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Microdata for Macro Models: the Distributional Effects of Monetary Policy

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Microdata for macro models: the distributional effects of monetary policy.*

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Abstract

In this paper we investigate the effect of standard and non-standard monetary policy implemented by the ECB on income inequality in Italy. We use for the first time the survey microdata on Income and Living Conditions (EU-SILC, Istat) in a repeated cross-section experiment to build measures of inequality and the distribution over time for incomes and subgroups of individuals. The identification strategy is based on surprises estimated in the EA-MPD database for the Euro Area. Using a battery of Local Projections, we evaluate the impact of monetary policy by comparing the performance of the impulse response functions of our inequality measures in different policy scenarios (pre and post-QE). The main findings show that an expansionary unconventional monetary policy shock compressed inequality of disposable and labor income more persistently than a conventional monetary shock. The financial channel has an equalizing effect favoring the less wealthy households mainly in the long-run. Overall, our evidence suggests that QE is associated with a decrease in Italian households inequality.

Keywords: Income Inequality, Monetary Policy, Local Projections, Survey Data, High Frequency Data.

JEL Codes: C81, D31, E52, E58

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1 Introduction

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 wealth.

Nowadays inequality is widening across most advanced economies and the trend to greater equality of incomes which characterized the postwar period has been reversed. According to J. Stiglitz and other economists on rethinking capitalism and sustainable growth, *«this is partly because the extraordinary growth in top incomes has coincided with an economic slowdown. [...], the standard theory cannot explain how countries with similar technology, productivity and per capita income can differ so much in their before-tax and transfers distribution and a major thrust of modern economics is to understand the role of institutions in creating and shaping markets»* (evonomics, 2016 September 9).

To cope with the consequences of the global financial crisis, central banks have used monetary policy to stimulate aggregate demand by implementing expansionary monetary policies since the end of 2008. They have responded to the crisis in an unprecedented way, on the one hand by reducing rapidly the official discount rate and on the other by adopting unconventional measures by launching medium and long-term refinancing operations and asset purchases to encourage banks to provide credit to firms and households. The objective was to pursue price stability and at the same time to favor economic recovery trough expansionary policies. However after the sovereign debt crisis in 2011 and a second recessionary wave in 2012-13, since June 2014, the European central bank (ECB) has also adopted a series of new unconventional measures for the Euro area to continue providing uplift to the economy even when policy rates approach the lower bound. Furthermore the threat of deflation was countered by lowering long-term interest rates via the asset purchase programs (APP). Some observers see the low-level rates policy as an artificial state generated by the policies of central banks and argue that it threatens not only economic and financial stability, but social equity too, generating a trade-off between stability and equity. While, according to Bernanke

[2015], monetary policy is not a key driver of increased inequality, as it is "neutral" or nearly so in the longer term, meaning that it has limited long-term effects on "real" outcomes like the distribution of income and wealth. For these reasons, the impact of monetary easing on inequality that has been largely ignored in the literature and practice of monetary policy has recently gained more attention. *«These unconventional measures follow exactly the same logic as the conventional ones: they make financing conditions more expansionary relative to the natural rate, and in doing so bring the economy back to balance and inflation back to our objective. But while this kind of monetary policy, is simply a continuity of what central banks have always done we know it has raised concerns. Those concerns have focused in particular on the side effects of monetary policy and its distributional consequences: between savers and borrowers, weaker and stronger countries, the rich and the poor. The question, in short, is whether there is a trade-off between stability and equity».* Mario Draghi, President of ECB, DIW Europe Lecture, Berlin, 25 October 2016.

Although the large debate on the topic, the empirical literature is sometimes ambiguous and still scarce. Empirical studies for the US, UK and Japan exploit survey data on household income at the quarterly level. The influential paper of Coibion et al. [2017] uses quarterly data from the US Consumer Expenditure Survey (CEX) in a VAR with narrative shocks to estimate the effects of conventional monetary policy on the Gini coefficients for consumption and income, but not for wealth. A few papers follow in the steps of Coibion et al. [2017] for other countries. Montecino and Epstein [2015], for the US by analyzing both the QE period (2008-2010) and the post-QE period (2011-2013) has found that an expansionary monetary policy, mainly in the form of QE, during these periods contributed to rising inequality. In particular, the dis-equalizing effects of increasing asset returns outweighed the redistributive effects of falling unemployment. Mumtaz and Theophilopoulou [2016] provide similar evidence for the UK using the Family Expenditure Survey (FES). In particular, they find that contractionary monetary policy shocks lead to an increase in earnings, income and consumption inequality and contribute to their fluctuation. Saiki and Frost [2014] exclusively focus on the impact of

unconventional monetary policy (UMP) on inequality. They look at how the recent UMP in Japan affected inequality, using micro-level data of Japanese households in a VAR framework. Their main results show that UMP widened income inequality after 2008Q3 as the Bank of Japan (BoJ) resumed its zero interest rate policy and reinstated UMP. This is largely due to the portfolio channel: asset prices may become overvalued while UMP is in place. Consequently wealthy households that tend to save their money in financial assets earn more income from dividends and capital gains. Using aggregate panel data from 32 advanced and emerging market countries, Furceri et al. [2018] find that contractionary monetary policy shocks increase income inequality, on average. The effect is asymmetric: policy tightening raises inequality more than easing lowers it and depends on the state of the business cycle.

For what concerns the Euro Area, the empirical analyses are limited due to scarcity of proper household income, wealth or consumption surveys. Guerello [2017] recovers measures of income dispersion from the European Commission Consumer Survey and evaluates the effects of both types of monetary policy on income distribution. She finds that in the Euro Area standard expansionary monetary measures typically reduce the dispersion on income distribution. However, during a prolonged period of zero-lower bound, even if the beneficial effects on the economy of conducting QE monetary policy are unarguable, for several European countries the positive effects of these policies might be associated with an increase in income dispersion. Lenza and Slacalek [2018] use the Household Finance and Consumption Survey (HFCS) by ECB and proceed in two steps relying on both aggregate and household-level data of the four largest euro area countries (France, Germany, Italy and Spain). They find that quantitative easing decreased income inequality and had no significant effect on wealth inequality in the Euro Area.

Focusing on Italy, Casiraghi et al. [2018] study the distributional implications of non-standard monetary policy for Italian Households using the Survey of Household Income and Wealth (SHIW) conducted by the Bank of Italy. They report that larger benefits from ECB's unconventional monetary policy measures accrue to households at the bottom of the income

scale, as the effects via the stimulus to economic activity and employment, outweigh those via financial markets. The authors only exploit the cross-sectional dimension of the survey in 2010 and find that the overall effects of non-standard policies on income and wealth are negligible. The response of income along the wealth distribution is U-shaped due to easing credit conditions and the reaction of poorer households labor income to the improvement of the macroeconomics conditions.

After 2010, is the impact of non-standard monetary policy for Italian households income distribution still negligible? Does QE matter? Are macroeconomic effects able to offset short-term financial effects, over the medium-term? We try to respond to such questions.

In doing so, our contribution is twofold: we use for the first time EU-SILC microdata on Italian households (Istat) exploiting the survey in a repeated cross-sectional dimension to build inequality measures over time and for specific incomes and subgroups of individuals. Then we adopt a new identification strategy for monetary policy shocks: to isolate policy surprises we use the Euro Area Monetary Policy Event-Study Database (EA-MPD) by Altavilla et al. [2019], which presents high-frequency data as intraday asset price changes around the ECB policy announcement, with the identifying assumption that within the day monetary policy does not react to asset prices, and therefore causality goes from monetary policy to asset prices.

Finally, following Coibion et al. [2017] we combine microdata with macro model estimating the monetary policy effect directly on *ad hoc* inequality indices computed at the individual household level. Using a battery of Local Projections, we evaluate the impact of monetary policy by comparing the performance of the impulse response functions of inequality indices in different policy scenarios (pre and post-QE). Thus, we assess the impact of both conventional and unconventional monetary policy relying on earnings heterogeneity and the income composition channels through which monetary policy affects income distribution.

The main findings show that expansionary monetary policy compressed inequality through the income composition channel and for some sub-group of individuals. The financial channel

has an equalizing effect favoring the less wealthy households mainly in the long run up to the median percentiles. Overall, some evidence seems to suggest that QE is associated with a decrease in Italian households' inequality.

The remainder of the paper is organized as follows: Section 2 describes the main transmission channels of monetary policy; Section 3 describes the data and the construction of the measures of inequality and the distribution of income and financial wealth. Section 4 outlines our empirical approach, based on a new identification strategy and local projection model to assess the effects of both conventional and unconventional monetary policy shocks. Furthermore, it illustrates and interprets the main empirical results and robustness checks. Section 5 concludes.

2 Which channels should monetary policy activate? Recent statistics on income distribution in Europe

By analyzing some European statistics, since 2010, both GDP and employment have resumed growing in the OECD area. The economic recovery has gradually led to improvements in labor markets and household incomes but it has not yet delivered inclusive growth and not reversed the trend towards increasing income inequality observed over the past decade. Economic recoveries, even when weak, reduce unemployment and create job opportunities that should narrow income inequality. At the same time recoveries can increase inequality by fuelling capital incomes, which are concentrated at the top, and increasing jobs and wages more among better-off households. Moreover the current recovery has often been associated with fiscal tightening to restore the sustainability of public finance, in some cases with stricter access to social transfers, which are concentrated at the bottom of the income distribution. Over the past ten years, income inequality levels have remained at historical highs.

During the recovery, high-income households gained more due to unequal growth of labor incomes and changes in redistribution.

Data from Eurostat show wide inequalities in the distribution of income in 2016. In the EU, the top 20% of the population (with the highest income) received 5.2 times as much income as the bottom 20%. Compared to 2008, the largest increase in income inequality ratio was in Bulgaria (from 6.5 in 2008 to 8.2 in 2017, or +1.7), Italy (+1.1), Spain and Lithuania (both +1.0). Furthermore between 2007 and 2010, labor incomes among working-age households decreased sharply in European countries facing sovereign debt crisis and implementing structural reforms in a context of sharp fiscal consolidation and weak demand. In Europe recovery started later than elsewhere, and labor incomes decreased even further from 2010. Hence, inequality among the working-age population is typically higher. Inequality of market incomes among this population - i.e. labor and capital incomes plus private transfers - has been increasing since 2008 and remains high despite the economic recovery. By 2013, disposable income levels among the working-age population were almost back to pre-crisis levels despite a continuing shortfall in market income. This lower redistribution constitutes a challenge for policy-makers. Widening income gaps between rich and poor and high unemployment have raised awareness about the need to restore growth but also to make sure that all groups in society contribute to and benefit from greater prosperity.

3 Data and the measure of inequality for the Italian incomes distribution

In this section, we briefly describe the Italian Survey on Income and Living conditions and the construction of measures of inequality and the distribution for total disposable income, labor income and, financial capital income and wealth.

3.1 The Italian Statistics on Income and Living Conditions (EU-SILC)

The measures of income and wealth inequality are all constructed from The European Union Statistics on Income and Living Conditions (henceforth, EU-SILC), which is a survey aiming at collecting a large set of qualitative and quantitative information at individual and household level in member countries (Statistics on Income and Living Conditions. Regulation of the European Parliament. no. 1177/2003). It provides some crucial indicators on income, poverty, social exclusion in the European Union (i.e. at risk of poverty rate and the Gini coefficient). It is carried out yearly in different EU countries since 2004 and it is the reference source for comparative statistics on income distribution in Europe. Besides, it provides both cross-sectional and longitudinal data comparable across the participating European countries. The survey is conducted through household and personal interviews (all individuals over 16). The sample design is based on a two-stages scheme (municipalities and households), where the primary sample units (municipalities) are stratified by population size within each region. Italy, like most EU countries, adopted a rotational sample design, composed of four rotational groups, each to be followed-up for 4 years. Each year one-fourth of the sample is renewed. The overall sample is statistically representative of the population residing in Italy and it is about 20,000 households per year. In particular, in 2017, it amounts to 22,226 households (48,819 individuals), residing in about 680 municipalities.

Data collection is structured in three parts: a. General form to collect demographic information related to each household member (sex, date and place of birth, citizenship etc.) and some information for each household member aged less than 16 years (the type of school attended, formal and informal childcare etc.); b. Household questionnaire to collect information about housing conditions, housing expenses, economic situation,material deprivation, household income components; c. Personal questionnaire for each household member aged at least 16 years to collect information on education, health, current or previous labor and, income by detailed components (employee, self-employment, pensions and other

social transfers, financial and real capital, private transfers). Incomes and social benefits data collected by interviews are integrated with administrative register data, generally fiscal data, to improve the quality of statistical information.[1] Overall, all EU-SILC quantitative information are processed by using specific statistical procedures to delete outliers and impute missing data.[2]

Thus in our dataset we matched all parts of the questionnaires, taking into account demographic information, household income components, information on education, health, current or previous labor and, income by detailed components. Even though not explicitly designed to measure wealth, the EU-SILC survey contains information on multiple sources of financial wealth. Following the OECD Household financial assets classification,[3] we derive a measure of financial wealth by summing the estimated amount held by households in four different components: currency and deposits, public bonds, shares and other bonds and equities, mutual funds and other assets. Finally, the dataset includes cross-sectional microdata for Italian households from 2004 up to 2017. Overall, we have more than 600 thousand individual records over 13 years.

3.2 Measuring inequality

The detailed microdata does allow us to consider a wide range of inequality measures for total disposable income before and after transfers, labor earnings broken down by salaries from employees and income of self-employed workers, financial capital income and financial wealth. These are the variables we consider in our analysis.[4]

[1] Detailed information in Törmälehto and Jäntti [2013].

[2] For further details see in Istat [2008].

[3] National Accounts of OECD Countries, 2019.

[4] Financial income is defined as the sum of income refer to the amount of interest from assets such as bank accounts, certificates of deposit, bonds, etc, dividends and profits from capital investment in an unincorporated business (less expenses incurred). Total disposable income is given by the sum of the earnings and financial income plus the one arising from other sources, as transfers (unemployment benefits, pensions, children allowances etc.), income from the rental of a property or land (after deducting costs such as mortgage interest repayments) minus taxes on income and social insurance contributions. Disposable income before transfers is given by the disposable income minus social transfers described above excluded old-age and survivor' benefits.

Income variables are annual and refer to the year before the survey (12 months before to the interviews). The EU-SILC provides information on net incomes however, starting from 2007 gross incomes are available as well. For the sake of homogeneity, in our analysis we consider net incomes, taking into account that since 2007 no change has occurred in tax-rates and income brackets. However, as a further extension, we can to compute inequality measures of total disposable income before social transfers and to evaluate the impact of conventional and unconventional monetary shocks by isolating as much as possible the automatic stabilization effects of the transfer system. Furthermore, we can to compute *ad hoc* inequality measures for some subgroups of individuals, i.e. borrowers vs savers.

In the construction of the inequality measures, we use the weights provided within the survey. All the nominal variables have been expressed in real terms (2015 prices) using the annual data for the Harmonised Index of Consumer Prices (HICP).[5] To adjust household income according to the size we use the modified OECD equivalence scale and then we assign the equivalent household income to each member of the household, that is divided by the number of household members converted into equivalized adults. In other words we assume equal intra-household division of income and approximate individual living standards by assigning each individual the equivalized household income.[6] In doing so, we can control for the number of adults and the number of children in the household.

Following Casiraghi et al. [2018], we consider mainly three measures of inequality: the Gini coefficient, the ratio between the 90th percentile and 10th percentile and, the ratio between the 75th percentile and 25th percentile. Additionally, we compute the 99th, 90th, 75th, 50th, 25th, and 10th percentiles for all the variables considered above. We construct these measures for all the definitions of income and wealth. Taken together, these are extremely valuable because they provide a complete overview of inequality, the distribution, and their

[5]Eurostat, 2018b. Harmonised Index of Consumer Prices (HICP).

[6]Household members are equivalized or made equivalent by weighting each according to their age, using the so-called modified OECD equivalence scale. This scale gives the following weight to household members: 1.0 to the first adult; 0.5 to the second and each subsequent person aged 14 and over; 0.3 to each child aged under 14.

dynamics. In fact while the US CEX survey does not include the very upper end of the income distribution (i.e. the top 1%) which has played a considerable role in income inequality dynamics since 1980 in the US and Europe, EU-SILC includes even incomes at the top end of the distribution. In the calculation of inequality measures, we use the weights provided within the survey and exclude incomplete income reporters. Since all incomes and wealth information refer to the previous year, automatically the EU-SILC inequality measures time coverage shifts one year back, precisely from 2003 to 2016.

However, to cover the entire period of ECB communications, that is starting from 1999, we need a longer time span of the series because the survey, alone, does not cover such a long period time. As a first step, we compute a back-calculation of EU-SILC inequality income measures by exploiting the microdata from the Historical Archive of the Bank of Italy's Survey of Household Income and Wealth (SHIW). Specifically, we extended the series backward till 1999, in such a way that it is possible to recover 18 observations for each inequality measures.

The SHIW has been carried out by the Bank of Italy since the mid-1960s and comprises about 8,000 households per year distributed over 300 Italian municipalities and provides information on individual household characteristics and on their balance sheet (incomes and wealth).[7] Baffigi et al. [2016], extensively examines how survey data are related to those coming from other sources (national accounts, tax data, censuses, other sample surveys as EU-SILC and so on), summarizing the main results of the numerous works carried out on this aspect.[8] The authors found that both SHIW and EU-SILC exhibit bias due to non-response and underreporting. They found also that the average household income and the Gini inequality index exhibit a sharp correlation between the two surveys even if there are some differences in the calculation of some aggregates such as those concerning self-employment or financial capital incomes.[9] The overall estimates obtained in the EU-SILC survey can be used

[7] SHIW Archive, Bank of Italy.

[8] Following this strand see also Jappelli and Pistaferri [2010] and Fagereng et al. [2016].

[9] In the EU-SILC survey, the income from self-employment coming from interviews is compared with that from administrative sources and the maximum of the two values is imputed in the estimate of household

for comparison with the SHIW with good results. Thus, we compute common coefficients over the two surveys common span, and then we retropolate the EU-SILC inequality indexes. Finally, we obtain a longer time span 1999-2016 yearly data useful for macro model estimates which cover both a part of times of conventional (1999-2008) and soft and hard unconventional (2009-2016) monetary policy actions. Figure 2 in the Appendix shows the trend over time of different measures of inequality we have retropolated for different components of income and financial wealth. Overall, all measures show a slightly increasing trend over the last eighteen years in Italy. Financial capital income and wealth exhibit more volatility with respect to total disposable and labor income, especially during and after the financial crises. In the last two years they present a slight decrease in inequality as for the labor income measures.

4 Empirical methodology and the identification strategy

To evaluate the effects of both conventional and unconventional monetary policy on the income distribution of individual households we use the monetary policy surprises estimated in the Euro Area Monetary Policy Event-Study Database, (EA-MPD, henceforth) by C. Altavilla, L. Brugnolini, R. Gürkaynak, R. Motto and G. Ragusa, henceforth ABRGM. We focused on the effects of an expansionary monetary policy exploring the financial channel and the income composition channel (i.e. 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 labor income, offsetting the total effect on inequality). By using a battery of local projections, as Jordà [2005], we estimate a baseline policy scenario using the whole sample period (1999-2016) and a counterfactual scenario without QE up to 2008. Finally, we examine the impact of unconventional monetary policy by comparing the two scenarios.

income. A similar procedure is adopted for financial capital incomes.

4.1 The Euro Area monetary policy Event-Study Database

To identify monetary policy shock, most empirical works on Euro Area use innovations in monetary policy rate, i.e. 3-month rate in case of conventional monetary policy shocks and the long term interest rate in case of unconventional monetary policy as in Guerello [2017] and Casiraghi et al. [2018]. In related literature we find other identification strategies. Following Lenza and Slacalek [2018], the main identifying assumption to evaluate unconventional monetary policy is that an expansionary asset purchase shock decreases the term spread (defined as the difference between ten-year and three-month constant-maturity). In their simulation Casiraghi et al. [2018] running the quarterly model of Bank Italy (BIQM), adopt the same assumption as above. Broadly speaking, a monetary shock is identified as an innovation in the policy rate or in the monetary base that does not contemporaneously affect both prices and output. The monetary shocks proposed, however, has two main issues. First, they are predicted by past information and autocorrelated with their past. Second, there is a potential information problem since central banks transfer information about the outlook of the economy around the policy announcements.

Thus, it is difficult to disentangle a pure monetary policy surprise from one that arises, for instance, from central bank information. Some of the recent works in this vein are Jarocinski and Karadi [2018], who use stock-bond correlations to identify central bank information signaling as opposed to classical monetary policy surprises. This issue is even more concerning once we aggregate the monthly measure into a quarterly or an annual one. For these reasons, we use intraday interest rates changes around ECB policy announcements available in the Euro Area Monetary Policy Event-Study Database, (EA-MPD, henceforth), compiled by ABGRM, regularly updated and freely available by authors. EA-MPD provides a framework to extract multidimensional surprises based on Gürkaynak et al. [2005] and Swanson [2017]. EA-MPD makes available intraday interest rates and asset price changes for the history of ECB Governing Council announcements for a wide range of variables.

They in detail report OIS,[10] sovereign yields, stock prices, and exchange rates. The assets covered are the Overnight Index Swap (OIS) rates with 1, 3, 6 months and 1 to 10, 15, and 20 years maturities; German bond yields with 3 and 6 months and 1 to 10, 15, 20, and 30 years maturities; French, Italian, and Spanish sovereign yields with 2, 5, and 10 years maturities, the stock market price index and the stock price index comprising only banks, and the exchange rate of the euro.

In contrast with FED, there are two steps in the ECB communication procedure: first, at 13:45 Central European Time (CET) the ECB releases a very short note where it states the decisions about the three main interest rates (the main refinancing operation rate, MRO, the marginal lending facility rate, MLF, and the deposit facility rate, DF); then, after forty-five minutes, at 14:30 CET, the president of the ECB reads the introductory statement (IS) which is a document containing the reasons underlying the choice of the interest rates, describing ECB's view about the economic situation and providing information on its future behavior. This part lasts around fifteen minutes and is followed by a forty-five-minutes session of questions and answers (Q&A).

To build the asset price/yield changes database, they take the price/yield difference in short windows on Governing Council dates. Given this information release structure, they calculate the changes reported in the database as the difference between the upper median and the lower median (Table 2).

They collect all the changes for all the instruments around the three windows, and they present the Euro Area Monetary Policy Event-Study Database (EA-MPD) as a single workbook.[11]

Causality is very hard to tease out in macroeconomics however, jumps in OIS and asset

[10]OIS are euro area-wide interest rate measures, not affected by country risk either as credit risk or as safe haven premia. The OIS contracts are over-the-counter interest rate swaps where the underlying reference rate is the euro area inter-bank rate, EONIA. Unlike US Federal Funds Futures, which have fixed calendar month coverage, each OIS contract is fixed maturity.

[11]For an accurate description of the methodology see the Appendix to Measuring Euro Area Monetary Policy by Altavilla et al. [2019].

Table 1: Timing of monetary policy announcements in EA-MPD

	Press Release 13:45 CET	**Press Conference 14:30 to 15:30 CET**	**Monetary Event 13:45 to 15:30 CET**
lower median ($lower_t{}^{med}$)	10 min before 13:25-13:35	10 min before 14:15-14:25	10 min before 13:25-13:35
upper median ($upper_t{}^{med}$)	15 min after 14:00-14:15	10 min after 15:40-15:50	10 min after 15:40-15:50
change ($upper_t{}^{med} - lower_t{}^{med}$)	$Change_t^R$	$Change_t^C$	$Change_t^M$

prices around monetary policy announcements represent a kind of natural experiment to identify the causal effect of a monetary policy surprise. High-frequency data are an essential input to study the effects of monetary policy communication. Hence the high resolution of the intraday data allows for the measurement of asset price changes separately for the ECB's Press Release Window, the Press Conference Window, and their union, the Monetary Event Window.

4.2 How many dimensions of policy do the market reactions suggest?

Following the Governing Council policy meetings, ABGRM estimate latent factors from changes in yields in such a way to provide structural interpretation[12] to extract monetary

[12]The matrix X^j, j = *press release, press conference* has changes in 1, 3, and 6-months and 1, 2, 5, and 10-years yields in its seven columns, with each row corresponding to a policy date. This matrix is taken directly from the EA-MPD. The factor structure is

$$X^j = F^j\Lambda + e^j$$

where F are the common latent factors, Λ are the factor loadings, and are the idiosyncratic variation of yields at different maturities. After that they analyze the press release and press conference windows separately and by principal components, estimate the factors and rotate them to provide a structural interpretation, as common drivers of yield changes.

policy surprises from these asset price changes that admit economic interpretation and to ask how many dimensions of policy action and communication market participants perceive in press releases and press conferences.

To understand what these latent factors were, they use the methods developed by Gürkaynak et al. [2005], which makes the factors admit macroeconomic interpretation, and follow Swanson [2017] in labeling the QE factor. In particular, they identify four monetary policy factors, labeling these as Target, Timing, Forward Guidance (FG), and QE shocks. These shocks look fairly similar to those identified for monetary policy shocks with other central banks. For example, Swanson [2017] identifies target, path and asset purchase surprise in a comparable database of US monetary policy shocks.

The factors ABGRM have found, make us understand that differentiating the signals (release/conference) is crucial in the yield curve response to ECB monetary policy. As described by the authors, the estimated footprint (see Figure 1) that monetary policy measures leave on the yield curve varies across the two event windows. As expected, in the press release window, the only relevant factor is Target, related to the surprise in the immediate setting of the policy rate. Again as expected, this factor loads heavily on the short rates (1-month OIS), with little effect on the long-term interest rates.

It turns out that financial markets perceive a short-term and longer-term forward guidance factor. They call "timing" the first factor, which has a peak effect at about the six-months maturity (6-months OIS) and has little effect on long-term interest rates, to differentiate it from what is now commonly called forward guidance, which has a peak effect at two years and significantly affects long-term interest rates (2-years OIS). While the Timing factor captures the shifts in market expectations over the next few meetings that leave longer-term interest rates essentially unchanged, the Forward Guidance factor captures the revision in market expectations about the future path of policy rates that are orthogonal to the current policy surprise.

The QE factor has a larger effect the longer the maturity is, consistently with QE

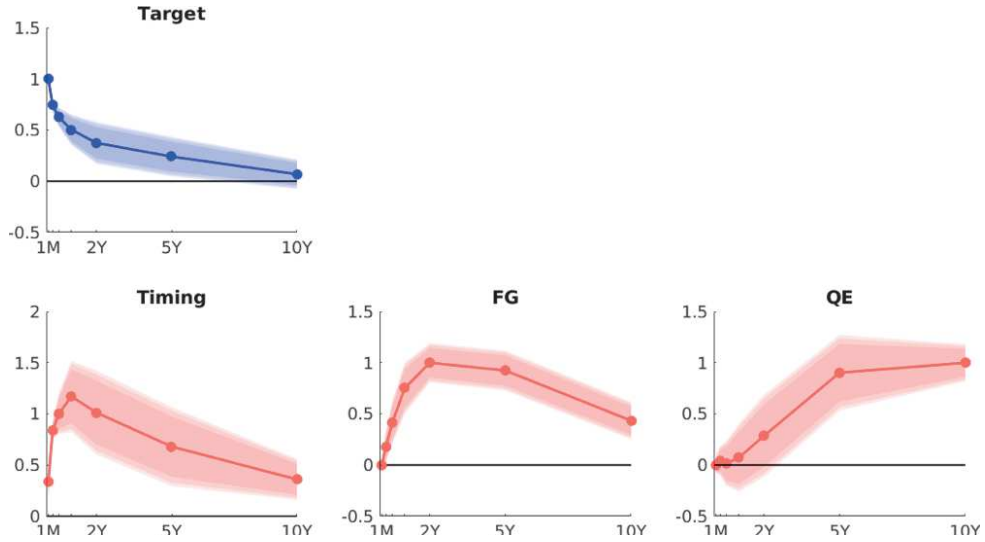

Figure 1: Factor loadings

Note: The figure shows the factor loadings for the press release (first row) and the conference windows (second row), in basis points. The shaded areas indicate the 90%, 95% and 99% confidence intervals (C. Altavilla et al., 2019).

implementation in the Euro Area, where the average maturity of purchased securities was about eight years. Importantly, QE turns out to have lowered all yields and narrowed spreads, Italians included. They find that responses of Spanish and Italian yields were statistically and economically larger than OIS loadings, showing that sovereign spreads narrowed in response to larger-than-expected QE announcements.

This result is confirmed by the data. Looking at Figure 3 in the Appendix, the large asset purchases started from the end of 2014 reduced the Italian term spread (long term - short term interest rate). The reduction, from 4.32 in 2013 to 1.49 in 2016, is entirely accounted for by the drop in the long-term interest rate since the short-term rate was almost at zero.

Furthermore, the effects of the FG and QE shocks are found to be more persistent than for the US, though the persistence of these shocks is hard to identify with much precision. In particular, ABGRM show that the QE effect was long-lived, with a half-life of about a year. This is much longer than what was found earlier in the literature, when QE surprises were not quantified, and the effects were based only on the dates of QE announcements.

Moreover Euro Area monetary policy shocks do not have asymmetric effects, in contrast to some evidence for the US.

4.3 The identification of monetary policy shocks

Before turning to the effects of MP shocks on inequality, we first investigate how expansionary monetary policy actions affect the Italian macroeconomic aggregates, as well as the financial variables. The shocks identify periods in which monetary policy was more expansionary than usual (conditional on real-time forecasts), especially after 2001 when the national currencies were completely converted to Euro. Against the risk of deflation, 2002-2005 is identified as a period of consistently positive MP shocks. On the other hand, the 2006-2008 period is identified as more restrictive since the creation of the Euro Area. After the financial crisis of 2008-09, central banks have aggressively cut monetary policy rates, in many cases to their lower bound. Conversely, the European Central Bank did not immediately cut its main policy interest rate to zero. The rate on the main refinancing operations (MRO) was reduced sharply at the end of 2008 and it bottomed at 1% in May 2009 but did not fall below that threshold until mid-2012. The interest rates were further reduced after the intensification of the sovereign debt crisis and during the following economic crisis. The rate on the deposit facility reached zero in July 2012, before entering negative territory from 2013 onward.

Since the financial crisis of 2008-09, in addition to the so-called standard monetary policy, the ECB implemented several additional purchasing programs (Securities Market Program, SMP and the Outright monetary transactions, OMT) and longer term refinancing operations (LTROs) designed to support dysfunctional market segments, foster bank liquidity and avert a credit crunch. In September 2014 the ECB announced the purchase of asset-backed securities and a broad portfolio of euro-denominated covered bonds. To re-anchoring inflation expectations on inflation rates below, but close to 2% and to inject liquidity in the system, on the 22nd of January 2015 the Governing Council of the European Central Bank (ECB) decided to launch an expanded asset purchase program (APP) joining other central banks

in adopting quantitative easing (QE) in addition to other non-standard monetary policy measures as the margin for standard monetary policy changes in the form of interest rate cuts had eroded. All the non-standard measures were embedded in Forward guidance (FG), which means that the ECB has been providing information about its future monetary policy intentions based on its assessment of the outlook for price stability.[13]

We follow ABGRM to identify innovations to monetary policy purged of anticipatory effects related to economic conditions to characterize the effects of monetary policy (MP) in Italy. We consider the following exogenous monetary surprises on a monthly basis: OIS 1-month and OIS 6-months, as the monetary surprises that allow us to identify mostly the effect of conventional monetary policy since they derive from Target and Timing factors loadings, respectively; OIS 2-years and 10-years Italian bond yield as the rates that, following the analysis by ABGRM, identify the unconventional monetary policy (pre and post-QE, see section 4.2) since they derive from Forward Guidance and QE factors loadings, respectively. The vector describing the monetary surprises is the following:

$$\hat{\epsilon}_{s,t}^{MP,m} = [OIS1m; OIS6m; OIS2y; IT10y]$$

where m indicates that the surprises are monthly.

Before estimating the impulse response functions, we verify that the monetary surprises are not autocorrelated with their past. These issues are particularly concerning in the context of a local projection, in which the measure is included directly (and not as an instrument) and thus might lead to biased (and puzzling) results, as shown in Miranda-Agrippino and Ricco [2018]. As expected, monetary surprises don't exhibit any relevant autocorrelation implying that we are isolating potential information problems about the outlook of the economy, as much as possible in a short temporal window.

Since the Italian inequality measures are available on an annual basis, we aggregate the

[13]The ECB began using Forward Guidance on July 4, 2013 when *"The Governing Council expects the key ECB interest rates to remain at present or lower levels for an extended period of time."*

monthly monetary surprises into annual shocks $\hat{\epsilon}_{s,t}^{MP,y}$, using a simple time sum.

Finally, to compute the impact of monetary policy on inequality, we estimate impulse responses with local projections (LP) along the lines of Jordà [2005], whose flexibility allows us to deal with a short sample and annual data. The LP approach consists in running a sequence of predictive regressions of a variable of interest on a structural shock for different prediction horizons. The model we estimate is the following:

$$\Delta Y_{j,t+h} = \alpha_j^{(h)} + \beta_j^{(h)} \hat{\epsilon}_{s,t}^{MP,y} + \eta_{j,t+h} \sim MA(h) \tag{1}$$

where $\alpha^{(h)}$ is a constant and $\eta_{j,t+h}$ is the residual. The cumulated estimated coefficients $\Sigma_{h=0}^{H} \hat{\beta}_j^h$, for $h = 0, ..., H$, represent the effects of $\hat{\epsilon}_{s,t}^{MP,y}$, a conventional or an unconventional monetary policy shock at time t on $Y_{j,t+h}$, the macroeconomic aggregates considered at time $t + h$.[14] $Y_{j,t+h}$ horizon is set as $h = 0 \ldots, 4$ years.

As shown by Jordà [2005], the direct estimation of the autoregressive coefficients $\beta_j^{(h)}$, $h = 0 \ldots H$, corresponds to estimating the impulse response functions (IRFs) without casting the Wold representation theorem. Hence the IRF is given by the sequence of regression coefficients of the structural shock and it is consistent with asymptotic normality properties. The impulse responses are presented in the next section with 1 and 1.65 standard deviation confidence bands. The errors arising from this projection are vector moving average (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). However, we don't include additional lags of the shock $\hat{\epsilon}_{s,t}^{MP,y}$, as the sample autocorrelation function for each monetary surprise doesn't reveal a significant correlation between different lags, and since

[14] Following the literature on monetary policy effects, it is conventional to assume that monetary policy shocks do not have contemporaneous effects on output, inflation, etc. but may have a contemporaneous effect on equity prices. Consistent with this convention, we set the contemporaneous effects to zero for GDP and Inflation in the impulse responses reported in Figures in Appendix C. This means that we use $\hat{\beta}_1^{(h)}$ for GDP and HICP price index rather than $\hat{\beta}_0^{(h)}$ to assess the impact over time of 1% monetary shock. For the FTSE-MIB index and spread, we use $\hat{\beta}_0^{(h)}$.

the inclusion of these would imply dropping observations.[15]

Along with the four measures of monetary policy stance $\hat{\epsilon}_{s,t}^{MP,y}$, few other macroeconomic variables are considered in the analysis, namely real GDP, inflation rate, and the FTSE-MIB, the stock market index specifically for Italy. Finally, to fully identify all the transmission channels of non-standard monetary policy we include the spread as the difference between short- and long-term interest rates (10 years government bonds), only in the unconventional scenario. We use the macroeconomic variables in log-levels except for the spread; GDP and FTSE-MIB are also expressed in real terms.

The variables are available at the annual frequency, for the sample 1999 to 2016. If on the one hand, the annual frequency could be a limit for the analyses of monetary policies, on the other hand it is more suitable to capture the effect on income distribution given the slow movements of the dispersion measures over a single quarter or even more a single month.

4.4 The transmission of conventional and unconventional monetary shocks

Far from a narrowing definition of conventional and unconventional monetary policy, we assess the impact of these monetary policy actions on the Italian economy using different identification strategies. First, we estimate the impact of standard monetary policy over the period 1999-2012, where short interest rate cuts were implemented; then, we estimate the effect of non-standard monetary policy over the entire sample 1999-2016 using two identification strategies, QE and Forward Guidance innovations. Finally, we analyze the difference between the two scenarios since from 2013 onward policy rates reached the zero lower bound (ZLB) and only non-standard tools have been active.

The impact of standard monetary policy is estimated using the OIS6m monetary surprises (loading from Timing factor) as it is more suitable using annual data. However, to be sure

[15] While a vector autoregressive model (VAR) consumes data only along with the lag dimension (p), LP consumes data both along the lag(p) and the lead (h) dimension, thus the lag-length selection is crucial (Brugnolini [2018].)

that the OIS1m surprise is orthogonal to OIS6m, we include OIS1m among the endogenous variables. The results are presented in Appendix C, Figure 4, 5, 6. Over the reduced sample 1999-2012, an expansionary monetary policy shock, that is a 1 point decrease of the policy rate, increases Italian real GDP in the short-run and inflation. The effect on prices is stronger and more persistent with respect to national product, while the impulse response of the FTSE-MIB index shows an almost null reaction. As expected, the OIS1m exhibits a reaction almost close to zero, as it is orthogonal to the monetary surprise implemented. These results are in line with the bulk of the theoretical and empirical literature on conventional monetary policy shocks.

To assess the impact of QE, we use IT10y as monetary policy shock over the entire sample 1999-2016 including the spread as an endogenous variable, taking into account that QE might have a contemporaneous effect on all the macro variables. Following this strategy, an expansionary non-standard policy shock increases Italian real GDP while reduces inflation, both in a persistent way. The effect on financial variables is sharply positive even in the long-run. The spread falls on impact and then exhibits an upward dynamics, whereas the response of prices seems quite puzzling and inflation seems to be unresponsive to the QE stimulus. Indeed, as stated by Williamson et al. [2016], both the ECB and the Bank of Japan are still experiencing inflation below their targets and further unconventional monetary policy actions do not seem to help. Recently Cochrane [2017] states that near to the ZLB inflation could be still stable and, therefore, an increase in the interest rates could lead to a rise of inflation.[16]

Moreover, we can gauge the effect of Forward Guidance over the entire sample period, using OIS2y as monetary innovation and including the spread as an endogenous variable. The advantage of using an interest rate longer than the targeted policy rate is that it incorporates

[16]This view is known as *New Fisherian Hypothesis* and it is based on the Fisher Effect according to which the real interest rate is independent of economic activity in the long-run and so an increase in the nominal interest rate will be reflected only in a one-for-one increase in inflation. Cochrane [2017], after testing several New Keynesian models concluded that, near the ZLB, inflation positively reacts to the nominal interest rate also in the short-run.

the impact of forward guidance and therefore remains a valid measure of monetary policy stance also during the period when the federal funds rate is constrained by the zero lower bound (Jarocinski and Karadi [2018]). Figure 6 shows the IRFs after an expansionary monetary policy: the effect is slightly positive for GDP and sharply increasing for the HICP index probably because FG embedded the ECB policy intentions on anchoring inflation target below but close to 2%. Then, a decrease in the short-term interest rate leads to a persistent increase in inflation, because it clearly stimulates output growth. FG shock reduces the spread, as expected. Moreover, the decrease in the long-term rate is rather short-lived and reverts after one year. Indeed, it has a puzzling effect on stock prices in the short-run due to the uncertainty of ECB's FG in 2012 and the second half of 2013, maintaining an accommodative monetary stance.[17] Jarocinski and Karadi [2018] found the same puzzling behavior of Euro Area market participants after some crucial ECB's information surprises.

4.5 The Effects of Monetary Policy Shocks on Inequality

To gauge the overall effects of the monetary surprises on inequality indexes and the income distribution, we adopt the same econometric technique described in the previous section and estimate a version of equation (1) using inequality measures for total disposable income, labor earnings and capital financial income, defined as in section 3:

$$\Delta Z_{i,t+h} = \alpha_i^{(h)} + \beta_i^{(h)} \hat{\epsilon}_{s,t}^{MP,y} + \eta_{i,t+h} \qquad h = 0, ..., H \tag{2}$$

where Z_i corresponds to the Gini index, the ratio between the 90th and the 10th decile and the ratio between the 75th and the 25th percentile that better account for changes at the tails of the distribution following Casiraghi et al. [2018] and finally, the percentiles of the distribution P10, P25, P50, P75, P90 and P99 expressed in logarithms of disposable income, disposable income before transfers, labor income, financial capital income and financial wealth.

[17] In short, the ECB's announcement on 2013, 4 July, while allowing one-year interest rates to be anchored (Draghi, 2014), was not enough to coordinate the market operators' short-term expectations and keep them at low rate levels, causing sharp stock price volatility.

The specification of (2) allows for a contemporaneous effect of the unconventional monetary policy shock on the inequality measure of interest.[18]

First we trace out the effect of an expansionary conventional monetary policy on inequality as a baseline scenario up to 2012. Then we compare the baseline scenario with the effect of an expansionary unconventional monetary policy on inequality (all sample 2004-2016). The monetary surprises we implement in our model are the following:

$$\hat{\epsilon}_{s,t}^{MP,y} = [OIS1m; IT10y]$$

The OIS1m surprise (Target factor) is implemented to estimate conventional policy, while IT10y surprise (QE factor) is used to evaluate unconventional monetary policy. We assess the effect on inequality using OIS6m (Timing) and OIS2y (FG) as well, but the estimates are not statistically significant both at 1 and 1.65 confidence levels.

4.6 Main results

As shown in Figure 7, we compare the effect of a monetary surprise between the two periods: the effect of an expansionary monetary policy on total disposable income reduces inequality in Italy both in standard and non-standard time but, while in the first scenario the effect is short-lived (after 1 year the Gini index shows an upward trend), the impact of QE is equalizing starting from the second year but more persistent as shown in its downward trend with respect to the conventional case. Furthermore, the impulse responses of the P90-P10 ratio and P75-P25 ratio are more coherent in the unconventional scenario. Since policy rates have been unusually low for a long time, this result might suggest more persistent distributional effects than during a normal interest rate cycle (Domanski et al. [2016]).

Looking at the income distribution, the overall impact of an expansionary non-standard monetary policy is more equalizing than the conventional scenario. In particular the 10th

[18]Furthermore, it is particularly convenient given the small sample at hand and its robustness towards misspecification.

percentile appears to be the one that benefits the most from the unconventional policy after one year both for disposable and labor income, while the magnitude of the responses of the remaining percentiles is nearly identical. The sign of the responses is the same for each percentile. The top 1% benefited more from an accommodative standard policy (Figure 10).

The effect of the unconventional monetary policy is equalizing for both labor and financial incomes, as well. The size and dynamics of labor income inequality measures are very similar to the total disposable income ones for the unconventional case. In particular, the bottom of the distribution appears to be the one that benefits the most from the unconventional policy after two years probably reflecting the slow recovery of employment in Italy after the financial crises. Additionally, we are able to gauge the QE effect on employee and self-employment income. Figure 11 compares the QE effects: the Gini index calculated on employee incomes decreases immediately after the shock while the effect on self-employment is dis-equalizing in the first two years and then turn to be equalized after the second year with higher magnitude. Indeed, the IRFs reflect the recent upward dynamics of self-employment labor income in Italy. On the other side, financial income inequality shows quite different behavior: while in the conventional case the Gini coefficient decreases and upsurges after one year, in the unconventional scenario the Gini coefficient decreases persistently from the first year onwards (12). This fall is mainly driven by the prompt rise in the 10th, 25th and 50th percentiles, with the former responses displaying a higher magnitude. The responses appear largely delayed for the 99th and 90th percentiles, for which, if anything, an increase is observed after one year and with a higher intensity only after three years (Figure 13). This probably reflects different households behaviors: those who hold low financial incomes switched rapidly toward more profitable assets, as mutual funds (a widespread asset in Italy after financial crises, see Household Financial Assets, OECD); instead, households at the top of financial income distribution kept their portfolio unchanged for a longer period benefiting from higher asset prices. These findings show that the income composition channel has been activated by QE.

The responses of inequality measures and financial wealth distribution are presented in

Figure 15 and 14, respectively. While in the conventional case the Gini coefficient decreases and upsurges after two years, in the unconventional scenario the Gini coefficient decreases strongly after one year and persistently from the second year onwards. There is also an unambiguous and persistent decrease in each measure of inequality in response to a decrease in the nominal interest rate. As for the financial income distribution, this fall is mainly driven by the sharp rise in the 10th percentile. The responses appear largely insignificant for the remaining percentiles for which a slight increase is observed after the first year. The behavior of the household distribution is completely different in the conventional case: a decrease in nominal short rate, lowered all the income percentiles meaning that the standard monetary policy works differently as it affects all families that hold securities and deposits. Taking into account that risky financial assets are almost exclusively held by the upper decile of the gross wealth distribution, the financial segmentation channel seems to be activated under the non-standard monetary policy in favor of less wealthy households even though, under UMP, stock prices appear to have reacted to a lesser extent.

4.7 Effects on sub-group of households and other possible extension

As a further extension, we consider some specific questions raised in the public debate. One is whether non-standard measures differ from conventional policies in the extent to which they may cause an "expropriation of savers" (Casiraghi et al. [2018]): monetary expansion makes borrowers better off by reducing the interest payments on debt, while savers holding deposits face lower returns. The other one concerns the redistributive role of fiscal policy (Guerello [2017]) since low-income households tend to rely more on transfers while middle-income households rely on labor income and those at the upper tail of the income distribution will rely relatively more on business and capital income (Colciago et al. [2019]). Consequently, we analyze the impact of QE on household disposable income before transfers.

At the end of 2017 in Italy, housing was the main investment for Italian households and

it represents half of the gross wealth with a value of 5.246 billion euros although, since 2011, the ratio of dwellings to total assets declined in the following years, falling from 54 to 49 percent in 2017. Furthermore, the downward trend in residential housing prices in Italy, underway since 2012, has resulted in a reduction in the average value of housing and in the ensuing contraction in the value of housing wealth (BdI-Istat Report, 2019). According to the Household Budget Survey by Istat, in the same year, mortgagors represents the 19.6% of households living in their dwellings (13.4% in 2008). Since EU-SILC survey makes available some information on households savings and housing tenure status (i.e. owners, mortgagors), we can analyze the impact of non-standard monetary policy on the so-called "savers" households, i.e. families with capital income and without a mortgage (owners or not), and on the "borrowers" households, defined as families without capital income but with a mortgage (although other definitions to classify savers and borrowers are allowed) assessing whether the saving redistribution channel worked. According to Cloyne et al. [2018], housing tenure is a useful proxy for the balance sheet positions of households. Mortgagors, by definition, have sizable debt but also sizable wealth (which is typically tied-up in their house) while outright owners have sizable housing and other financial wealth. As shown in Figure 16 non-standard monetary policy, says QE, is dis-equalizing for savers but only in the first year. From the second period, IRF shows a downturn in dynamics probably because incomes from real and financial capital are not eroded sharply from low-interest rates like in a standard monetary policy. Even if on a lower magnitude, the impact for borrowers is equalizing indeed, meaning that the prolonged period of low-interest rates allows people to get access to cheaper loans. Therefore, savers do not appear to have been hit hard by non-standard monetary policies. In addition, considering that the share of deposits in the financial portfolio, increased from 10 to 13 percent between 2005 and 2017, the share of securities declined from 8 to 3 percent in the same period and the shares and other equity fell from 12 to 10 percent (BdI-Istat Report, 2019), we can argue that, differently for US and UK, equity prices were not the main drivers of rising inequality in Italy.

Finally, given the role played by fiscal policy in Italy, even if limited by fiscal compact rules in recent years, we find that redistributive policies might have shaped the distribution of income and its response to external shocks. Following Guerello [2017], the Gini index of disposable income before social transfers (pension excluded) provided by the EU-SILC database can be considered as a proxy of redistributional effects of fiscal policy.[19] Figure 17 shows that the effect of an expansionary monetary policy on disposable income before transfers reduces inequality in Italy both in standard and non-standard case but, while in the first scenario the effect is short-lived (after one year the Gini index shows an upward trend), in the second scenario, starting from the second year the impact of QE is equalizing and more persistent as shown in its downward trend with respect to the conventional case. Furthermore, the impulse responses of the P90-P10 ratio and P75-P25 ratio exhibit a more marked decrease meaning that low-income households have benefited more from fiscal transfers other than pensions, if anything. All in all, the effect before and after transfers are very much alike, probably because following the sovereign debt crises tightening fiscal rules have limited government policy actions in Italy and other European countries. For these reasons the social tensions associated with fiscal consolidation in part stemming from the global financial crisis, have put the distributional impact of governments' tax and spending policies at the heart of the public debate in many countries. According to Bernanke [2015] it would be preferable to have more proactive fiscal policies and a more balanced monetary-fiscal mix when interest rates are close to zero. Greater reliance on fiscal policy would probably give better results, and would certainly be easier to explain, than changing the target for monetary policy.

4.8 Robustness

We also conduct a robustness check analysis by adopting the same methodology on another measure of inequality for each scenario we have discussed before: the cross-sectional standard deviation of log-levels which removes zero values thus reducing sensitivity to extreme values.

[19] We do not use a pre-tax income considering that for many years the tax rates and tax brackets have been unchanged in Italy.

Figure 18 in Appendix C.4 shows the impulse response functions of disposable income, disposable income before transfers, labor income, financial capital income and financial wealth in both the conventional and the unconventional monetary policy scenario. The results are broadly consistent for what concerns both the short and the long-run dynamics. All in all, an expansionary monetary policy reduces inequality. However the equalizing effect is more evident and long-lived in the unconventional scenario.

5 Conclusion

In this paper, we investigate the effects of conventional and unconventional monetary policy shocks on income inequality in Italy focusing on the income composition channel. In doing so, we use for the first time the household survey microdata on Income and Living Conditions (EU-SILC, Istat) in a repeated cross-section design in order to compute inequality measures over time and for specific incomes and subgroups of individuals (savers vs. non-savers). Our identification strategy for the monetary policy innovations is based on intraday interest rates changes around ECB policy announcements available in the EA-MPD database for the Euro Area, recently published. The reactions of free-risk rates at different maturities in the Monetary Event Window allow us to disentangle a pure monetary policy surprise from one that arises from central bank information about the economic outlook such that we disentangle news and noise.

The main results show that an expansionary non-standard monetary policy compressed inequality both for disposable income and earnings (in particular for employees). With respect to the conventional scenario the equalizing effect of non-standard policy is long-lived. Looking at the income percentiles, the impact of an expansionary non-standard monetary policy is heterogeneous among the distribution and more equalizing than the conventional scenario. In particular the 10th percentile appears to be the one that benefits the most from unconventional policy both for disposable and labor income meaning that the income

composition channel works well in the QE period even if the overall impact on household disposable and labor income is modest. The same equalizing effect is more evident in the unconventional scenario when we consider the response of disposable income before social transfers (pension excluded) meaning that fiscal policy did not have a crucial redistributive role in Italy during the crises and the recovery period.

Turning our attention to financial wealth, the non-standard monetary policy shows an equalizing effect favoring the less wealthy households up to the median percentile mainly in the long-run meaning that unconventional monetary policy is no longer "neutral" over the cycle. The evidence on financial income is very much alike with sharp heterogeneity across the distribution. Hence, we can argue that different for the US and UK, equity prices were not the main drivers of rising inequality in Italy. Overall, some evidence suggests that QE is associated with a decrease in Italian household inequality and savers do not appear to have been hit hard by non-standard monetary policies. Furthermore, the Euro Area's experience with unconventional monetary policy may hold important policy implications for government policy choice. Future researches could investigate the key role of fiscal and redistributive policies on inequality.

References

C. Altavilla, L. Brugnolini, R. S. Gürkaynak, R. Motto, and G. Ragusa. Measuring euro area monetary policy. Working Paper Series 2281, European Central Bank, May 2019. URL https://ideas.repec.org/p/ecb/ecbwps/20192281.html.

A. Baffigi, L. Cannari, and G. D'Alessio. Cinquant'anni di indagini sui bilanci delle famiglie italiane: Storia, metodi, prospettive (fifty years of household income and wealth surveys: History, methods and future prospects). Bank of Italy Occasional Paper, (368), 2016.

B. Bernanke. Monetary policy and inequality. ben bernanke's blog. 2015.

L. Brugnolini. About Local Projection Impulse Response Function Reliability. CEIS Research Paper 440, Tor Vergata University, CEIS, Jun 2018. URL https://ideas.repec.org/p/rtv/ceisrp/440.html.

M. Casiraghi, E. Gaiotti, L. Rodano, and A. Secchi. A "reverse Robin Hood"? The distributional implications of non-standard monetary policy for Italian households. Journal of International Money and Finance, 85(C):215–235, 2018. doi: 10.1016/j.jimonfin.2017.1.

J. Cloyne, C. Ferreira, and P. Surico. Monetary policy when households have debt: new evidence on the transmission mechanism. Working Papers 1813, Banco de España, May 2018. URL https://ideas.repec.org/p/bde/wpaper/1813.html.

J. H. Cochrane. The new-keynesian liquidity trap. Journal of Monetary Economics, 92:47–63, 2017.

O. Coibion, Y. Gorodnichenko, L. Kueng, and J. Silvia. Innocent bystanders? monetary policy and inequality. Journal of Monetary Economics, 88(C):70–89, 2017.

A. Colciago, A. Samarina, and J. de Haan. Central bank policies and income and wealth inequality: A survey. Journal of Economic Surveys, 33(4):1199–1231, 2019.

D. Domanski, M. Scatigna, and A. Zabai. Wealth inequality and monetary policy. BIS Quarterly Review March, 2016.

A. Fagereng, L. Guiso, D. Malacrino, and L. Pistaferri. Heterogeneity in returns to wealth and the measurement of wealth inequality. American Economic Review, 106(5):651–55, May 2016. doi: 10.1257/aer.p20161022. URL http://www.aeaweb.org/articles?id=10.1257/aer.p20161022.

D. Furceri, P. Loungani, and A. Zdzienicka. The effects of monetary policy shocks on inequality. Journal of International Money and Finance, 85(C):168–186, 2018.

C. Guerello. Conventional and unconventional monetary policy vs. households income distribution: an empirical analysis for the euro area. Journal of International Money and Finance, 85, 11 2017. doi: 10.1016/j.jimonfin.2017.11.005.

R. Gürkaynak, B. Sack, and E. Swanson. Do actions speak louder than words? the response of asset prices to monetary policy actions and statements. International Journal of Central Banking, 1, 02 2005. doi: 10.2139/ssrn.633281.

Istat. L'indagine europea sui redditi e le condizioni di vita delle famiglie (eu-silc). Metodi e norme no. 37, 2008.

T. Jappelli and L. Pistaferri. Does consumption inequality track income inequality in italy? Review of Economic Dynamics, 13(1):133–153, 2010. URL https://EconPapers.repec.org/RePEc:red:issued:09-225.

M. Jarocinski and P. Karadi. Deconstructing monetary policy surprises: the role of information shocks. Ecb working paper, 2018.

O. Jordà. Estimation and inference of impulse responses by local projections. American Economic Review, 95(1):161–182, March 2005. doi: 10.1257/0002828053828518. URL http://www.aeaweb.org/articles?id=10.1257/0002828053828518.

M. Lenza and J. Slacalek. How does monetary policy affect income and wealth inequality? Evidence from quantitative easing in the euro area. Working Paper Series 2190, European Central Bank, Oct 2018. URL https://ideas.repec.org/p/ecb/ecbwps/20182190.html.

S. Miranda-Agrippino and G. Ricco. The transmission of monetary policy shocks. Cepr discussion paper no. dp13396, 2018.

J. Montecino and G. Epstein. Did quantitative easing increase income inequality? SSRN Electronic Journal, 01 2015. doi: 10.2139/ssrn.2692637.

H. Mumtaz and A. Theophilopoulou. The impact of monetary policy on inequality in the uk: An empirical analysis. Working Paper 783, 2016. URL http://hdl.handle.net/10419/175220.

A. Saiki and J. Frost. How does unconventional monetary policy affect inequality? evidence from japan. Dnb working papers, Netherlands Central Bank, Research Department, 2014. URL https://EconPapers.repec.org/RePEc:dnb:dnbwpp:423.

E. T. Swanson. Measuring the effects of federal reserve forward guidance and asset purchases on financial markets. National bureau of economic research, 2017.

V.-M. Törmälehto and M. Jäntti. 1. combining sample surveys and registers-an overview

in the context of eu-silc. The use of registers in the context of EU–SILC: challenges and opportunities, page 13, 2013.

S. Williamson et al. Neo-fisherism: A radical idea, or the most obvious solution to the low-inflation problem? The Regional Economist, 24(3):2–23, 2016.

APPENDIX

A INEQUALITY MEASURES

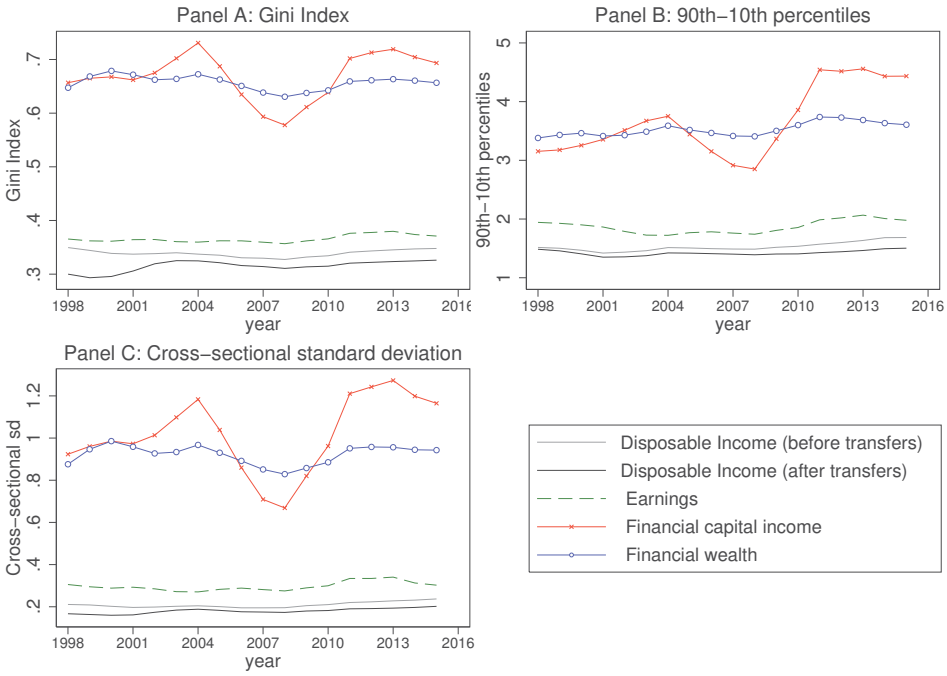

Figure 2: Measures of income and wealth inequality. Years 1998-2016.
Note: Author's calculations using the EU-SILC survey. See Section 3.2 for details.

B INTEREST RATES AND OTHER MACROECONOMIC DATA

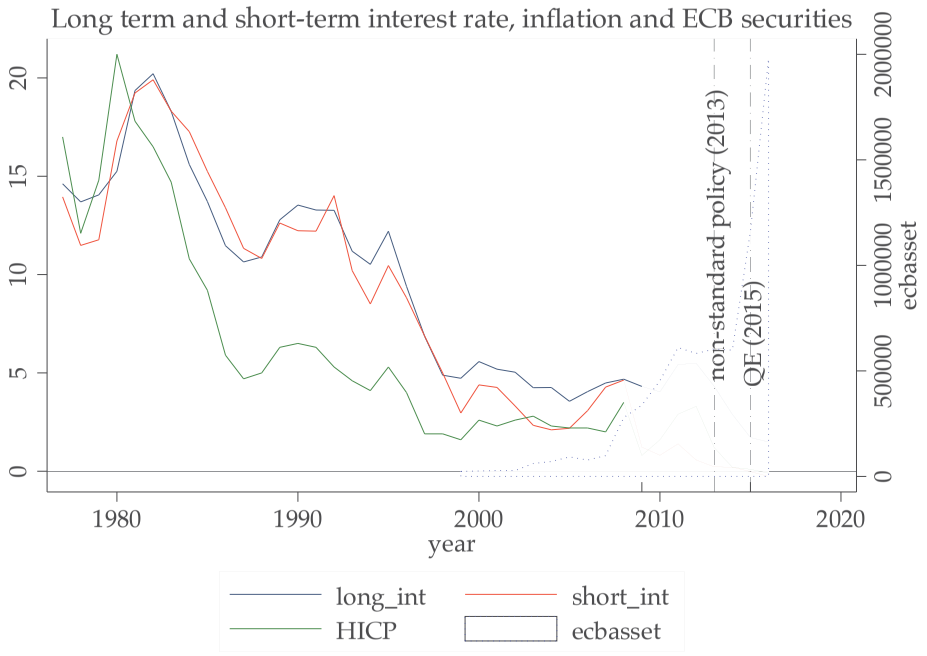

Figure 3: Policy rates and inflation dynamics, before and after non-standard monetary policy. ECB and Eurostat database.

C IMPULSE RESPONSE FUNCTIONS

C.1 CONVENTIONAL MONETARY POLICY

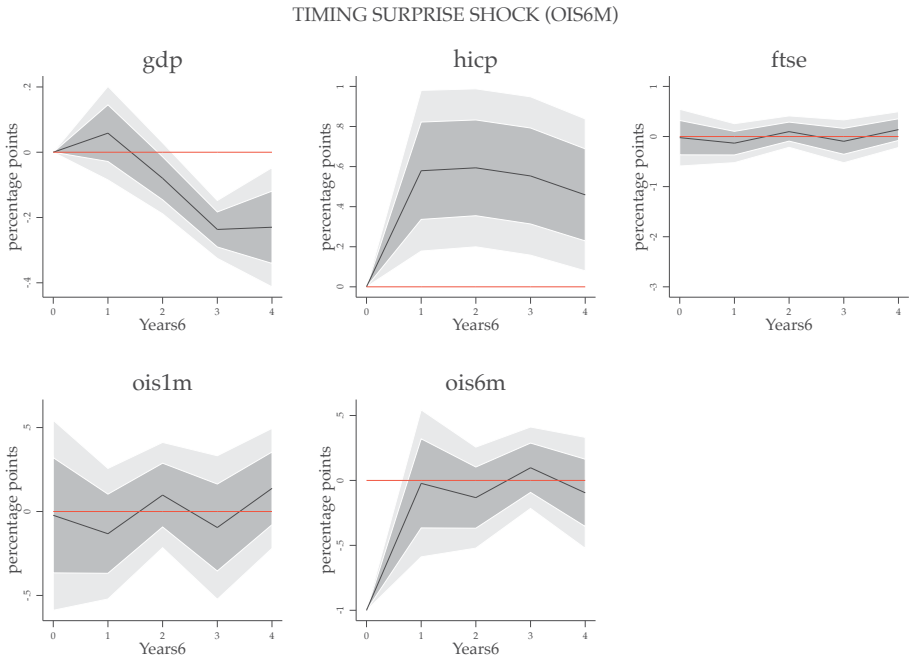

Figure 4: IRFs of Conventional monetary policy

Note: Impulse responses of the different macroeconomic variables to a 100 bp. expansionary Italian monetary policy shock using the baseline LP model excluding the measure of interest $Z_{i,t}$ from the system. The dark and light-shaded areas are 68% and 90% confidence bands respectively.

C.2 UNCONVENTIONAL MONETARY POLICY

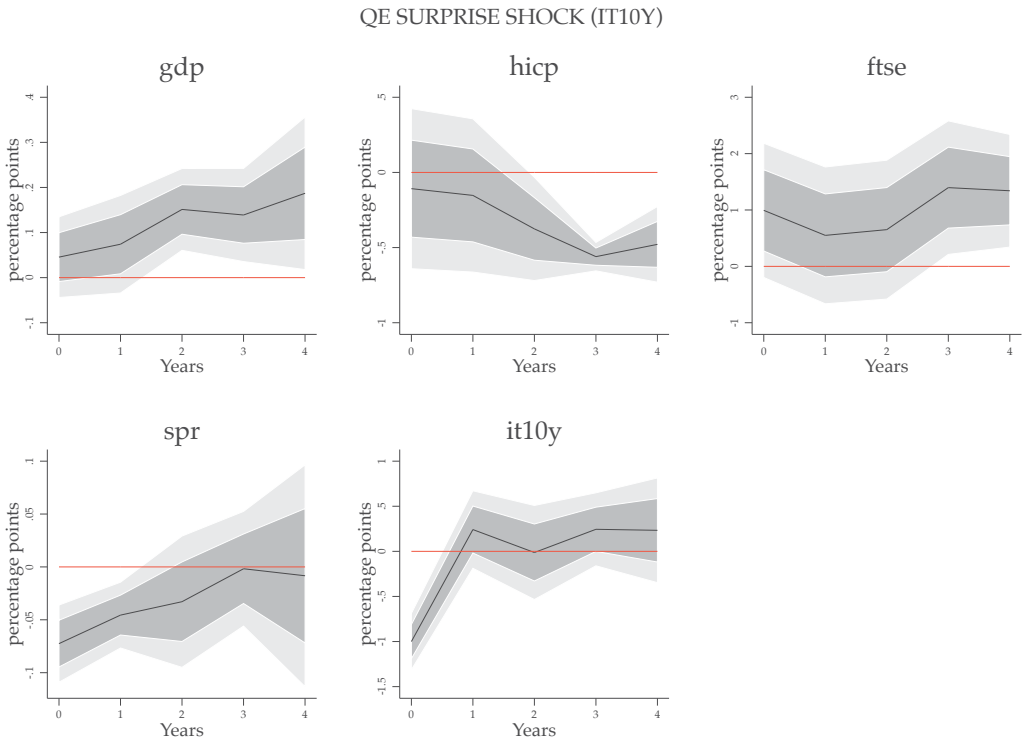

Figure 5: IRFs of Unconventional monetary policy

Note: Impulse responses of the different Italian macroeconomic variables to a 100 bp. expansionary monetary policy shock using the baseline LP model excluding the measure of interest $Z_{i,t}$ from the system. The dark and light-shaded areas are 68% and 90% confidence bands respectively.

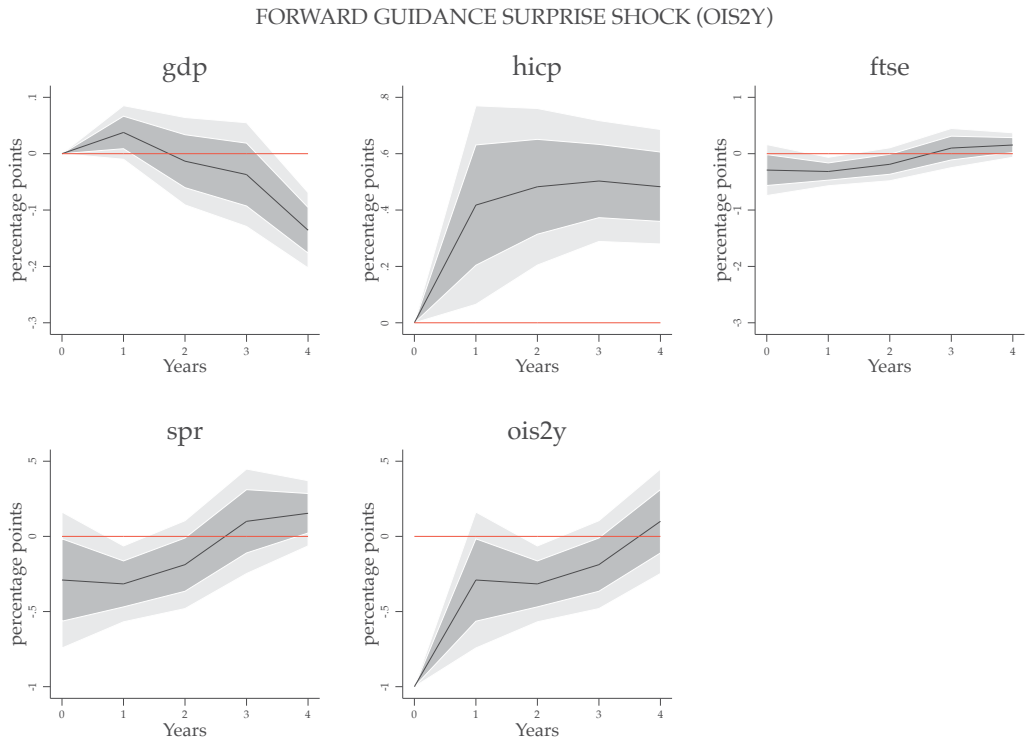

Figure 6: IRFs of Unconventional monetary policy

Note: Impulse responses of the different Italian macroeconomic variables to a 100 bp. expansionary monetary policy shock using the baseline LP model excluding the measure of interest $Z_{i,t}$ from the system. The dark and light-shaded areas are 68% and 90% confidence bands respectively.

C.3 EXPANSIONARY MONETARY POLICY SHOCKS ON INEQUALITY MEASURES IN ITALY

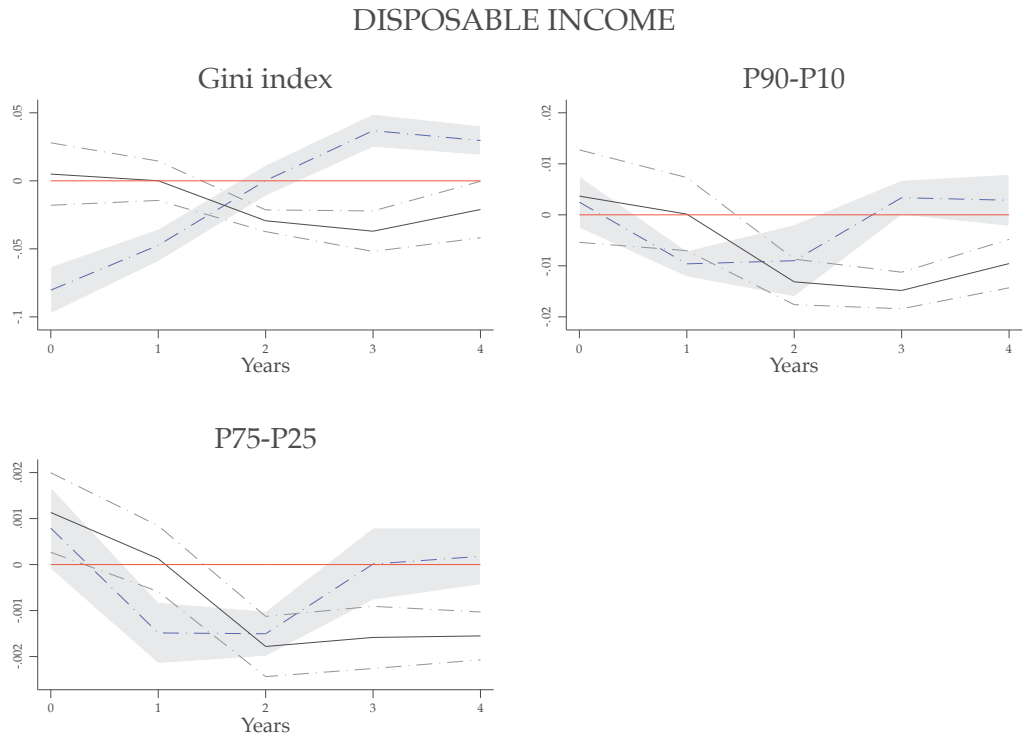

Figure 7: IRFs of Conventional (blue dash-dotted line) and Unconventional (black line) monetary policy on disposable income inequality measures

Note: Impulse responses of the Gini index (percentage points), P90-P10 and P75-P25 ratios to a 100 bp. expansionary monetary policy shock. The dash-dotted grey lines and light-shaded areas are both 68% confidence bands.

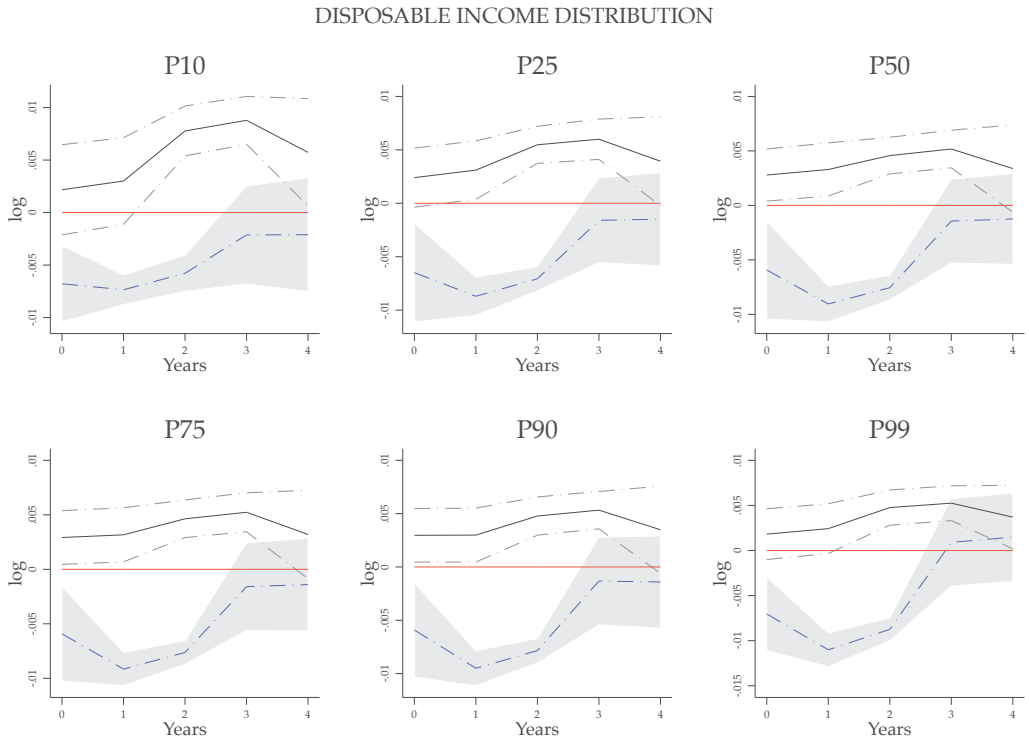

Figure 8: IRFs of disposable income percentiles

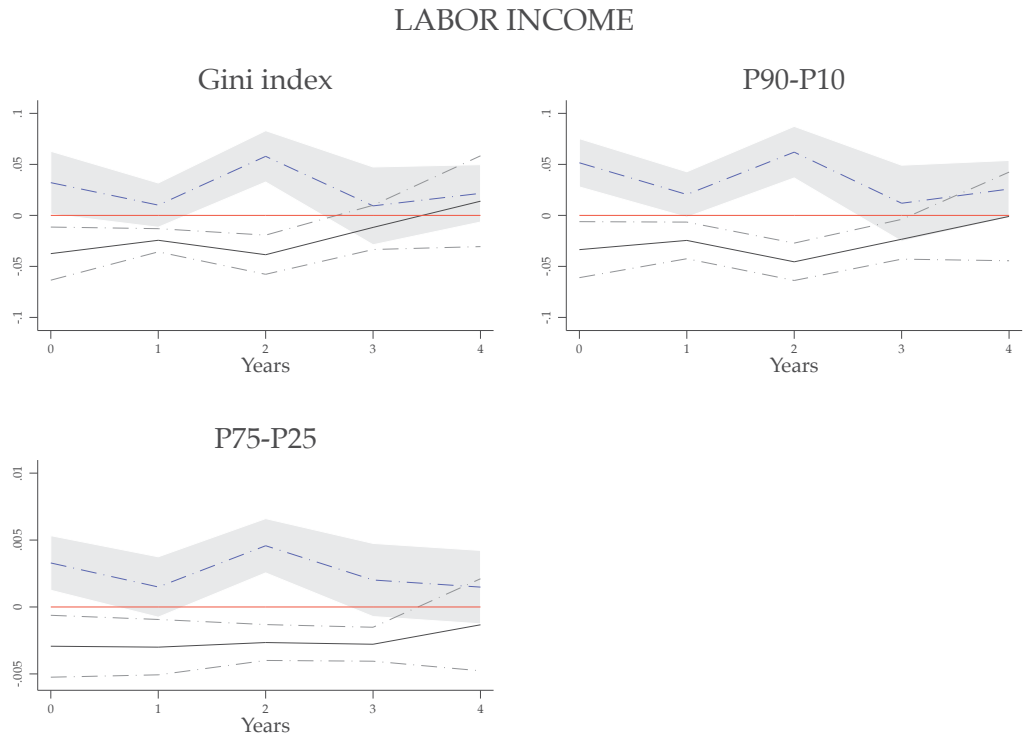

Figure 9: IRFs of Conventional (blue dash-dotted line) and Unconventional (black line) monetary policy on labor income inequality measures

Note: Impulse responses of Gini index (percentage points), P90-P10 and P75-P25 ratios to a 100 bp. expansionary monetary policy shock. The dash-dotted grey lines and light-shaded areas are both 68% confidence bands.

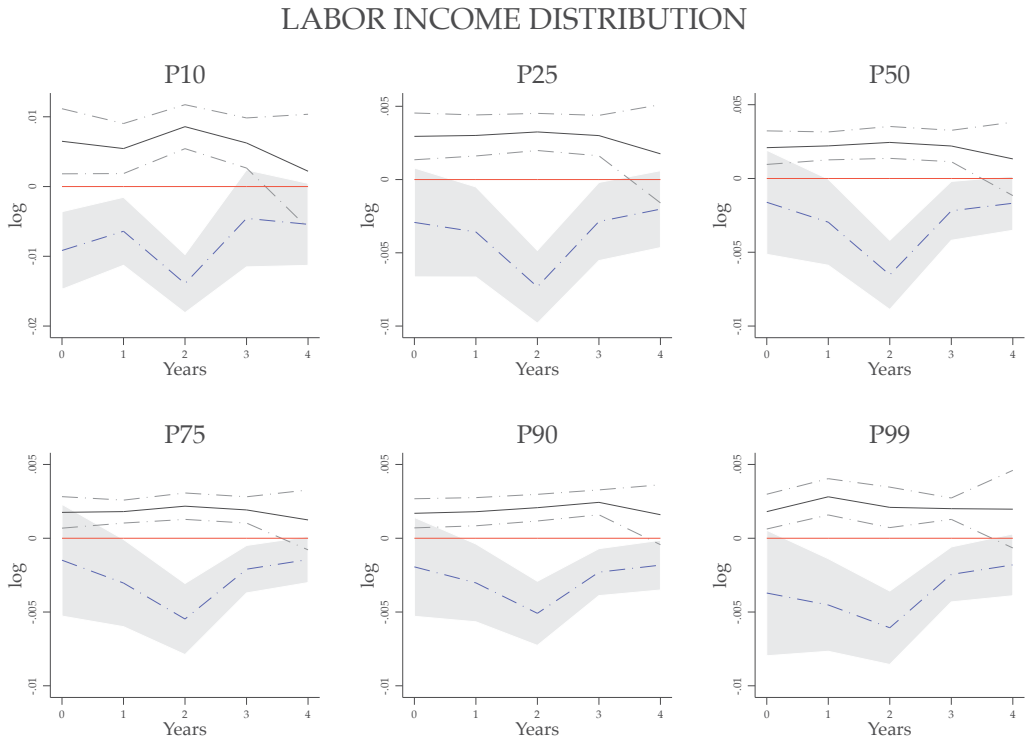

Figure 10: IRFs of labor income percentiles

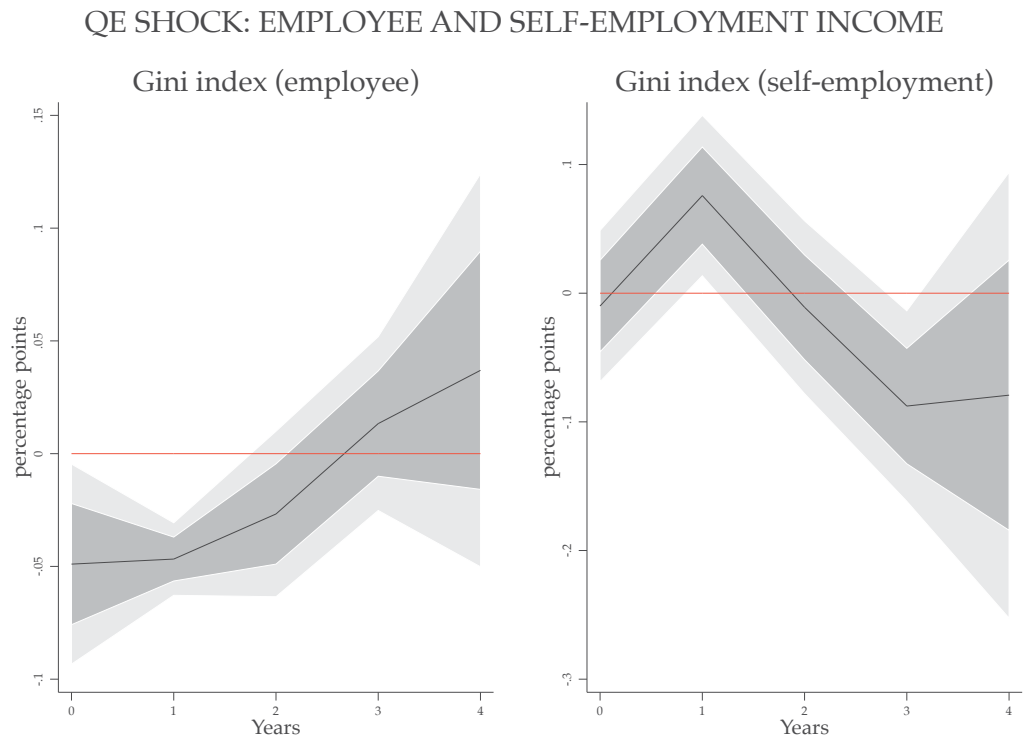

Figure 11: IRFs of Unconventional monetary policy on employee and self-employment inequality

Note: Impulse responses of employee and self-employment the Gini index to a 100 bp. expansionary monetary policy shock. The dark and light-shaded areas are 68% and 90% confidence bands respectively.

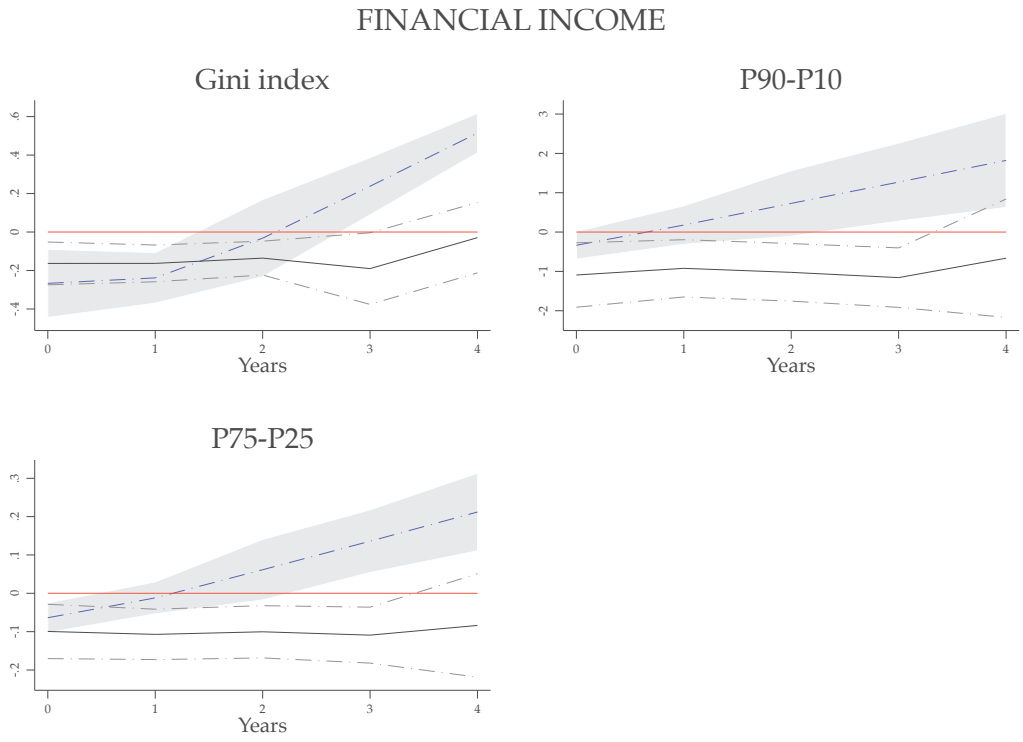

Figure 12: IRFs of Conventional (blue dash-dotted line) and Unconventional (black line) monetary policy on financial income inequality measures

Note: Impulse responses of Gini index (percentage points), P90-P10 and P75-P25 ratios to a 100 bp. expansionary monetary policy shock. The dash-dotted grey lines and light-shaded areas are both 68% confidence bands.

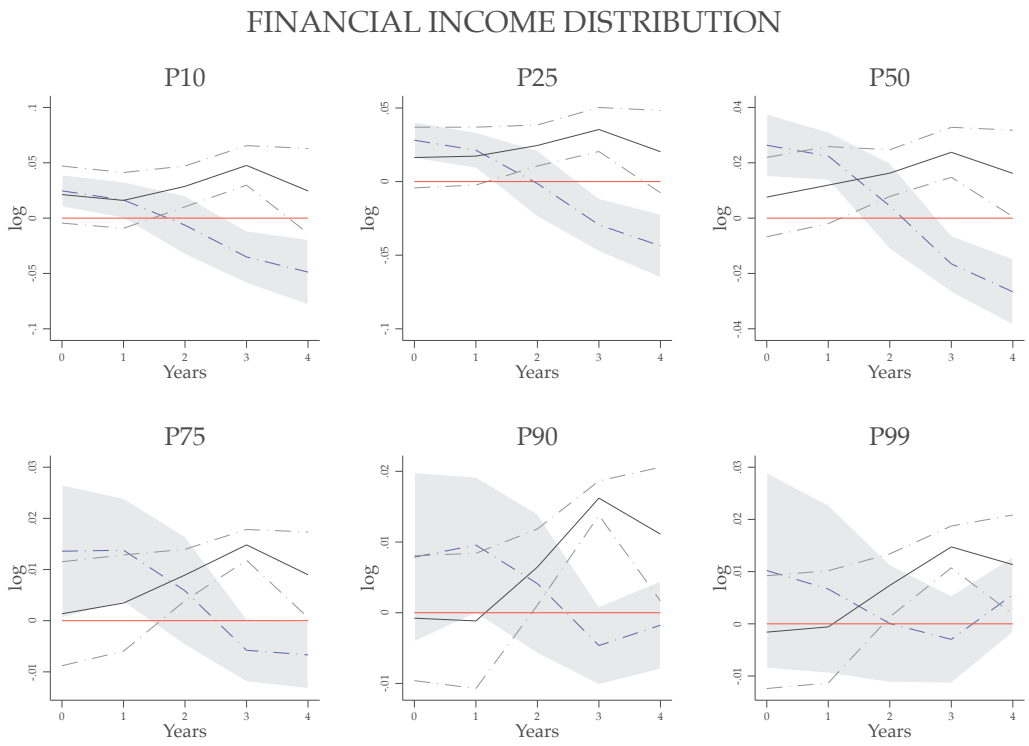

Figure 13: IRFs of financial income percentiles

Note: Impulse responses of income percentiles in log-levels to a 100 bp. expansionary monetary policy shock both unconventional (black solid line) and conventional (blue dash-dot line). The dotted line and light-shaded areas are 68% confidence bands.

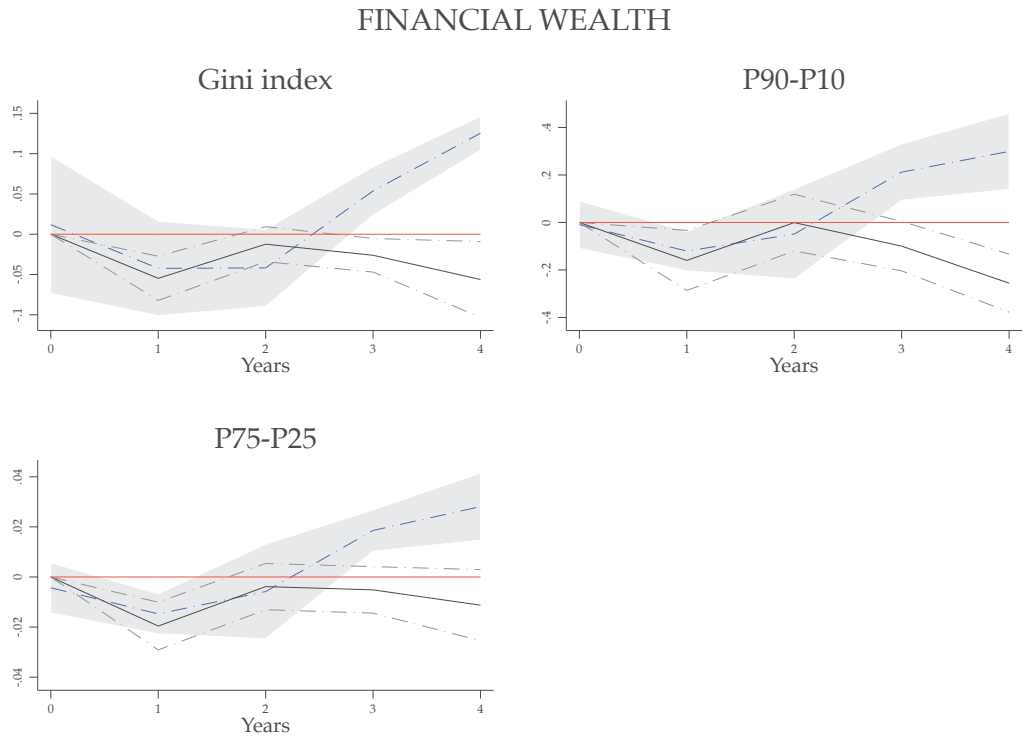

Figure 14: IRFs of Conventional (blue dash-dotted line) and Unconventional (black line) monetary policy on financial wealth inequality measures

Note: Impulse responses of Gini index (percentage points), P90-P10 and P75-P25 ratios to a 100 bp. expansionary monetary policy shock. The dash-dotted grey lines and light-shaded areas are both 68% confidence bands.

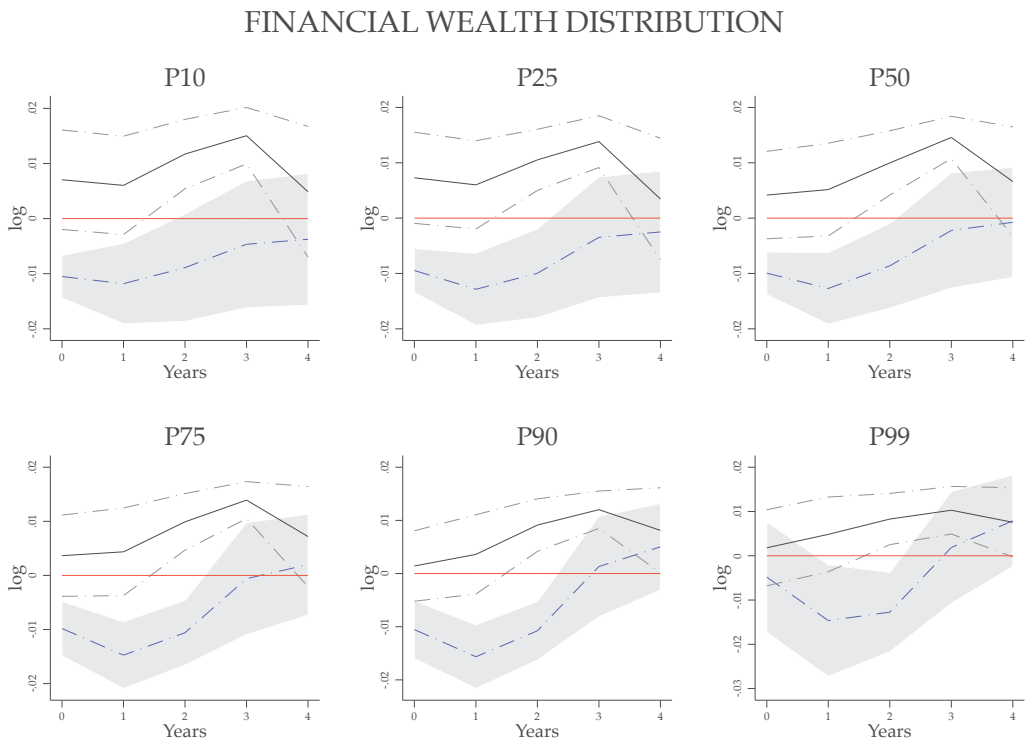

Figure 15: IRFs of financial wealth percentiles

Note: Impulse responses of income percentiles in log-levels to a 100 bp. expansionary monetary policy shock both unconventional (black solid line) and conventional (blue dash-dot line). The dotted line and light-shaded areas are 68% confidence bands.

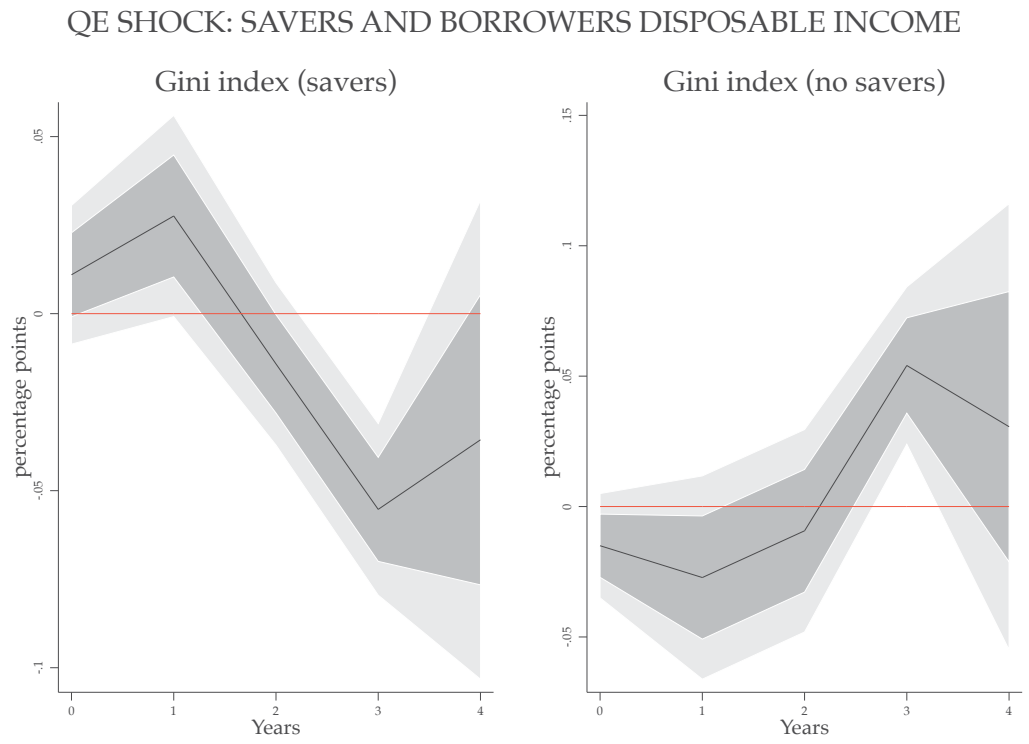

Figure 16: IRFs of Unconventional monetary policy on savers and non-savers disposable income inequality

Note: Impulse responses of savers and non-savers the Gini index to a 100 bp. expansionary monetary policy shock. The dark and light-shaded areas are 68% and 90% confidence bands respectively.

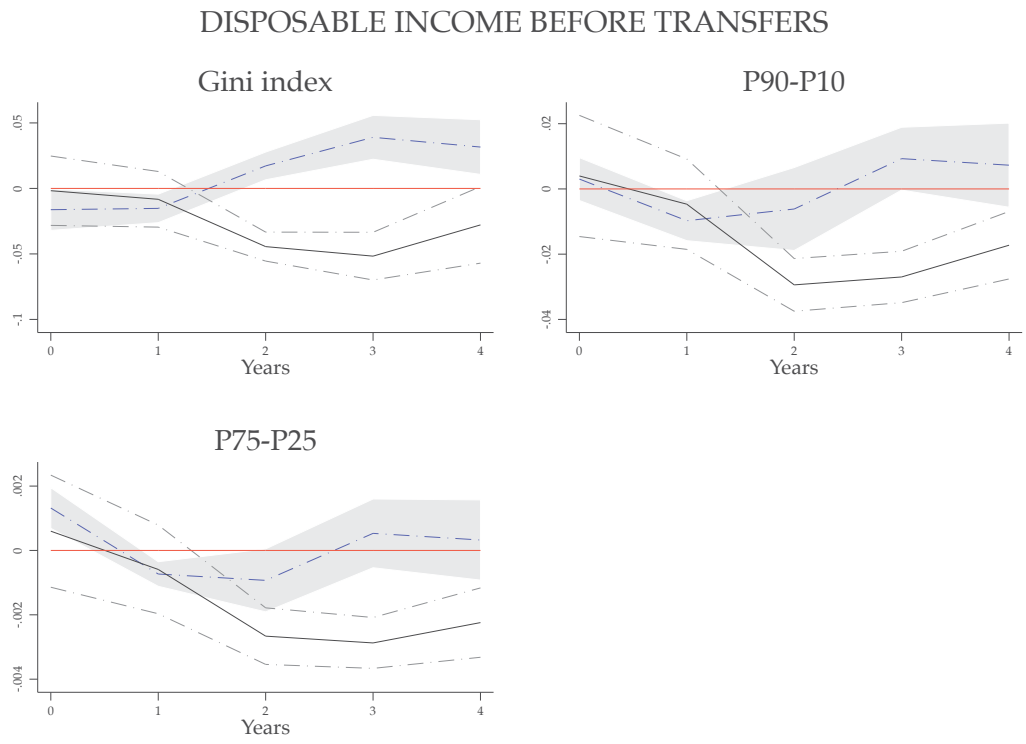

Figure 17: IRFs of Conventional (blue dash-dotted line) and Unconventional (black line) monetary policy on disposable income inequality measures

Note: Impulse responses of Gini index (percentage points), P90-P10 and P75-P25 ratios to a 100 bp. expansionary monetary policy shock. The dash-dotted grey lines and light-shaded areas are both 68% confidence bands.

C.4 EXPANSIONARY MONETARY POLICY SHOCKS ON INEQUALITY MEASURES IN ITALY. ROBUSTNESS CHECK

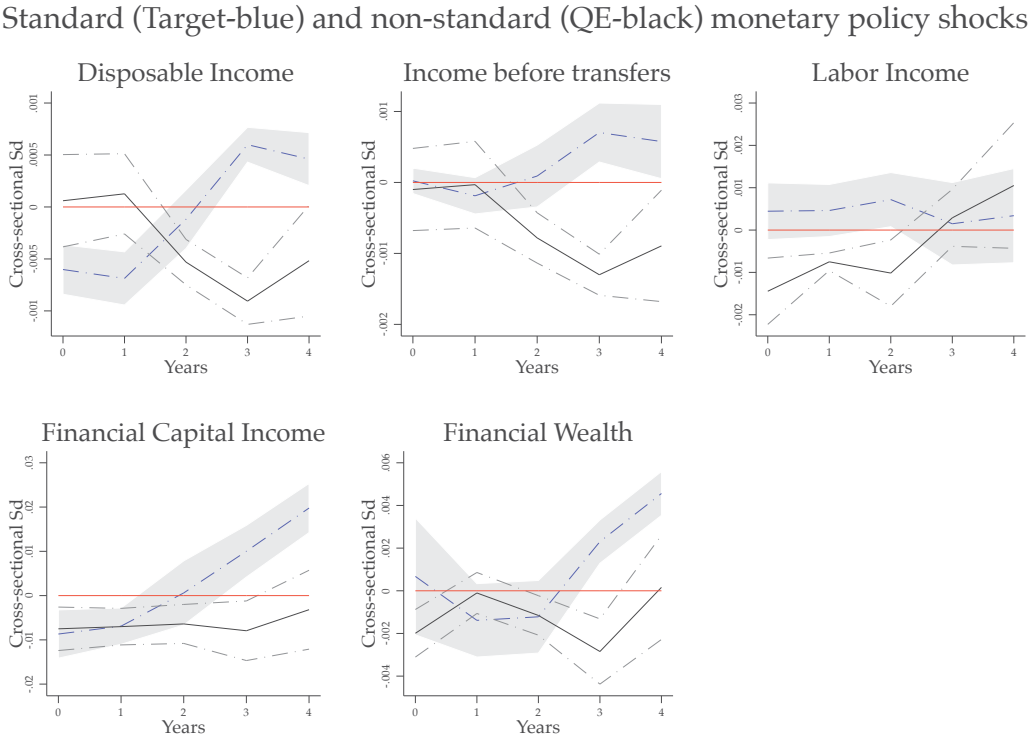

Figure 18: IRFs of Conventional (blue dash-dotted line) and Unconventional (black line) monetary policy on cross-sectional standard deviation

Note: Impulse responses of Cross-sectional Sd to a 100 bp. expansionary monetary policy shock. The dash-dotted grey lines and light-shaded areas are both 68% confidence bands.

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