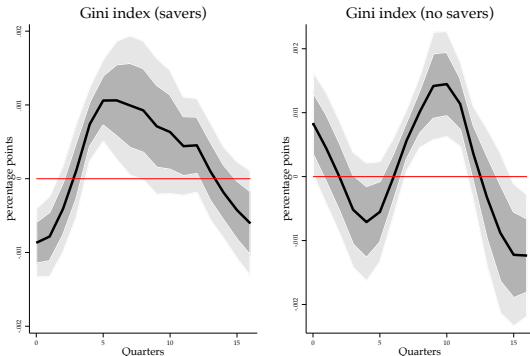MP shock: Eonia3 (Jarociński-Karadi) and QE (ois10y surprise black line)

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QE shock on Savers and Borrowers Inequality

savers return

QE SHOCK: SAVERS AND BORROWERS DISPOSABLE INCOME

- Savers (people with capital gains and without a mortgage) benefit of higher asset prices on impact and then appear to have been hit hard by non-standard monetary policies only in the medium run.

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QE shock on Employee and Self-employment Inequality

employment   return

QE SHOCK: EMPLOYEE AND SELF-EMPLOYMENT INCOME