The Redistributive Impacts of ECB's Unconventional Monetary Policies: Evidence From Italian Household Surveys

(very preliminary version)

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Abstract

Unconventional Monetary Policies (UMP) recently implemented in most of the advanced economies raised controversies about their potential impact on income inequalities. Repeatedly, non-standard monetary policies have been held responsible for producing redistributive effects through assets price appreciation. At the same time, central bankers argued that these exceptional measures have prevented rising unemployment rates and eased households financial constraints. In this paper, we attempt to confront these two interpretations by focusing on the case of the European Central Bank (ECB). Using extensive micro data from the Italian Survey of Household Income and Wealth (SHIW), we assess the redistributive impacts of the UMP conducted by ECB between 2008 and 2016, relying on the following redistributive channels : employment, indebtedness and asset price appreciation and the fall in returns on savings accounts. We find that UMP have had weak redistributive effects across Italian households and their impacts on income inequality are relatively small.

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1 Introduction

Since the Global Financial Crisis (GFC) of 2008 and the recession that ensued, the economic debate among academics and policymakers in developed countries has separately focused on two burgeoning topics: monetary policy alongside the moves of central banks and the worrying level of income and wealth inequality. On the one hand, central banks have been on the frontline to prop up their economies by engaging massive cuts of their policy rates. In the meantime, they mobilized a toolkit of Unconventional Monetary Policies (UMP henceforth) that sought to ease financial conditions and guide agents' expectations. These exceptional measures ranged from negative interest rates to forward guidance and asset purchase programs. On the other hand, the noteworthy contributions in public debate of Piketty (2014) made a strong argument for the troubling state of inequality in the advanced economies and its potential impact on growth and social cohesion. Consequently, it fostered large discussions on how to resorb the disparities within societies and create a more inclusive growth.

In the aftermath of GFC, interest for how far UMP could shape income distribution was neglected by policymakers. This is logical as long as the first rank priority back then was to restore growth. As a matter of fact, central banks were subject to an intertemporal bias where long-run consequences of their decisions are sacrificed in favour of short-run objectives. Nevertheless, it is only recently that we observed a resurgence of interest for the potential links between monetary policy and inequality. In the United States (U.S.) and Europe, UMP implemented by central banks have been blamed for causing distributional consequences. Actually, it is increasingly supported that monetary authorities are captured by the vested interests of private banks. To illustrate this idea, Acemoglu and Johnson (2012) state that:

> *"As the American economy begins to improve, influential people in the financial sector will continue to talk about the need for a prolonged period of low interest rates. The Fed will listen. This time will not be different".*

In the meantime, central bankers didn't take long to make a stand in this debate. Mario Draghi (2016), President of European Central Bank (ECB), claimed that UMP have prevented the Eurozone to fall into a deep recession. Moreover, he asserted that the criticism levelled at the ECB ignores what would have been the state of monetary union without such exceptional measures, arguing that :

> *"Those who claim that monetary policy worsens inequality typically do not consider the counterfactual. They take the distributional situation as given, but forget that monetary policy is acting precisely because the macroeconomic situation was at risk of changing. In fact, according to ECB simulations, Euro area GDP would be cumulatively at least 1.5 percent lower between 2015 and 2018 without the expansionary policy measures we have adopted".*

Central bankers argue that UMP produced positive outcomes on the macroeconomy. That is, they have relatively succeeded in stabilizing output, enhancing employment and making debt service less painful. However, this reading grid conceals an important part of the puzzle. It is actually feared that these measures and particularly Quantitative Easing programs (QE henceforth) push asset prices up, resulting in wider income dispersion. This is likely to happen, especially if the distribution of financial assets ownership is highly skewed towards top-income households. In this context, a general question one would like to address is: are the redistributive implications of assets price appreciation so strong they exhaust the positive effects of UMP on employment and indebtedness? Put differently, to which extent low and middle income households - who substantially rely on labor incomes and debt - could benefit from the positive outcomes of UMP?

The collateral effects of UMP on income distribution have been well documented in the literature (Guerello (2017), Frost & Saiki (2014)). The latter focused on the response of inequality indicators - in terms of income, consumption and expenditure - to monetary policy shocks using standard macro-econometric models. What have not been thoroughly explored as much, however, are the micro-foundations of UMP's redistributive impacts. That is, the channels through which the distributional effects of UMP work and how should they impact different household groups. What is attempted in this paper is to document the distributional implications of UMP on a micro-founded basis, with focus on the ECB case.

Using individual data from the Italian Survey on Household Income and Wealth (SHIW), we assess the distributional effects of the several unconventional monetary policy measures implemented by ECB since the financial crisis. Specifically, we rely on the following distributional channels: (1) changes in employment and (2) indebtedness levels, (3) financial and real assets appreciation plus (4) the fall in returns of savings accounts. While (1) and (2) are considered as indirect redistributive channels, (3) and (4) would rather be comprehended as direct ones. The redistributive outcomes of these channels are separately evaluated through the prism of income quantiles and the Gini coefficient (as a standard measure of income inequality) in four periods: 2008-2010, 2010-2012, 2012-2014 and 2014-2016. During each of the chosen assessment periods, the ECB effectively implemented non-standard monetary policy measures that we classify according to three specific types of central bank interventions: interest rate cuts, lending facilities operations and asset purchase programs.

Our empirical methodology borrows from decomposition methods in labor economics and mobilizes Unconditional Quantile Regression (UQR) techniques, introduced by Firpo & al. (2009), combined with the Oaxaca-Blinder decomposition method. This empirical strategy determines the quantitative contribution of each theoretical channel of UMP to households income, but also defines the fraction of changes in income that is in fact attributable to UMP redistributive channels. To the best of our knowledge, this is the first time such methods are applied to assess the distributional implications of UMP on a Eurozone member state.

This paper contributes to the recent literature that considers the importance of monetary policy's redistributive channels and underlines their heterogeneity when affecting different income groups (Epstein & Montecino (2017); Adam & Tzamourani (2016)). It differs, however, from the above literature in two important ways. First, the entire period of non-standard monetary policy measures in the Eurozone is documented (2008-2016), which gives the opportunity to lend weight for the criticism levelled at ECB's monetary policy decisions. Second, the evaluation of ECB's measures is decomposed into four periods. Knowing the changeability of Eurozone monetary policy in the last decade, this allows observing how the potency of UMP distributional effects would vary following monetary policy stance.

We find that the overall effects of UMP on households' income and the Gini index in Italy have been small in the short-run, which aligns our paper on what former literature have documented.

However, our results point out to the existence of a strong relationship between UMP measures' potency and the extent of UMP redistributive channels impacts on income. Indeed, the empirical evidence obtained through our decomposition method suggest that the 2010-2012 and 2014-2016 evaluation periods (where the ECB has put in place significant UMP measures both in terms of programs and magnitude), feature statistically significant gains in incomes of modest households, mainly via gains in terms of employment.

Moreover, although we do not find a strong distributional impact of financial assets price appreciation; we would like to emphasize two interesting findings: on the one hand, the interest rates cuts implemented by the ECB between 2008 and 2010 were associated with a decline in income of the 5 percent poorest, through lower savings accounts returns. On the other hand, the 2014-2016's decomposition results - during which the expanded Asset Purchase Programs come into effect - show that the 10 percent richest benefited from a 2 percentage points increase in income, stemming from higher equity shares prices.

This particularly underlines that, redistributive impacts of UMP are admittedly small but they are unevenly distributed across households. Rich households tends to benefit from financial assets and to a lower extent from employment; but those at the bottom could be potentially made worse off as a result of lower returns on fixed-income assets.

The rest of this paper is delineated as follows. In the next section, we discuss in detail how conventional monetary policy would affect income and wealth inequality. Then, we focus on the redistributive impacts of UMP, derive the distributional channels at stake and show how they would impact, directly or indirectly, household income. In section 3, we present data along with the empirical techniques we use. In section 4, we specify our empirical model; display the regression and decomposition exercise results, before drawing some important conclusions for future non-standard monetary policy measures of the ECB.

2 Related literature

2.1 Conventional monetary policy and inequality

Romer and Romer (1999) early studied the question of monetary policy and inequality. With standard regression models, they sought to estimate the impact of monetary policy on poverty and inequality for a panel of industrialized countries. In the short-run, evidence point that cyclical booms generated by loose monetary policies reduce unemployment and therefore improve poor people's well-being. But, this improvement is only temporary because as unemployment returns to its natural rate, inequality rises again. Therefore, they suggest that in the long run, low inflation and stable aggregate demand growth matter more for a lower inequality.

In an influential paper, Coibion & al. (2017) look to which extent monetary policy in the U.S. had contributed to inequality from 1980 to 2008. To do so, they compute inequality indicators from the Consumer Expenditure Survey (CEX) and use Romer & Romer (2004) narrative method to identify monetary policy shocks. Results showed that contractionary monetary policy increased income inequality across U.S. households. In fact, top-income groups (typically those who manage to diversify their incomes) tend to respond positively to monetary policy shocks in comparison to those located at the bottom of income distribution. Therefore, heterogeneity of income sources is of a high relevance. However, all the obtained inequality measures focus solely on income. Yet, redistributive effects of monetary policy and particularly in its unconventional form concern firstly wealth (a stock variable) rather than income (a flow variable).

Forasmuch as monetary policy is expected to affect price levels, Doepke & al. (2015) develop a life cycle model to examine the distributional effects of unexpected inflation in the U.S. They mobilize sector-level data from the Flow of Funds Accounts (FFA) along with individual data from the Survey of Consumer Finances (SCF). The authors argue that when the Federal Reserve targets higher inflation, it results in significant wealth redistribution. Indeed, middle-aged, middle-class households, who tend to have large mortgages, benefit at the expense of wealthy retirees, who hold their savings in bank deposits. This finding raises two remarks for our research question. First, it confirms that assets respond differently to monetary policy decisions. Second, redistribution could occur at the very heart of asset segments.

By extending this issue to a set of countries, Furceri & al. (2016) study the effects of monetary policy shocks on inequality. Using a Panel Vector Autoregressive (P-VAR) model, they attempt to capture the causal effect of monetary policy shocks (derived using Romer & Romer (2004) identification method) on income inequality for a group of 32 advanced and emerging economies. The authors document that expansionary monetary policy contributes to lessen income inequality while the opposite is true for contractionary monetary policy. The magnitude of these effects yet depends on business cycle fluctuations but also on the labor share of income and redistribution policies. Therefore, expansionary monetary policy tends to reduce inequality more in countries with a high share of labor income and limited redistribution policies.

From the contributions we discussed above, it appears that redistributive impacts of conventional monetary policy involve three dimensions that produce simultaneously "winners" and "losers": income, inflation and real interest rate. The heterogeneity of income sources and their differential response to business cycle fluctuations make low-income households very sensitive to monetary policy shocks. Conversely, unexpected changes in price levels are equalizing as they redistribute wealth from creditors to debtors. Nonetheless, the redistributive impact of real interest rates on inequality rests upon the distribution of balance sheets across households and the maturity of assets (i.e. short versus long term).

2.2 Redistributive impacts of UMP

Before taking an interest in the empirical aspects of UMP and income distribution, the literature has initially compared, from a theoretical perspective, the distributional implications of standard monetary policy with those of non-standard ones. In this respect, Bivens (2015) points that the difference between conventional monetary expansions and asset purchase programs with regard to their distributional implications is hard to disentangle. While the mechanisms at stake differ, both monetary policies intend to lower long-term interest rates and then, their redistributive effects could not be different. Kiley (2014) challenges however this interpretation when he compares movements of equity prices and interest rates before and after the monetary easing era in the U.S. He finds that assets price appreciations are tenuous in a context of Zero Lower Bound (ZLB). Hence, the redistributive impacts of UMP would be less potent than standard monetary policy.

Regarding the empirical contributions on UMP and income distribution, no consensus has emerged yet. In fact, some emphasize the prime role of asset prices in widening income disparities while others rather insist that UMP primarily benefited low-income households.

Relying on household income and wealth surveys from six advanced economies (France, Germany, Italy, Spain, U.K. and the U.S.), Domanski & al. (2016) document the redistributive impacts of UMP, focusing exclusively on wealth inequality. They first construct household balance sheets per quantiles for each country of the panel. Then, they compute the growth rate of assets and liabilities before determining rates of return on assets and debt servicing cost on liabilities. Results suggest that the fall in savings returns and high bond prices did not add much to wealth inequality whereas the rising equity prices seem to be a potent driving factor.

On the Eurozone level, Adam & Tzamourani (2016) use data from the Household Finance and Consumption Survey (HFCS) and compute all households balance sheets (62.000 household from all Eurozone countries). Their methodology consisted in calculating household net wealth and multiplying it by a 10 percent price increase, which delivers the household's capital gains for a given class of assets (equities, bonds or real estate). Results shed light upon the fact that capital gains from bond and equity price appreciations tend to be concentrated amongst the top 5 percent households, while median household strongly benefits from the recovery of real estate market.

For the same monetary area, Guerello (2017) uses a P-VAR framework and the dispersion of changes in income (as a proxy for the change in income inequalities). Her results show that the redistributive impacts of UMP depend on households closeness to financial markets. Thereby, in countries where households mainly own assets in bank deposits (distantly connected with financial markets), central bank's balance sheet expansions are associated with a lower income dispersion.

On the country-level, Casiraghi & al. (2017) study the impact of UMP on inequalities for the Italian economy from 2011 to 2013. To do so, they use the Italian Survey of Household Income and Wealth (SHIW) and model each distributional channel in an equation to be estimated (employment and capital gains from assets price appreciations). The authors come to the conclusion that effects of UMP on inequalities were neutral since poor and rich households both benefited respectively from the channels of employment and assets price appreciations. Hence, these two channels balance each other out, challenging this way the assertion that UMP acted as a *"reverse Robin-Hood"*.

In recent past, research on the redistributive impacts of UMP has primarily focused on the distributional effects of QE *per se*. This is understandable since QE involved massive asset purchases that amounted sometimes to 80 billions dollars, on a monthly basis. As an illustration, Mumtaz & Theophilopoulou (2017) show that UMP and QE in particular have increased inequality in the U.K. This conclusion stems from a counterfactual analysis based on the Gini coefficient's path under a "policy" and "no-policy" scenarios. They show that the Gini coefficient for income, wage, and consumption is higher under the "policy" scenario. Equally, using data from the Federal Reserve's Survey of Consumer Finances (SCF), Epstein & Montecino (2017) evaluate the redistributive impact of QE1 in the U.S. (which targeted the purchase of Mortgage Backed Securities). They highlight that despite its equalizing effects on employment and mortgage refinancing, QE has widened income inequality mainly because of equity price appreciations.

From these contributions, it is noticeable that the relationship between UMP and income distribution entails a specific feature. Actually, no longer are credit and lending channels the dominant way in which it impacts the economy, but it appears much more to be working itself through asset prices, whether it is real estate, bonds or equities. This paper points towards this direction from a microeconomic perspective. That is, study how the redistributive channels associated with UMP differently interact with heterogeneous household groups.

2.3 The redistributive channels at stake

Before identifying the redistributive channels at stake, we first take stock of the monetary policy measures carried out by the ECB since 2008. We choose to distinguish these measures in accordance with three types of central banks' interventions: policy rate cuts, lending facilities operations and asset purchase programs. In actual fact, the ECB reduced its policy rate until it reached the ZLB in March 2016. It supported as well, through refinancing operations and asset purchase programs, bank lending along with public and private sectors financing conditions (see Appendix B).

Asset purchase programs are expected to cause redistributive effects directly through asset prices appreciation, especially if the latter are held by top-income households. Besides, given that lending facilities operations are intended to ease businesses and households' financial conditions, low and middle income households could be encouraged to borrow more while businesses are likely to increase their labor demand. Also, low rates would result in what Keynes called the "euthanasia of rentiers" in that they directly reduce returns on fixed-income assets. Hence, asset prices appreciation together with the fall in returns on saving accounts would be considered as direct redistributive channels. By contrast, changes in the level of employment and indebtedness would be comprehended as indirect channels.

Following the aforementioned redistributive channels of UMP, we derive the income equation:

$$Net\ Disposable\ Income = Labor\ income + Property\ income + Pensions\ and\ Net\ Transfers \quad (1)$$

In the above-mentioned equation, *Labor income* refers to payroll and net self-employment incomes earned by workers employed or self-employed, and *Property income* assembles earnings received from real-estate and financial assets (government securities, bonds and equities) minus interest payments. *Pensions and Net Transfers* simply denotes retirees income and public assistance to households (financial help, scholarships, alimony etc.). Our income equation allows to estimate at least one of the distributional channels of UMP. Therefore, *Labor income* should capture the effect of UMP on employment levels as much as *Property income* is expected to reflect the asset-price appreciation channel. In addition, the presence of *Pensions and Net Transfers* captures the potential complementarity between fiscal and monetary policies.

Table 1 summarizes household total net disposable income for 2008, 2010, 2012, 2014 and 2016, extracted from the respective waves of the Italian SHIW. In this respect, household mean income in Italy has witnessed a durable decline between 2008 and 2014 before experiencing a slight increase in 2016. This is mainly attributable to the severe macroeconomic shocks the Italian economy has faced in the last decade, particularly during the Eurozone debt crisis. Besides, inequality measures, depicted by percentile ratios and Gini coefficient, show to some extent that income inequalities in Italy have leveled-off or slightly increased between 2008 and 2016.

The present paper seeks to investigate the distributional implications of the UMP conducted by the ECB on Italian households. To this end, we mobilize five waves of the SHIW and consider an assessment over four periods. Specifically, we have in sight to evaluate between 2008 and 2010 the redistributive impacts of the first wave of the Covered Bond Purchase Program (CBPP1) and policy rate cuts. Then, for the 2010-2012 period, we focus on the Securities Market Program (SMP), the second wave of Covered Bond Purchase Program (CBPP2) and the Long-Term Refinancing Operations (LTRO). Afterwards, we document between 2012 and 2014 the distributional consequences of CBPP3 and the Targeted Longer-Term Refinancing Operations (TLTROs). Finally, the 2014-2016 evaluation period focuses on the expanded Asset Purchase Programs (APP).

Table 1: Total household income between 2008 and 2016

	Net Disposable Income				
	2008	2010	2012	2014	2016
Mean	33700.37	32347.96	32335.8	31981.63	33023.37
Percentiles					
10	11731.91	12000	11190	11056.85	11588.33
25	17665.03	17711.66	16979.78	17381.52	17270.16
50	27160.97	27441.34	25918.68	26025.81	27106.23
75	42150.98	41206.33	41695.55	40843.1	42202.56
90	62532.67	56708.41	60652.97	59047.16	58943.98
95	77443.4	71200	72611.13	72385.86	69003.42
99	134758.4	121411.5	112373.1	115202.2	118885.1
Percentiles Ratios					
90/10	5.3	4.73	5.42	5.34	5.08
90/50	2.3	2.06	2.34	2.27	2.17
10/50	0.43	0.44	0.43	0.43	0.43
Gini Coefficient	0.35780	0.33917	0.35642	0.34848	0.34962

Note: The statistics reported above are obtained using unit sampling weight (defined at household level)

3 Data & methods

3.1 The Survey on Household Income and Wealth (SHIW)

The SHIW collects individual data for about 8.000 Italian households, distributed over 300 municipalities and provides information on incomes, savings, assets and liabilities. It is released once every two years, offering users more choices regarding the time dimension in which a research would like to be aligned with. On top of that, since the survey sampling design involves heterogeneous households, "sampling weights" data are included. Usage of the latter is required in order to recognize for each respondent its relative importance and avoid estimation bias. Most importantly, the surveys exhibit a panel component as they track the same households across time using a single questionnaire number (NQUEST), which identifies the respondent along survey waves. This is not necessarily the case for other surveys, where respondents are selected randomly. This sampling method therefore enables to observe how household income has changed over time, given an exogenous shock.

Nevertheless, the SHIW presents some shortcomings. As a case in point, information on households subjected to a banking ban (relevant to control for the indebtedness channel) are nonexistent. Another issue deals with the changes made to the surveys at different time stages. We notice that some variables are regularly replaced, merged or simply removed from the questionnaire. For instance, in 2008 and 2010 waves, household information on bank current and deposit accounts were presented in separate variables. Starting from 2012, they were merged in one single variable. This prevents to fully estimate the redistributive consequences associated with the fall in returns on saving accounts.

3.2 Empirical strategy

This paper aims to decompose changes in net income with respect to UMP redistributive channels in four periods. To do so, our empirical strategy follows Firpo, Fortin and Lemieux's (2007, FFL henceforth) seminal paper, which combines Recentred Influence Functions (RIFs) with the Oaxaca-Blinder (OB) decomposition method. In the first place, for each time period, RIFs of income quantiles are computed and regressed on the independent variables specified in equation (7). Then, changes in income between the considered periods are decomposed into an explained and unexplained components using Oaxaca-Blinder decomposition method. Last, this exercise is further expanded so that we could observe the quantitative contribution of UMP redistributive channels to income changes.

Interest for distributional decomposition methods in labor economics has significantly increased in the last decades. This was motivated by the growing economic inequalities in the advanced world, whether it deals with social backgrounds, gender or race. Concisely, OB - developed initially to study wage differentials - first decomposes changes in mean wages into an explained and unexplained components [1] and separate them in a second phase with respect to the contribution of each independent variable. This second feature is what distinguishes OB from standard decomposition methods developed by Juhn & al. (1993) or Gosling & al. (2000), as they do not allow for dividing the explained and unexplained components into the quantitative contribution of independent variables.

Nonetheless, FFL (2007) introduced further improvements to OB's application, through the decomposition of wage distributions beyond the mean using a novel Recentered Influence Function (RIF) regression. The latter was first suggested by FFL (2009) and consists on estimating the impacts of changes in the distribution of independent variables on the dependent one, replacing the latter by a chosen distributional statistic $v(F_y)$ (for example the Gini coefficient).

The RIF of a single observation y for a given distributional statistic v is defined as $RIF(y;v) = v(F_y) + IF(y;v)$, where F_y denotes the density function of the dependent variable Y and $IF(y;v)$ stands for the influence function of an individual observation on the distributional statistic v.

[1] In the literature on decomposition methods, the explained and unexplained components are usually called respectively composition effect and wage structure effect.

Following FFL notation, the general RIF-regression model linearly links the conditional expectation of the $RIF(v;y)$ with the covariates, so that $E[RIF(Y;v)|X] = m'(X)$. Note that coefficients of the regression model can be estimated using OLS.

Forasmuch as we are interested in the effects of UMP on income distribution, the influence function of a quantile τ, $IF(y;Q_\tau)$, corresponds to $(\tau - \mathbb{1}\{y \leq Q_\tau\})/f_y(Q_\tau)$, where $\mathbb{1}\{.\}$ is an indicator function, Q_τ is the population quantile and f_Y the density function. Thus, the *Recentered*-IF for quantiles could be rewritten as:

$$RIF(y;Q_\tau) = Q_\tau + \frac{\tau - \mathbb{1}\{y \leq Q_\tau\}}{f_y(Q_\tau)} \tag{2}$$

In the case of quantiles, the RIF regression or Unconditional Quantile Regression (UQR) as it is commonly phrased reflects the marginal (or the partial) effect of a shift in covariate X on the unconditional quantile. The regression model becomes $E[RIF(Y;Q_\tau)|X] = m'(X)$. For example, in our case, the UQR seeks to estimate the impact of holding government securities on net income among the 90th quantile in 2008, 2010, 2012, 2014 and 2016.

Therefore, for the first step of our empirical strategy, we need first to compute from equation (7) the RIF for all quantiles and then run an OLS regression of each one on explanatory variables for both periods (before and after the UMP package).

As previously noted, FFL's application of OB enables to extend the decomposition to RIF regressions' distributional statistics and more specifically to income quantiles and the Gini coefficient. Consequently, an implementation of the OB decomposition method on the latter would make it possible to empirically account for the contribution of UMP redistributive channels to the income inequality in Italy. Recall that in the light of FFL's approach, OB distributional decomposition divides changes in the dependent variable for a given distributional statistic into an explained and unexplained components. The first measures shifts in the composition of covariates while the second captures effects of changes in the coefficients. Formally, the variation of a distributional statistic v over $t = 0, 1$ is $\Delta_v = v_1 - v_0$. For quantiles, the previous term becomes $\Delta_\tau = \widehat{Q}_{1,\tau} - \widehat{Q}_{0,\tau}$, knowing that $\widehat{Q}_{t,\tau} = \bar{X}_t\widehat{\beta}_t$. As an illustration, changes overtime in net income for the 10th quantile ($\tau = 10$) is $\Delta_{10} = \widehat{Q}_{1,10} - \widehat{Q}_{0,10}$, which can be decomposed following FFL notation into :

$$\begin{aligned}
\Delta_{10} &= (\widehat{Q}_{1,10} - \widehat{Q}_{c,1}) + (\widehat{Q}_{c,1} - \widehat{Q}_{0,10}) \\
&= \bar{X}_1\widehat{\beta}_1 - \bar{X}_1\widehat{\beta}_0 + \bar{X}_1\widehat{\beta}_0 - \bar{X}_0\widehat{\beta}_0 \\
&= (\bar{X}_1 - \bar{X}_0)\,\widehat{\beta}_0 \; + (\widehat{\beta}_1 - \widehat{\beta}_0)\,\bar{X}_1 \\
&= \Delta_X^\mu + \Delta_S^\mu
\end{aligned} \tag{3}$$

where $\widehat{Q}_{c,1}$ is a counterfactual distribution, that is, the income that would have prevailed for the 10th quantile of households if they had received in $t = 0$ the same income as in $t = 1$.

Adding and subtracting the term $\widehat{Q}_{c,1}$, we obtain the aggregate explained component Δ_X^{μ} and the unexplained one Δ_S^{μ}. These components can be further decomposed into the contribution of each explanatory variable. Accordingly, for the 10h quantile, the contribution of composition effect for holding government securities on income changes could be written as:

$$\Delta_{10,GovSec} = (\bar{X}_{1,GovSec} - \bar{X}_{0,GovSec})\ \widehat{\beta}_{0,GovSec} \tag{4}$$

Quoting Epstein & Montecino (2015), the explained component refers to "*the contribution of a change in the endowment of a factor X_k between two periods holding its return constant*". Then, for the employment channel, explained component can be interpreted as the labor income premium a household would earn from increasing its employment level between $t = 1$ and $t = 0$, for a given real wage. In contrast, as aforementioned, the unexplained component measures contributions of changes in covariates' coefficients or returns to factors as in our case.

Then, in the case of financial assets, the unexplained component can be interpreted as the increase in household financial income, received from a rise in the rate of return (from β_0 to β_1) on a held government security or bond, holding its endowment fixed. The same applies to real estate.

4 Empirics

4.1 The Model

The proposed model follows the income equation (1) previously specified and defines itself with the terms of Epstein & Montecino (2015). We focus on UMP redistributive channels, namely 1) employment, 2) indebtedness, 3) assets price appreciations and 4) the fall in returns on saving accounts. In this way, labor and property incomes from equation (1) should convey the effect of each channel on net income.

Hence, the functional form of *Labor income* of a household i for a given period t is:

$$Labor\ Income_{it} = \beta_t EMPLOY_{it} + \alpha_t Sex_{it} + \gamma_t Age_{it} + \theta_t EducAchi_{it} + \eta_t Region_{it} + \epsilon_{it} \tag{5}$$

EMPLOY, a dummy variable, indicates whether the head of household is employed or self-employed and takes the value of one in both cases and zero otherwise. We include also a set of control variables: *Sex* is equal to one if the head of household is a male and zero if a female, *Age* refers to the age of household while *EducAchi* is a vector of dummy variables, which denotes household's level of educational achievement. In addition, because Italy is still experiencing important regional disparities, particularly between its north and south, we incorporate *Region*, a vector of dummy variables. These correspond to the Italian regions (amounted to twenty region) and track where each household lives.

As for *Property income*, it is assumed to directly depend on the ownership of a set of assets:

$$Property\ Income_{it} = \lambda_t Gov_{it} + \tau_t Bond_{it} + \phi_t Equity_{it} + \Omega_t RealEst_{it} + \Psi_t Savings_{it} + \nu_{it} \quad (6)$$

Gov equals one if the household owns a domestic issued government security. We choose to group all the different types of government securities to avoid potential correlations between independent variables. Likewise, *Bond*, also a dummy variable, stands not only for bonds issued by Italian firms but also for funds and Exchange-Traded Funds (ETFs). Similarly, *Equity* equals one if the household owns equity shares and zero otherwise. *RealEst* indicates if the household owns or not his principal residence. *Savings* refers to deposit accounts ownership and takes one if the household possesses a bank deposit account. This variable intends to capture the redistributive channel related to the fall in returns on saving accounts. Coefficients of *Property income* equation could be interpreted as the rate of return on each asset. To estimate the indebtedness channel, we include *Debt*, a dummy variable that takes the value of one if the household has contracted during the period of interest a mortgage loan and/or a consumer credit. Hence, the net disposable income equation becomes:

$$\underbrace{Y_{it}}_{\text{Net Disposable Income}} = \underbrace{\beta_t EMPLOY_{it} + \mu_t \mathbf{X}_{it}}_{\text{Labor income}} + \underbrace{\alpha_t \mathbf{Z}_{it}}_{\text{Property income}} + \varepsilon_t Debt_{it} + e_{it} \quad (7)$$

where $\mathbf{X}_{it}$ is a vector gathering the control variables included in the *Labor income* equation. Similarly, $\mathbf{Z}_{it}$ gathers the variables defined in the *Property income* equation, indicating whether or not the household own any of the assets specified.

As mentioned in the previous section, the purpose of our empirical strategy is twofold. First, estimate the impact of UMP redistributive channels on each income quantile and second, decompose the changes in incomes with respect to the quantitative contribution of each channel. To do so, we have to assume that:

$$\mathbb{E}\left\{e_{it} | EMPLOY_{it}, X_{it}, Y_{it}, Debt_{it}, t\right\} = \lambda \quad \text{for} \quad t = 0, 1 \quad (8)$$

where $t = 0$ denotes the pre-UMP decision period and $t = 1$ the post one. This expression refers to the ignorability assumption, which is crucial to our decomposition exercise. Usually, sampling-based surveys face the recurrent problem of "selection bias", resulting from the fact that subjects effectively observed in the sample might be not representative of the concerned population. Therefore, unobservable factors contributing to the dependent variable (net disposable income in our case) might be not captured by the model, leading to inconsistent estimates of coefficients. However, as emphasized by Firpo & al (2011), ignorability supposes that : *"unobservables do not need to be independent (or mean independent) of X (a given exogenous variable) as long as their conditional distribution given X is the same in groups A and B"*.

This assumption implicitly acknowledges the existence of selection bias in the samples as long as they are constant across both groups (for our case before the implementation of UMP package and after). In other terms, if some unobservable factors and the variable $EMPLOY$ are correlated, the decomposition exercise remains robust since this correlation is the same for $t = 0$ and $t = 1$.

4.2 RIF regressions

In a first step, we process our micro data to keep only households who participated in the survey from 2008 to 2016. That is, in order to assess how the redistributive channels associated with UMP have impacted their incomes, we track in our estimations the same households (about 4.000 household from 2008 to 2016).

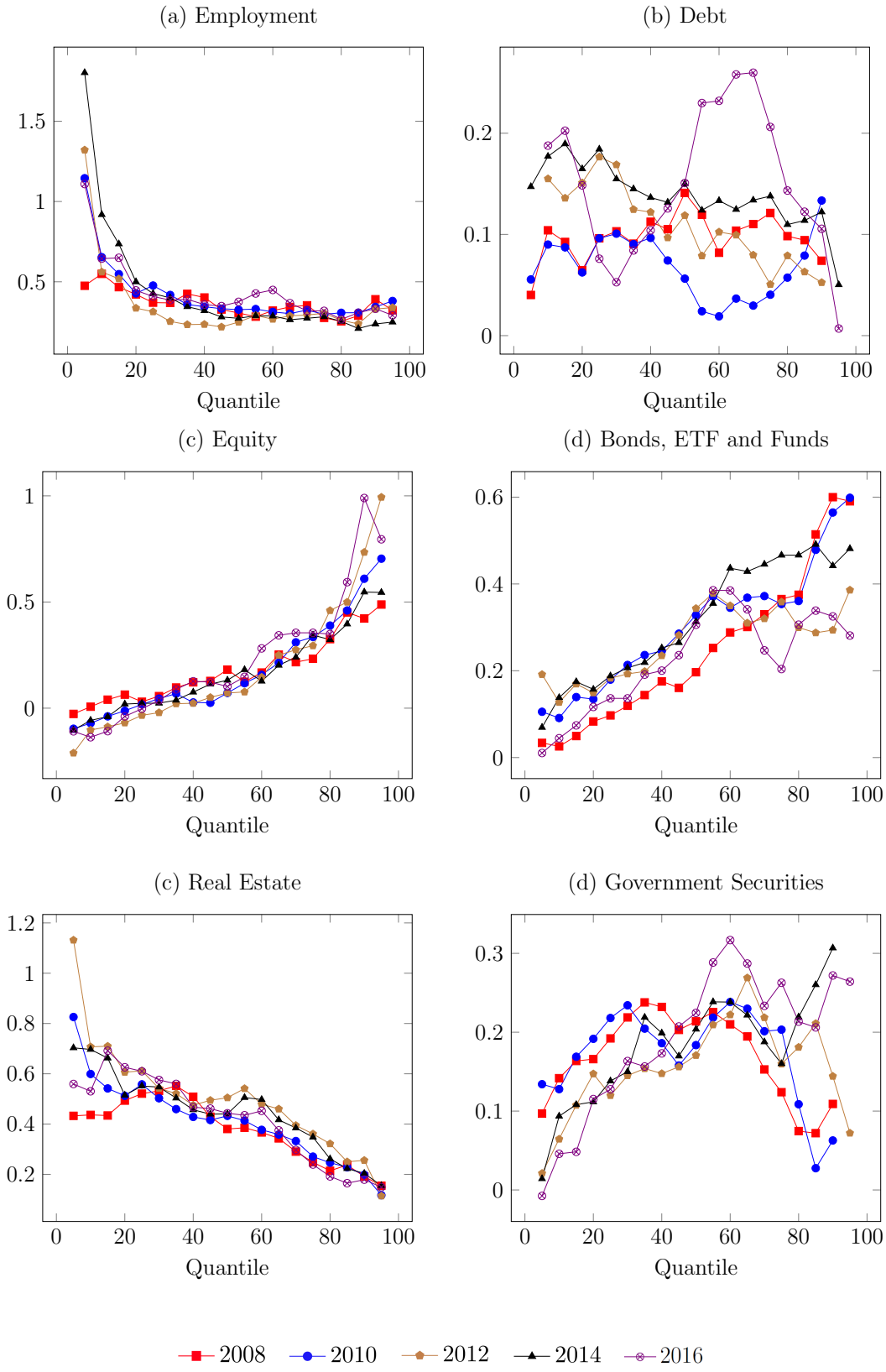
The first step of our empirical strategy consists on estimating the RIF of net disposable income for the distributional statistics we are interested in, namely the quantiles τ=$\{5, 15, 20, 25, ...85, 90, 95\}$ and Gini coefficient. After keeping only the positive values and removing outliers as well, we carry out log-transformations of the RIFs. Then, we use equation (7) to run RIF regressions over 2008, 2010, 2012, 2014 and 2016, replacing the dependent variable by the RIF of each quantile τ of net disposable income [2].

Results of RIF regressions for each survey wave are presented below in Figure 1 (see Appendix C for confidence intervals). The square and circle lines show for each quantile the RIF regression coefficients for 2008 and 2010. The remaining lines indicate the same for 2012, 2014 and 2016. Precisely, the graphs of RIF coefficients point out the quantitative contribution to income of each redistributive channel of UMP. For instance, the left side of the employment channel graph shows the impact of employment on income of poor households and vice-versa, as and when we go along the right side of the graph. The interpretations that could be sketched from the figures below are straightforward: a downward sloping curve means that the redistributive channel at stake tends to produce a relatively greater impact on modest households than the rich ones. As a consequence, in this case, the redistributive channel could potentially contribute to reduce income inequality. On the contrary, an upward sloping curve implies that the redistributive channel of UMP tends to benefit the richest and do not contribute much to low and middle income households. If so, the distributional channel is then expected to increase income inequality.

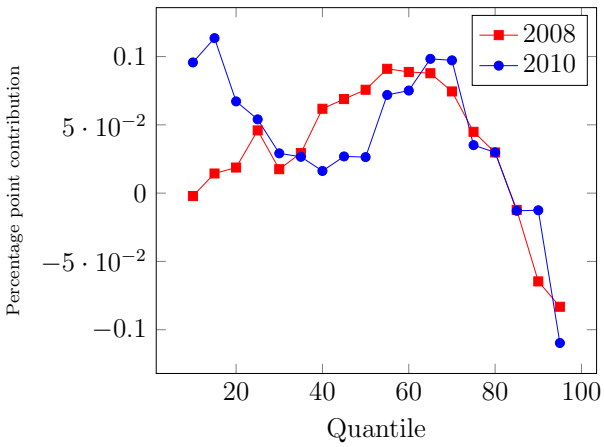
As we have expected in section 2, employment is a potent factor in reducing income inequality, as the coefficients curve is downward sloping. More specifically, the net disposable income of an employed household head at the 10th quantile in 2008 and 2010 was respectively, 55 and 65 percent higher than the one of an unemployed household. Comparably, the net income of households from the same quantile group was higher than unemployed ones by 53 percent in 2012, 97 percent in 2014 and 92 percent in 2016.

[2] For the all RIF regressions, we used standard kernel function "Epanechnikov" with a bandwith of 0.06.

Figure 1: RIF regression results the observed periods



(d) Saving accounts



Regarding other household groups, we notice that contributions of employment to income exhibit a non-linear effect. Indeed, the relative importance of employment substantially decreases as we move toward top quantiles. For example, changes in employment levels between 2008 and 2016 have more or less contributed to increase the median income by 30 percent. At the same time, impact of employment channel on the 90th quantile was marginal as coefficients ranged for the estimated periods between 22 and 40 percent. This result is therefore in line with the assertion early formulated and stresses that poor households rely substantially on labor incomes.

Turning now to financial and real assets, we notice that the former have strong disequalizing effects since their coefficients curves are upward sloping. This observation is consistent with the conjecture suggesting that ownership of financial assets is highly concentrated among top-income households. In respect of *Equity* - which is assumed to be the perfect unequal asset - they have contributed for instance to the income of 90th quantile in 2010 and 2012 by respectively 61 and 73 percent. The same could be said about *Bonds*, *ETF* and *funds* whose slopes indicate that their ownership benefits mostly rich households. However, interpretation should be nuanced with respect to government securities since they do not appear to be a strong disequalizing asset. Indeed, the shape of coefficients curves is upward sloping except for the top-half of income quantiles. In fact, these groups earn from government securities ownership the same returns as low and middle income households do. However, this does not appear to be the case in 2014 and 2016, as top-income households have managed to significantly increase their returns from government securities.

Unlike financial assets, *Real Estate* are strongly equalizing to the extent that they have a greater impact on low-income groups. This result makes sense inasmuch as an important share of Italian households (more than seventy percent) are owners of their principal residence. Furthermore, similarly to the employment channel, *Real Estate* ownership contributes to a higher extent to income of middle-class households. As a matter of fact, the regression coefficients for the studied periods settle between 38 and 45 percent.

Although debt is assumed to be concentrated among low-income households, its graph suggests that it is not a strong equalizing channel. Notwithstanding, one would notice a large difference in the contributions of debt to income in 2010 and 2016. This could be explained by the fact that following the GFC, households started a process of debt reduction. Hence, the relative weight of debt in income consequently declined. As economic activity improved and the ECB implemented its APP, households responded by borrowing more, resulting in an important weight of debt. Regarding the savings accounts channel, coefficients curves do not predict that it is a potent factor in reducing income inequality. Besides, coefficients values point out as well that returns on deposit accounts do not bring much to their holders.

Relying solely on RIF regressions do not fully depict to what extent the redistributive channels associated to UMP have shaped income distribution. That's why we must turn to the second step of our empirical strategy.

4.3 Decomposition results

The main purpose of this exercise is to grasp quantitatively the effective impact of UMP redistributive channels on income distribution. The OB decomposition method we use divides income changes into an explained and unexplained component. We assumed that when it comes to financial and real assets, the unexplained component conveys how much changes in the rate of returns on the specified assets have contributed to income. Therefore, the impact of assets price appreciation channel on income (through dividends and capital gains) must be absorbed by this component, while for employment and debt channels, we focus on their explained component. Last, to assess the effect of UMP channels on income inequality, we rely on the Gini coefficient, a standard measure of income dispersion, whose value ranges from zero to one.

Decomposition results of UMP channels in the four evaluation periods are exposed respectively in Tables 2, 3, 4 and 5 below [3]. Each column indicates the decomposition exercise for a given distributional statistic. The ones reported in these tables are the quantiles $\tau = \{5, 10, 20, 30, ..80, 90, 95\}$, which pictures the bottom and top of income distribution. Table 6 focuses separately on Gini coefficients in the four periods. First row of all the tables summarizes the aggregate percentage change in net income for each distributional statistic between $t = 0$ and $t = 1$. Intuitively, the statistics depicted underneath the row of "total change" add up to obtain the total percentage changes. The rows "Employment" and "Debt" point out the explained components of employment and debt channels. The "Financial and Real assets" row gathers the percentage point contributions of the unexplained components of Government securities, Bonds, Equity, Real Estate and the fall in returns on saving accounts (only for 2008-2010). It is worthwhile to emphasize that for most of the distributional statistics, the sum of UMP subcomponents is smaller than the total percentage change for the periods of UMP. This implies that actual changes in income for the studied periods were driven not only by monetary policy but also by other factors, not observed in our model.

[3] Statistical significance is assessed using the Z-test, where the null hypothesis is approximated by a normal distribution.

Table 2: Oaxaca-Blinder decomposition of Net Diposable Income for 2008-2010

	Q=5	Q=10	Q=20	Q=30	Q=40	Q=50	Q=60	Q=70	Q=80	Q=90	Q=95
Total change	0.038	0.019	0.007	0.024	0.01	0.002	0.0006	0.007	0.01	0.054^{c}	0.067
	(0.055)	(0.035)	(0.024)	(0.022)	(0.021)	(0.02)	(0.021)	(0.021)	(0.03)	(0.036)	(0.034)
a) Employment channel	0.027^{b}	-0.013^{b}	-0.009^{b}	-0.009^{b}	-0.009^{b}	0.0076^{b}	0.0073^{b}	0.0075^{b}	0.0071^{b}	0.008^{b}	0.009^{b}
	(0.013)	(0.006)	(0.004)	(0.004)	(0.0042)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.0043)
b) **Debt**	-0.003	-0.004^{c}	-0.002	-0.004^{b}	-0.004^{a}	0.002	0.0007	0.0011	0.0021	0.005	0.0013
	(0.005)	(0.002)	(0.002)	(0.0016)	(0.002)	(0.001)	(0.0014)	(0.0015)	(0.0015)	(0.002)	(0.0024)
Financial & Real assets	-0.35	0.145	0.029	-0.0055	-0.09	-0.033	-0.013	-0.05	-0.027	-0.019	0.027
c) Government Securities	-0.0035	-0.0013	0.003	0.0015	-0.004	0.003	-0.002	-0.005	-0.003	0.004	-0.0042
	(0.006)	(0.005)	(0.004)	(0.005)	(0.004)	(0.006)	(0.008)	(0.007)	(0.007)	(0.011)	(0.014)
d) Bonds	-0.008	0.0081	0.006	0.012^{b}	-0.009	-0.016^{b}	-0.007	-0.005	0.002	0.004	-0.0009
	(0.008)	(0.005)	(0.004)	(0.006)	(0.005)	(0.006)	(0.007)	(0.008)	(0.009)	(0.016)	(0.022)
e) Equity	0.003	-0.005	-0.0047^{c}	-0.0007	-0.006	0.005	0.0005	-0.004	-0.003	-0.009	-0.0011
	(0.003)	(0.003)	(0.002)	(0.0035)	(0.004)	(0.003)	(0.004)	(0.005)	(0.006)	(0.009)	(0.013)
f) Real Estate	-0.28^{b}	0.12^{c}	0.013	-0.021	-0.057^{c}	-0.037	-0.0074	-0.03	-0.023	-0.005	0.027
	(0.11)	(0.07)	(0.04)	(0.04)	(0.03)	(0.03)	(0.02)	(0.03)	(0.028)	(0.036)	0.042)
g) Saving accounts	-0.058^{c}	0.023	0.011	0.0027	-0.012	0.012	0.003	-0.0056	-0.00001	-0.013	0.0065
	(0.034)	(0.018)	(0.012)	(0.011)	(0.001)	(0.01)	(0.011)	(0.0114)	(0.01)	(0.0015)	0.016)

Note: Each column in this table reports for distributional statistics the total changes in income during the implementation of the UMP package. It is the sum of the employment and the financial assets components. The row "UMP channels" corresponds to (a) the explained component of employment plus (b) the explained component of debt plus the unexplained components of c) government securities, d) Bonds, e) equity, f) Real Estate and g) the fall in returns on savings accounts. The same applies to the rest of decomposition exercices except the last channel that is not considered. ^{c}, ^{b}, ^{a} respectively denote significance at the 10 percent, 5 percent and 1 percent levels.

Decomposition results of net disposable income between 2008 and 2010 are shown in Table 2 above. A first glance on these results indicates that interest rate cuts implemented by the ECB were associated with a strong impact on poor households, mainly through lower saving accounts returns. Indeed, changes in returns on bank deposit accounts contributed to decrease the income of the 5th quantile by 5.8 percentage points.

The ECB's monetary policy decisions over the 2008-2010 period have not been followed by significant gains in terms of employment. On top of that, changes in the level of employment resulted in opposite effects between households. They contributed (albeit to a small extent) to decrease the income of modest households, while they pushed up that of the households located at the top-half of the distribution. This does not appear to be the case for the debt channel, as changes in the level of indebtedness did not have a statistically significant impact on income of rich households. Moreover, in spite of the significant distributional impact of changes in coefficients on real estate (they have contributed to decrease the income of the 5th and 40th quantiles, respectively by 28 and 5.7 percentage points and increase that of the 10th quantile by 12 percentage points), we highlight the weak redistributive effects of the asset-price appreciation channel. This is probably due to the small amounts of assets purchased by ECB during the CBPP1 between 2008 and 2010 (around sixty billion of bonds).

The decomposition exercise for 2010-2012, exposed in Table 3 below, points out that the extent of UMP redistributive channels is related to the intensity of non-standard monetary policy measures. In fact, the 2010-2012 period, which we could consider as the first peak in terms of UMP implementation, exhibits positive redistributive impacts.

Unlike the 2008-2010's evaluation period, the redistributive channel of employment has positively contributed to all income quantiles between 2010 and 2012. In particular, the explained component of employment increased incomes of the five and ten percent poorest (5th and 10th quantiles), respectively by 2.6 and 1.1 percent. Changes in the level of employment over the same period increased median income by 0.5 percent and, to the same extent that of upper middle class households. The debt channel, captured by changes in indebtedness levels, mostly benefited modest households (10th, 20th, 30th and 40th income quartiles) but also contributed to increase the median income. These minor positive impacts of the debt channel stem from the LTROs package that helped as much as possible to improve businesses soundness and household finances solvency.

If former research on UMP redistributive impacts emphasized the influence of assets-price appreciation, the fact remains that this channel has not importantly contributed to income quantiles. Despite the implementation of the SMP and CBPP2, appreciation of financial assets has not produced the expected effect. As a matter of fact, the coefficients of financial assets' unexplained components - when statistically significant - hardly reach the one percentage point contribution to income. It should be noted, however, that the real estate channel continued to produce a negative impact on household income, and particularly this time on that of the top half of income distribution (minus 5.4 and 6 percentage points decrease in income of the 50th and 70th quantiles).

Table 3: Oaxaca-Blinder decomposition of Net Diposable Income for 2010-2012

	Q=5	Q=10	Q=20	Q=30	Q=40	Q=50	Q=60	Q=70	Q=80	Q=90	Q=95
Total change	0.06	0.063	0.057^{b}	0.072^{a}	0.08^{a}	0.075^{a}	0.049^{b}	0.034	0.019	0.007	0.019
	(0.073)	(0.035)	(0.026)	(0.022)	(0.021)	(0.023)	(0.022)	(0.023)	(0.023)	(0.027)	(0.04)
a) Employment channel	0.026^{c}	0.011^{c}	0.007^{c}	0.005^{c}	0.0046^{c}	0.005^{c}	0.0053^{c}	0.0057^{c}	0.0051^{c}	0.0065^{c}	0.0067^{c}
	(0.015)	(0.0061)	(0.0036)	(0.003)	(0.0025)	(0.0027)	(0.0029)	(0.004)	(0.0031)	(0.0036)	(0.004)
b) **Debt**	0.0045	0.003^{c}	0.0027^{c}	0.0031^{a}	0.0023^{a}	0.0022^{c}	0.0018	0.0014	0.0015	0.0009	-0.0005
	(0.003)	(0.0016)	(0.0015)	(0.0016)	(0.0012)	(0.0013)	(0.0012)	(0.0011)	(0.0011)	(0.0013)	(0.0014)
Financial & Real assets	-0.073	-0.09	-0.053	-0.014	-0.032	-0.053	-0.065	0.0005	-0.026	0.046	0.027
c) Government Securities	0.0132^{c}	0.0015	-0.0012	0.003	0.0007	0.0024	-0.0006	-0.0042	-0.011^{c}	-0.0078	-0.0072
	(0.007)	(0.006)	(0.0042)	(0.0038)	(0.004)	(0.0045)	(0.0054)	(0.006)	(0.0067)	(0.009)	(0.011)
d) Bonds	-0.0076	-0.008	-0.01	-0.007	-0.0043	-0.0066	-0.011	0.0046	0.012	0.011	0.022
	(0.012)	(0.008)	(0.008)	(0.0058)	(0.0057)	(0.0071)	(0.0085)	(0.0095)	(0.011)	(0.014)	(0.021)
e) Equity	0.0046	0.0026	0.0044	0.004	0.004	0.0057	0.006	0.0101^{c}	0.003	-0.0038	-0.0062
	(0.007)	(0.0035)	(0.0032)	(0.003)	(0.0033)	(0.0041)	(0.0047)	(0.0053)	(0.0064)	(0.0098)	(0.016)
f) Real Estate	-0.083	-0.0901	-0.0475	-0.014	-0.0321	-0.054^{c}	-0.06^{c}	-0.01	-0.03	-0.046	0.019
	(0.15)	(0.065)	(0.0442)	(0.035)	(0.032)	(0.034)	(0.0320)	(0.031)	(0.031)	(0.034)	(0.044)

Note: Each column in this table reports for distributional statistics the total changes in income during the implementation of the UMP package. It is the sum of the employment and the financial assets components. The row "UMP channels" corresponds to (a) the explained component of employment plus (b) the explained component of debt plus the unexplained components of c) government securities, d) Bonds, e) equity, f) Real Estate. ^{c}, ^{b}, ^{a} respectively denote significance at the 10 percent, 5 percent and 1 percent levels.

Table 4: Oaxaca-Blinder decomposition of Net Diposable Income for 2012-2014

	Q=5	Q=10	Q=20	Q=30	Q=40	Q=50	Q=60	Q=70	Q=80	Q=90	Q=95
Total change	0.0019	0.065^{c}	0.0095	0.003	0.015	0.017	0.026	0.024	0.014	0.015	0.012
	(0.056)	(0.036)	(0.027)	(0.022)	(0.0021)	(0.023)	(0.025)	(0.023)	(0.023)	(0.028)	(0.032)
a) Employment channel	-0.013	-0.0096	0.005	-0.004	-0.0031	-0.0031	-0.003	-0.003	0.0025	-0.0022	0.0032
	(0.013)	(0.01)	(0.005)	(0.0043)	(0.0032)	(0.0032)	(0.0035)	(0.0031)	(0.0027)	(0.0024)	(0.0035)
b) **Debt**	-0.007	0.0002	-0.0004	0.0003	0.0004	0.0003	0.0002	0.0003	-0.0003	0.0003	-0.00002
	(0.005)	(0.0009)	(0.0014)	(0.0012)	(0.0012)	(0.0011)	(0.00146)	(0.0011)	(0.001)	(0.0011)	(0.0005)
Financial & Real assets	0.097	-0.063	0.011	-0.012	-0.06	-0.021	-0.061	-0.028	0.011	0.022	0.46
c) Government Securities	0.006	0.0032	-0.004	0.001	-0.006	0.0006	-0.0023	0.0036	-0.0028	0.0017	0.0144
	(0.0058)	(0.0041)	(0.006)	(0.004)	(0.0042)	(0.005)	(0.0061)	(0.0065)	(0.0074)	(0.013)	(0.016)
d) Bonds	0.0026	-0.0019	0.0018	-0.003	0.0008	0.0026	-0.0115	-0.003	-0.0031	0.0053	0.0004
	(0.0085)	(0.0058)	(0.0045)	(0.005)	(0.0053)	(0.0064)	(0.0083)	(0.0085)	(0.0097)	(0.015)	(0.017)
e) Equity	0.0015	-0.00002	0.0022	-0.0013	-0.0007	-0.0013	-0.0021	-0.0046	0.0013	0.0015	-0.004
	(0.0045)	(0.0046)	(0.0026)	(0.002)	(0.0024)	(0.003)	(0.0038)	(0.004)	(0.0058)	(0.009)	(0.014)
f) Real Estate	0.086	-0.064	0.011	-0.009	-0.055^{c}	-0.023	-0.045	-0.024	0.016	0.013	0.035
	(0.094)	(0.061)	(0.043)	(0.034)	(0.032)	(0.032)	(0.034)	(0.03)	(0.028)	(0.031)	(0.033)

Note: Each column in this table reports for distributional statistics the total changes in income during the implementation of the UMP package. It is the sum of the employment and the financial assets components. The row "UMP channels" corresponds to (a) the explained component of employment plus (b) the explained component of debt plus the unexplained components of c) government securities, d) Bonds, e) equity, f) Real Estate. ^{c}, ^{b}, ^{a} respectively denote significance at the 10 percent, 5 percent and 1 percent levels.

Decompositions of net disposable income between 2012 and 2014 points out that (contrary to what we have noticed in the last evaluation period), a weak intensity of UMP measures comes along with low redistributive effects. Indeed the ECB in this period, apart from the announcement of the OMTs in September 2012, has not conducted much of UMP measures. It chose instead to adopt a sort of *wait and see* attitude until it observes the effects of its formerly implemented measures. As a consequence, this resulted in almost no redistributive impacts. It was in response to the sluggish growth and high unemployment rates the Eurozone was still experiencing back then, that the ECB has decided in the end of 2014 to reactivate its UMP toolbox.

To begin with, none of the employment and debt channels coefficients is statistically significant between 2012 and 2014. Once more, distributional effects of financial assets appreciation are impotent in spite of the positive response of Eurozone financial markets to the OMTs announcement. This makes sense as long as this program has never actually been implemented. The same could be said about real estate appreciation channel except for the 40th quantile whose income decreased, to a statistically significant extent, by 5.5 percentage points.

The 2014-2016 assessment period coincides with the timing where the ECB has decided to accelerate the pace of its conducted UMP measures. By the end of 2014, it launched the first program of the expanded APP (where it purchased asset backed securities) along with the third wave of the CBPP. These were thereafter supported by the purchase of public and private sectors assets but also with the extension of the LTROs.

As in 2010-2012 evaluation period, these measures were associated with significant redistributive impacts; which confirms a sort of common scheme where, broad and multiple UMP programs result in significant effects across households income. Although the explained component of employment contributed to reduce the income of the 20 percent poorest (20th quantile) by 1.17 percent, changes in employment levels between 2014 and 2016 primarily benefited low-income households. As a result, the net disposable income of the 5th, 10th and 30th quantile increased, to a statistically significant extent, respectively by 4.73, 2.41 and 1.05 percentage points. The employment channel also increased the median income, that of the upper middle class households and, to the same extent, the income of richest households.

As far as financial and real assets are concerned, the decomposition exercise of 2014-2016, like previous decompositions, continued to display low distributional impacts via the assets price channel. Yet, two relevant results from this decomposition table deserve to be discussed.

First, changes in returns on bonds appear to have decreased, in a statistically significant way, the income of some household groups (specifically, the 20th, 70th and 80th income quantiles). As noted by Epstein & Montecino (2017), this could be yielded by the fact that bond ownership impacts net income mainly via dividends, which prevents bonds holders to benefit from higher bonds prices.

Second, changes in returns on equity shares contributed to increase the income of the 10 percent richest by 2 percentage points. This signals that, the ECB's purchase programs accelerated as of 2015, have started to deliver strong redistributive impacts via asset price appreciations.

Table 5: Oaxaca-Blinder decomposition of Net Diposable Income for 2014-2016

	Q=5	Q=10	Q=20	Q=30	Q=40	Q=50	Q=60	Q=70	Q=80	Q=90	Q=95
Total change	0.095	0.021	0.008	0.00001	0.018	0.0173	0.039	0.045^{c}	0.019	0.03	0.0066
	(0.064)	(0.041)	(0.028)	(0.025)	(0.022)	(0.024)	(0.028)	(0.024)	(0.023)	(0.03)	(0.037)
a) Employment channel	0.0473^{b}	0.0241^{b}	-0.0117^{b}	0.0105^{b}	0.0083^{b}	0.0072^{b}	0.0075^{b}	0.0072^{b}	0.0066^{b}	0.0062^{b}	0.0065^{c}
	(0.021)	(0.011)	(0.0053)	(0.0047)	(0.004)	(0.0032)	(0.0034)	(0.0033)	(0.0031)	(0.0024)	(0.0036)
b) **Debt**	-0.0023	-0.0028	0.0024	-0.0024	0.0022	-0.0024	-0.0021	-0.0021	-0.0017	-0.0019	-0.00081
	(0.0022)	(0.002)	(0.0015)	(0.0016)	(0.0014)	(0.0011)	(0.0015)	(0.0014)	(0.0013)	(0.0015)	(0.0016)
Financial & Real assets	-0.1	-0.13	-0.072	0.012	0.001	0.0013	-0.024	-0.076	-0.067	0.02	0.02
c) Government Securities	-0.0017	-0.004	-0.0002	0.0011	-0.0022	0.0017	0.0064	0.0037	-0.0005	-0.0028	-0.0116
	(0.009)	(0.005)	(0.004)	(0.0046)	(0.0044)	(0.0055)	(0.0072)	(0.0073)	(0.0082)	(0.0131)	(0.018)
d) Bonds	-0.007	-0.0114^{c}	0.0042	-0.0085	-0.0064	-0.0008	-0.0063	-0.0242^{b}	-0.0195^{c}	-0.0142	0.0244
	(0.01)	(0.0065)	(0.0046)	(0.0057)	(0.0058)	(0.007)	(0.0094)	(0.01)	(0.011)	(0.017)	(0.0023)
e) Equity	-0.0003	-0.0035	0.0023	0.0006	.0023	-0.0013	0.0068	0.0051	0.0012	0.0196^{c}	0.0111
	(0.004)	(0.0034)	(0.0021)	(0.0025)	(0.0024)	(0.0036)	(0.0048)	(0.0051)	(0.0062)	(0.011)	(0.0144)
f) Real Estate	-0.09	-0.115	-0.078	0.019	0.0073	0.0017	-0.031	-0.0607^{c}	-0.048	0.0172	-0.004
	(0.11)	(0.074)	(0.048)	(0.04)	(0.0344)	(0.035)	(0.04)	(0.034)	(0.031)	(0.035)	(0.037)

Note: Each column in this table reports for distributional statistics the total changes in income during the implementation of the UMP package. It is the sum of the employment and the financial assets components. The row "UMP channels" corresponds to (a) the explained component of employment plus (b) the explained component of debt plus the unexplained components of c) government securities, d) Bonds, e) equity, f) Real Estate. ^{c}, ^{b}, ^{a} respectively denote significance at the 10 percent, 5 percent and 1 percent levels.

Table 6: Oaxaca-Blinder decomposition of Net Diposable Income for Gini coefficients

	2008-2010	2010-2012	2012-2014	2014-2016
Total change	0.0005	0.0025[a]	0.001	0.0006
	(0.0006)	(0.001)	(0.0007)	(0.001)
a) Employment channel	-0.0002[b]	0.0002[c]	-0.0001	0.0004[b]
	(0.0001)	(0.0001)	(0.0001)	(0.002)
b) **Debt**	-0.00005	0.00004	0.00009	-0.00003
	(0.00004)	(0.00003)	(0.00003)	(0.00004)
Financial & Real assets	0.002	-0.0035	0.0004	-0.0007
c) Government Securities	-0.00007	0.0004	0.0003	-0.00004
	(0.0002)	(0.0003)	(0.0002)	(0.0003)
d) Bonds	0.0001	-0.0007[c]	-0.00003	0.0002
	(0.0003)	(0.0004)	(0.0003)	(0.0003)
e) Equity	-0.0002	0.00006	0.00008	-0.0002
	(0.0001)	(0.0002)	(0.0002)	(0.0002)
f) Real Estate	0.0009	-0.0033[b]	0.00006	-0.0007
	(0.001)	(0.0015)	(0.001)	(0.0015)
g) Saving accounts	0.0007[b]	N/A	N/A	N/A
	(0.002)			

Note: [a], [b] and [c] respectively denote significance at the 1, 5 and 10 percent levels.

Decomposition results for Gini coefficients are presented in Table 6 above. They highlight, as much when it comes to the Gini index or household income groups, that the distributional channels associated with UMP share relatively low redistributive impacts (in terms of contribution to income). However, it is worth to underline some elements of these results. First and foremost, the fall in interest income on fixed-returns assets (the saving accounts channel) associated with the interest rates cuts carried out by the ECB, contributed to marginally increase the Gini index between 2008 and 2010 by 0.0007. Secondly, besides the fact that an intensive implementation of UMP is followed by strong distributional impacts across households; this mechanism also translates (via the employment channel) into a higher Gini index and then wider income disparities. In detail, changes in employment levels between 2010 and 2012 resulted in an increase in the Gini coefficient of 0.0002; while for 2014-2016, where the effect of the employment channel on household income was a bit stronger, the Gini index rose by 0.0004. These results may appear paradoxical to the extent that a rise in poor households income should be followed by a decline in income inequalities. The answer to this paradox perhaps lies in the specific construction of the Gini coefficient.

Actually, the Gini index tends to attach a relatively greater importance for observation in the middle of the distribution than those located at the extremes (that is, the poorest and richest households). This regularity is for instance consistent with the observed impact of the real estate channel on the Gini coefficient between 2010 and 2012. In fact, knowing that during this period, changes in returns on this asset significantly reduced the income of the 50th and 60th income quantiles (typical middle class households); this resulted in a lower disparity around the middle of income distribution, which translates into a smaller Gini index (a statistically significant decline of -0.0033).

Overall, our decomposition results support three major findings with regard to the distributional effects of UMP. First, episodes of intensive UMP implementation are associated with income increases for modest households, primarily via gains in employment. Second, we provided empirical evidence related to the negative impact on poor households from the fall in returns on bank deposit accounts, as well as the small gains from equity shares ownership for top-income households. This finding is not definitive as the ECB still continues up to now its large QE programs and we should be probably expecting from the financial assets channel significant distributional effects in the near future. Third, if our results tend to support the idea suggesting that the redistributive impacts of UMP are small, they show also that these impacts are unevenly distributed between households and remain sensitive to monetary policy stance.

5 Conclusion

Using the Italian Survey on Households Income and Wealth (SHIW), we show that UMP implemented by the ECB since 2008 had modestly impacted income inequalities - approached through the Gini coefficient - in Italy. However, by considering the impact of UMP on each income quantile, we find that poor and middle class households have marginally gained from changes in the level of employment and indebtedness, especially between 2010-2012 and 2014-2016. To achieve this result, we distinguished at first three different types non-standard monetary policy measures: asset purchase programs, lending facilities operations and the fall in returns on savings accounts. From this point forward, we focused our concern on the most discussed redistributive channels, namely: the appreciation of financial assets, real estate and savings accounts (direct channels) plus employment and indebtedness, which are perceived in the literature as an indirect effects of UMP. Empirically, we mobilized FFL (2007) seminal approach, that combines RIF regressions with the Oaxaca-Blinder decomposition method. This empirical strategy was motivated by the aim to dissect the contribution of each relevant component of UMP redistributive channels to changes in income in four assessment periods: 2008-2010, 2010-2012, 2012-2014 and 2014-2016. For future research, perhaps a comparative perspective with financial-markets driven economies (as U.S. or U.K.), where ownership of financial assets is more important, could yield a better comprehension of how the redistributive impacts of UMP actually work.

6 References

Acemoglu, D. Johnson, S. 2012. Who Captured the Fed?. Economix Blogs. The New-York Times. Available at : http://economix.blogs.nytimes.com/2012/03/29/who-captured-the-/?_r=0

Adam, K. Tzamourani, P.. 2016. "Distributional consequences of asset price inflation in the Euro Area". European Economic Review, vol. 89(October), 172-192.

Bivens, J. 2015. "Gauging the Impact of the Fed on Inequality during the Great Recession". Working Paper No. 12. Hutchins Center Working Papers, Brookings Institution.

Casiraghi, M. Gaiotti, E. Rodano, L. Secchi, A. 2017. "A "reverse Robin Hood" The distributional implications of non-standard monetary policy for Italian household". Journal of International Money and Finance, in press.

Coibion, O. Gorodnichenko, Y. Kueng, L. Silvia, J. 2017. "Innocent Bystanders? Monetary Policy and Inequality in the U.S.". Journal of Monetary Economics, vol. 88(June), 70-89.

Doepke, M. Schneider, M. Selezneva, V. 2015. "Distributional Effects of Monetary Policy". Working Paper No. 14. Hutchins Center Working Papers, Brookings Institution. Available at : https://www.brookings.edu/research/distributional-effects-of-monetary-policy/

Domanski, D. Scatigna, M. Zabai, A. 2016. "Wealth inequality and monetary policy". BIS Quarterly Review, March 2016. Available at : https://papers.ssrn.com/sol3/papers.cfm?abstractid=2744862

Draghi, M. 2016. "Stability, Equity and Monetary Policy". Speech delivred at the 2nd DIW Europe Lecture, on 25 October 2016. Available at: http://www.ecb.europa.eu/press/key/date/2016/html/sp161

Epstein, G. Montecino, J. 2017. "Did Quantitative Easing Increase Income Inequality?" Working Paper No. 28, Institute for New Economic Thinking. Available at:
https://www.ineteconomics.org/uploads/papers/WP28-Epstein-Montecino.pdf

Firpo, S. Fortin, N. Lemieux, T. 2007. "Decomposing wage distributions using Recentered Influence Function regressions". University of British Columbia. Available at :
http://www.economics.uci.edu/files/docs/micro/f07/lemieux.pdf.

Firpo, S. Fortin, N. Lemieux, T. 2009. "Unconditional Quantile Regressions". Econometrica, vol. 77(3), 953-973.

Firpo, S. Fortin, N. Lemieux, T. 2011. "Decomposition Methods in Economics". In *Handbook of Labor Economics*, vol 4, part A, 1-102. Elsevier.

Frost, J. Saiki, A. 2014. "Does unconventional monetary policy affect inequality? Evidence from Japan". Applied Economics, vol. 46(36), 4445-4454.

Furceri, D. Loungani, B. Zdzienicka, A. 2017. "The Effects of Monetary Policy Shocks on Inequality". Journal of International Money and Finance, in press.

Guerello, C. 2017. "Conventional and unconventional monetary policy vs. households income distribution: An empirical analysis for the Euro Area". Journal of International Money and Finance, in press.

Gosling, A. Machin, S. Meghir, C. 2000. "The Changing Distribution of Male Wages in the U.K". Review of Economic Studies, vol. 67(4), 635-666.

Juhn, C. Murphy, K. Pierce, B. 1993. "Wage Inequality and the Rise in Returns to Skill?" The Journal of Political Economy, vol. 101(3), 410-442.

Kiley, M. 2014. "The Response of Equity Prices to Movements in Long-Term Interest Rates Associated with Monetary Policy Statements: Before and After the Zero Lower Bound". Journal of Money, Credit and Banking, vol. 46(5).

Mumtaz, A. Theophilopoulou, A. 2017. "The Impact of Monetary Policy on Inequality in the U.K. An Empirical Analysis". European Economic Review, vol. 98(September), 410-423.

Piketty, T.. 2014. Capital in the Twenty First Century. Harvard University Press, 816 pages.

Romer, D. Romer, C. 1999."Monetary policy and the well-being of the poor". Economic Review, Federal Reserve Bank of Kansas City, issue Q I, 21-49.

Romer, D. Romer, C. 2004. "A New Measure of Monetary Shocks: Derivation and Implications". American Economic Review, vol. 94(4), 1055-1084.

A Appendix

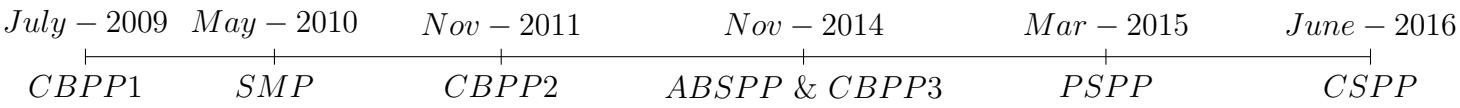
Table A.1: Means of independent variables (2008-2016)

	2008	2010	2012	2014	2016
Employment	0.5197	0.5238	0.5044	0.4791	0.4514
Debt	0.2268	0.2014	0.1839	0.1609	0.1470
Government Secuities	0.1135	0.1024	0.0794	0.0893	0.0759
Bonds	0.1265	0.1463	0.1279	0.1302	0.1127
Equity	0.0634	0.0661	0.0537	0.0523	0.0414
Real Estate	0.7321	0.7417	0.7233	0.7269	0.7396
Savings Accounts	0.2488	0.2386	N/A	N/A	N/A

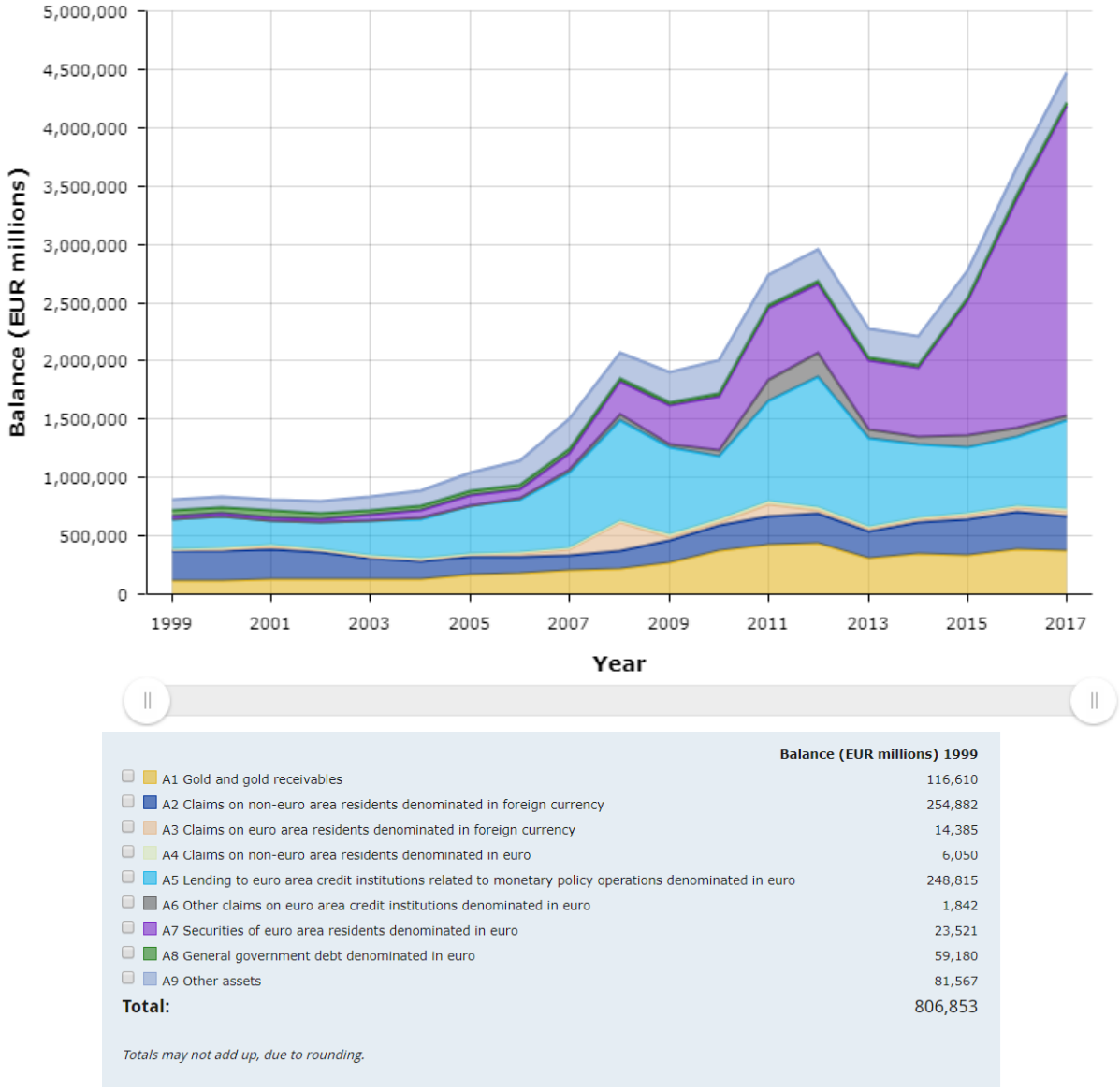
Table A.2: Description of independent variables

	Definition
Employment ($EMPLOY$)	Dummy variable for the employment status of the head of the household.
Indebtedness ($Debt$)	Dummy variable indicating if the household has contracted a credit.
Government securities ($GovSec$)	Dummy variable indicating whether or not the household directly owns any domestic government securities.
Bonds ($Bond$)	Dummy variable denoting if the household directly owns any bonds or not.
Equity ($Stock$)	Dummy variable indicating whether or not the household owns a non-zero amount of equity shares.
Real Estate ($RealEst$)	Dummy variable indicating whether or not the household owns his principal residence.
Savings Accounts ($Savings$)	Dummy variable that equals to one if the household possesses a bank deposit account.
Sex (Sex)	Dummy variable that equals to one if the household head is a men and zero otherwise.
Regions ($Region$)	Vector of twenty dummy variables indicating Italian regions.
Education ($Educachi$)	Vector of four dummy variables that measures household head's level of educational achievement.

Figure B.1: European Central Bank Asset purchase programs (2008-2016)



Graph B.1: Annual consolidated balance sheet of the Eurosystem



Source: https://www.ecb.europa.eu/pub/annual/balance/html/index.en.html

Figure B.2: European Central Bank Lending facilities operations (2008-2016)