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Monetary policy effects on wage inequality: evidence from Italy

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Abstract

This study examines the impact of monetary policy on wage inequality in Italy from 1999m1 to 2018m12, using a newly assembled dataset based on high-frequency administrative data on private-sector employees from the Italian Social Security Institute (INPS). By applying the Smooth Local Projection (SLP) method, we derive the impulse responses to exogenous monetary policy shocks of average wages and of the Gini index of wage inequality and other indicators of the wage distribution. Our findings show that expansionary monetary policy significantly reduces wage inequality while stimulating economic activity. Furthermore, distinguishing workers' subgroups according to sector of activity, occupation and firm's size, we find that expansionary monetary policy decreases wage inequality both 'between' and 'within' subgroups.

JEL codes: D63, E50, E52

Keywords: Monetary policy shocks, Wage inequality, Italian data, Earnings heterogeneity, Labour market

1 Introduction

In recent years, rising income and wealth inequality have become a pressing concern in advanced economies (OECD, 2011 and 2021). Significant inequality levels can lead to various adverse effects that could undermine GDP growth, including fostering political instability and encouraging protectionist tendencies, restricting opportunities for the poor to invest in education and entrepreneurial activity, increasing household debt, contributing to asset market bubbles and heightening financial instability.[1]

Particularly after the Great Recession and the consequent period of accommodative monetary policy stance, monetary policy has garnered significant attention from policymakers and academics as critical contributor to inequality changes.[2] However, it is somehow difficult to determine the overall effect of monetary policy on inequality, due to the considerable number of distributive channels it engenders, that could potentially have opposite implications (Coibion et al., 2017; Colciago et al., 2019). The first studies on the link between monetary policy and inequality focused on household wealth or income from various sources as the proxy variable of individuals' economic wellbeing (McKay and Wolf, 2023). Mechanisms affecting such link thus differ if one focuses on stock or flow variables, i.e., wealth or income, respectively (e.g., because of a different role played by channels related to savings or household debt when the focus is on wealth, or by public transfers when the focus is on income). Moreover, when the focus is on income, the effects of monetary policies on inequality might be indirectly mediated by general equilibrium responses related to changes in the various income sources (i.e. labour income, capital income, welfare monetary transfers). Among the so-called indirect channels (Kaplan et al., 2018; Ampudia et al., 2018), earnings heterogeneity has recently received substantial attention, though the number of related studies remains relatively limited.

Studies on the link between monetary policy and inequality usually face challenges in measuring inequality at high frequency and over extended periods. These data challenges are particularly pronounced in the Euro Area, where the two primary publicly available sources on household members economic wellbeing – i.e., the EU Statistics on Income and Living Conditions (EU-SILC), which

[1] See, among the others, Dabla-Norris et al., 2015; Jaumotte and Osorio-Buitron, 2015; Coibion et al., 2014; Kumhof et al., 2015; Kirschenmann et al., 2016; Perugini et al., 2016, Voitchovsky, 2009.

[2] Se,e among the others, Yellen, 2014; Bernanke, 2015; Draghi, 2016.

offers from 2004 onwards microdata on incomes from the various sources, and the Household Finance and Consumption Survey (HFCS), which provides microdata on income and wealth across the EU in four waves between 2010 and 2021 – record information on an annual basis only.

Recently, a new strand of studies at the country level has begun to leverage administrative microdata about household income or individuals' earnings to overcome the limitations of survey data.[3] Our article contributes to this emerging literature by examining how monetary policy affects earnings inequality in Italy from 1999 to 2018, exploiting a large sample of administrative records on employees in the private sector collected by the Italian Social Security Institute (INPS). This dataset, recording in detail dates, earnings, and other characteristics of each working spell experienced in a year, allows us to precisely reconstruct monthly and hourly wages and allows for a comprehensive assessment of the distributional impacts of monetary policy by investigating the effects of monetary policy shocks on mean earnings, various percentiles of the earnings distribution, and the Gini index of inequality. Additionally, to understand how worker and firm characteristics mediate the relationship between monetary policy and earnings distribution, we decompose the Theil index of inequality by major subgroups (i.e. by workers' occupation, sector of activity, firm' size) to disentangle whether the overall changes of earnings inequality due to a monetary policy shock are related to changes in mean earnings between different groups or changes in earnings gaps within individuals belonging to the same group.

Our empirical strategy involves the use of the Smooth Local Projection (SLP) technique developed by Barnichon and Brownlees (2019), which provides substantial gains in mitigating the drawbacks of the Local Projection method while maintaining its advantages over other approaches. As monetary policy shocks, we use the ECB monetary policy shock series developed by Jarociński and Karadi (2020), constructed using high-frequency surprises in the interest rate swaps around ECB policy announcements.

To anticipate our main results, we find that an expansionary monetary policy shock significantly benefits the Italian economy. It leads to an increase in industrial production and average wage and a decrease in unemployment and in the Gini index of wage inequality. Further analyses provide more insights about the equalizing effect of monetary policy shocks, since the lowest percentiles of the

[3] See, for instance, Holm et al. (2021), Andersen et al. (2023), Groiss (2023).

wage distribution experience the most substantial and sustained increases in earnings. Moreover, when workers are distinguished according to sector of activity, occupation and firm's size, we find that expansionary monetary policy reduces both the wage inequality within workers belonging to the same subgroup, and the between component of wage inequality (that is due to mean earnings gaps between the various subgroups) between those with a different occupation or working in differently sized firms.

The rest of the paper has the following structure. In Section 2 we review the literature on the effects of monetary policy on inequality. Section 3 describes the econometric specification and the data used. Section 4 presents the results. Section 5 concludes.

2 Related literature

Following Bernanke's (2015) suggestion to develop research meant to assess the several channels through which monetary policy exerts its effects on inequality, last years witnessed a burgeoning literature related to the topic (McKay & Wolf, 2023). The bulk of extant literature relies on two main viewpoints from which it is possible to assess the effects of monetary policy on income and consumption inequality through the so-called distributional channels (Colciago et al., 2019).

The first approach reconstructs them all separately (e.g. Amaral, 2017; Coibion et al., 2017; Colciago et al., 2019). Major distributional channels are: *savings redistribution, portfolio composition, income composition, earnings heterogeneity*.[4] Specifically, the latter is the one of our interest, and it relates to the different reactions to a policy shock of workers' outcomes, as hourly wages, hours worked, and employment levels along the wage distribution (thus allowing to distinguish extensive and intensive margins responses).

The second viewpoint sorts the distributional channels in direct and indirect channels within the Heterogenous Agents New Keynesian (HANK) literature (e.g., Kaplan et al., 2018; Ampudia et al., 2018; Bilbiie, 2024). The *direct channels*

[4] In addition, Colciago et al. (2019) discuss the *unexpected inflation channel*, and Amaral (2017) lists the *inflation tax channel*. Amaral (2017) and Colciago et al. (2019) discuss the *interest rate exposure channel* (based on the unhedged interest rates exposures, Auclert 2019). Coibion et al. (2017) also pinpoint the *financial segmentation channel* (Melcangi and Sterk, 2024). Albert et al. (2020) also investigate the *housing* and *fiscal channels*.

relate to the partial-equilibrium effects of interest rates changes. They encompass effects on households' saving patterns and net financial income. The *indirect channels* involve the general equilibrium responses in terms of employment and wages stemming from a stimulus (contraction) in aggregate demand and output following an expansionary (contractionary) policy.

On the empirical side, the literature on the effect of monetary policy on several measures of inequality yields mixed conclusions (Colciago et al., 2019). A first wave was opened up by the seminal contributions of, among others, Coibion et al. (2017), Furceri et al. (2018), Mumtaz and Theophilopoulou (2017), showing evidence on the adverse effect of contractionary monetary policy on income, earnings, and consumption inequality. The empirical investigation of El Herradi and Leroy (2021) yields estimates according to which contractionary monetary policy negatively affects top income shares in a group of OECD economies (1920-2016). Chang and Schorfheide (2024) show that a monetary easing engenders a fall in earnings inequality in the US (1990-2016).

Another recent strand of contributions focused on Scandinavian countries grounding on comprehensive administrative data. Holm et al. (2021) handle the case of Norway (1996-2015), where restrictive monetary shocks let low-liquid asset households cut consumption down while high-liquid asset households increase it. Andersen et al. (2023) results exhibit a non-negligible role for expansionary monetary policy in raising inequality by favouring high-income households in Denmark (1987-2014). At last, Amberg et al. (2022) illustrate the positive response of labour income at the bottom of the distribution and capital income at the top to expansionary policy in Sweden (1999-2018).

A detailed focus on the case of the Eurozone (1999-2014) can be found in Samarina and Nguyen (2024).[5] Overall, expansionary monetary policy is shown to reduce income inequality, in particular through their impacts via the so-called labour-market channel, while the financial channel played a subdued role. Specifically on the Italian case, Corrado and Fantozzi (2021) gauge the impact of monetary policy on household income inequality in Italy (1999-2017). Expansionary monetary policy is shown to result in lower income inequality by benefitting more households at the bottom of the distribution via its stimulus on job creation and employment. Again on the Italian case, Casiraghi et al. (2018) address the impact of unconventional monetary policy. According to them, households lying in the bottom of the income distribution are those who benefitted the most thanks to the

[5] On this issue, see also Lenza and Slacalek (2018), Guerello (2018), Fuentes et al. (2023).

boost to economic activity and employment, while the effects on wealth are negligible.

Among the distributional channels listed above, *earnings heterogeneity* is enjoying a notable deal of attention. Heathcote et al. (2010), Heathcote et al. (2023) stress that labour incomes at the bottom of the earnings ladder are mostly influenced by the course of the rate of unemployment and of hours worked, while top labour incomes mainly respond to changes in hourly wages instead. Motta and Tirelli (2012), Areosa and Areosa (2016), and Gornemann et al. (2021) discussed in a New-Keynesian environment the need for monetary policy design to include labour market heterogeneity and labour earnings inequality in their evaluations. Further remarks in this direction also came from policymakers (Bernanke, 2015; Draghi, 2016).

In the list of recent contributions addressing the role of the *earnings heterogeneity channel*, Komatsu (2023) singles out, in a SAMTANK model, that after an expansionary shock the occupational performance of the constrained agents at the bottom of the income distribution improves relatively more than that of the unconstrained agents, thereby lowering inequality in consumption.

Focusing on labour supply dynamics, Ma (2023) works in the direction of making explicit a *supply-side labour market channel* for monetary policy. Income inequality is shown to be reduced by expansionary policy through the differentiated response in terms of labour earnings due to indivisibility in (discrete) labour supply decisions. Ma (2024) explores further the relative relevance of the intensive and the extensive margins of adjustment. He demonstrates that when the extensive margin steers the response to a monetary shock inequality decreases. When the intensive margin dominates, the decrease in inequality can be significantly curbed or even reversed.

Additional evidence on the role of the intensive and extensive margins of adjustment is offered by Hubert and Savignac (2023) and Cantore et al. (2022). Hubert and Savignac (2023) investigate the case of France (2007-2019). The authors show that an expansionary monetary policy shock causes a U-shaped response: while labour income at the bottom and at the top of the distribution rises, middle-incomes do not respond as much. Moreover, on one hand, the extensive margin is the main route of adjustment for the bottom of the distribution, where people see their unemployment transition probability fall. On the other hand, the intensive margin steers the reaction of top incomes, with a peculiar role attributed by the authors to variable remunerations and bonuses. Again in this line of research, Can-

tore et al. (2022) pinpoint a *dampening channel of transmission* based on the heterogeneity in the intensive margin of adjustment. In the US (1994-2019) and UK (1994-2019) cases contractionary monetary shocks let labour market indicators such as worked hours and labour earnings shrink. Nevertheless, households at the bottom of the distribution who remain employed increase the amount of hours worked, thereby adjusting to the contractionary shock via a countercyclical response that runs through the intensive margin. Such a behaviour is rationalized in a TANK model.

An additional element is provided by Faia et al. (2022) and Gulyas et al. (2024), who assess the relevance of the so-called *labour mobility channel* of monetary policy. Faia et al. (2022) investigate the US case (1989-2019) to check the reaction of wage inequality and transition probability. The outcomes of this exercise demonstrate that monetary policy tightening compresses the dispersion of wages, in so doing reducing inequality. In particular, wages at the top of the distribution drop, and those at the bottom surge. In addition, for what regards transition probability, monetary tightening increases the separation rates at the bottom of the income distribution, and those who retain a job are relocated to better-paying jobs. The second contribution evaluates the effect of ECB monetary policy on Austrian workers and firms (1999-2019). To this end, they employ a wage regression and estimate worker and firm (wage) fixed effects. The main results offered by Gulyas et al. (2024) are the following: contractionary monetary policy adversely impacts low-paid workers' employment in high-paying firms and fosters the reallocation rate of low-paid workers among firms. Moreover, the reallocation process ends up for workers in finding jobs in lower-paying firms.

Broer et al. (2022) emphasize the role of *heterogeneous unemployment risk*. First, they provide empirical evidence on the equalizing effects of unexpected expansionary monetary shocks in Germany (2000-2012). Their estimations confirm also in the German case the beneficial influence of expansionary policy in terms of: relative stronger decrease in separation rates into non-employment, persistently higher employment rates for workers at the bottom of the income distribution, and a reduction in the labour earnings Gini coefficient. Then, Broer et al. (2022) set forth a model explaining how aggregate demand expansion due to accommodative monetary shocks can be magnified by their differentiated impact on unemployment risks across distinct segments of the income distribution. Groiss (2023) as well investigates the case of Germany (1999-2019), addressing how ECB's monetary policy impacts wage inequality. Conventional and unconven-

tional policies are found to impart an equalizing pattern to wage dynamics, lowering in this manner wage inequality. In particular, conventional policy exerts positive effects on wage levels across the entire distribution, with the bottom benefitting relatively more. Unconventional policy involves wages' increase particularly at the bottom of the distribution and it exhibits overall a stronger equalizing effect.

A different perspective is provided by Dolado et al. (2021), who focus on the US (1980-2007), where expansionary monetary policy results in an increase at business cycle frequency in both the skill premium and the relative employment of skilled workers. They rationalize this finding by presenting a New Keynesian DSGE model featuring capital-skill complementarity in production and search-and-matching labour market frictions in which a *demand amplification channel* positively impacts employment of high-skilled workers. The latter is reinforced by the fact that high-skilled workers are less subject to adverse frictions in the labour market. In the end, high-skilled workers benefit from stronger wage increases and better employment rates with respect to low-skilled workers. This involves a rise in income inequality.

3 Data and Methodology

3.1 The model

We use the Smooth Local Projection (SLP) technique developed by Barnichon and Brownlees (2019). The SLP method builds on the Local Projection (LP) developed by Jordà (2005) and uses penalized B-splines (Eilers & Marx, 1996) to enhance the estimation accuracy of the LP technique, mitigating common problems related to heavy parameterization of impulse responses and variability in the impulse response estimator. Like the LP method, SLP also offers several advantages over VAR models. Notably, as a single-equation approach, it avoids the need to estimate the entire system of equations and impose dynamic restrictions. Moreover, it is robust to misspecification of the data-generating process.[6]

In line with Barnichon and Brownlees (2019), we estimate the following model:

$$y_{t+h} = \alpha_{(h)} + \beta_{(h)} x_t + \sum_{i=1}^{p} \gamma_{i(h)} w_{it} + u_{(h)t+h} \qquad for\ h = 0,1,2,\dots,H \tag{1}$$

[6] For further details, see Ramey (2016), among the others.

Where y_t is our variable of interest, x_t is an exogenous shock variable, w_{it} is a set of p control variables, $u_{(h)t+h}$ is a prediction error term with variance $\sigma^2_{(h)}$.

The coefficient β_h, which represents the impulse response at horizon h, is smoothly approximated across different horizons using a linear combination of B-spline basis functions:

$$\beta_{(h)} \approx \sum_{k=1}^{K} b_k B_k(h) \qquad for \quad k = 1, \dots, K \qquad (2)$$

Where K is set to be large to minimise the bias due to approximation. B_k and b_k denotes a set of B-spline basis functions and a set of scalar parameters, respectively.

Substituting equation (2) into equation (1), stacking over time and writing the model in compact form:

$$\mathcal{Y} = \mathcal{X}\theta + \mathcal{U} \qquad (3)$$

The model is estimated using generalised ridge estimation:

$$\hat{\theta} = \arg\min_{\theta}\{\|\mathcal{Y} - \mathcal{X}\theta\|^2 + \lambda\theta' P\theta\} = (\mathcal{X}'\mathcal{X} + \lambda P)^{-1}\mathcal{X}'\mathcal{Y} \qquad (4)$$

Where P is a symmetric positive semidefinite matrix that specifies the nature of the penalty applied to the parameter estimates. We follow Barnichon and Brownlees (2019) by setting P to shrink the IR towards a line, which is approximately consistent with standard LP estimates.

The parameter λ is a shrinkage parameter that controls the strength of the regularization applied in the estimation process: if λ is large, the estimates are constrained more tightly to the penalty imposed by P. It results in a biased estimator with smaller variance. Conversely, if λ is zero, the estimator coincides with the least square estimator with no bias but higher variance. The value of this parameter is set using the k-fold cross-validation (Racine, 1997) procedure.

As customary in the LP literature, the variance of $\hat{\theta}$ is estimated using the Newey-West estimator to account for potential autocorrelation and heteroscedasticity in the residuals.

3.2 Data and main variables

We investigate the impact of monetary policy shocks on various indicators of the labour income distribution in Italy during the period 1999-2018 considering monthly data on earnings.

For this purpose, we use a large sample of administrative records on employees in the private sector (excluding domestic and agricultural workers) collected by the Italian Social Security Institute (INPS). The source of information is the form that employers have to fill out in order to social contributions to their employees. In detail, we use the LOSAI (Longitudinal Sample INPS) archive whose sampling is based on 24 birth dates of employees. Thus, the sample approximately covers 6.6% of the universe of private employees.[7] We track workers from 1999 to 2018 (the latest available year).

In more detail, for each worked spell in a year as a private employee, the dataset provides information on gross earnings (including overtime pay and all kind of monetary compensation giving right to social security contributions, gross of personal income taxes and of the social contributions paid by the employee), the starting and the ending day in the year (thus, equal to 1/1 and 12/31 for job spells lasting a whole year), the contractual arrangement (full- versus part-time and open-ended versus fixed-term), a coarse occupation classification (distinguishing apprentices, blue-collar, white-collars, middle managers, executive managers), and information about the firm's class size (14 different classes are used) and sector of activity (according to the 2-digit NACE Rev. 2 classification). Some basic demographic information is also recorded, namely, gender, year of birth (thus allowing us to compute age in each year) and region of work.[8]

Using starting and end dates of each working spells experienced by an individual in a year, we developed a monthly dataset attributing, to each month in a year, the corresponding share of the total earnings received in a certain period (i.e. for those employed the whole year, monthly wage is merely 1/12 of total earnings, where for fragmented working periods monthly values are attributed to according to the share of the total spell experienced in a given month).

As main outcome variables, we then look at three earnings variables:[9]

1. Total monthly gross earnings – obtained summing all earnings from private employment received during a month;

[7] Specifically, those born on the 1st and 9th of each month and year are included in the sample.
[8] No information about worker's education, citizenship, marriage status and household characteristics is instead collected in the INPS archives we had at disposal.
[9] By definition, administrative data do not track informal job, that is highly diffused in Italy. Likewise, actual worked hours by part-timers might be underreported by the employers when a full-time worker is registered through a part-time arrangement and the remaining hours are 'informally' paid by the employer. However, administrative records have the major advantage of being not affected by unit or item non-response and, differently from surveys on individuals, are not affected by memory bias or imprecise earnings measurement, that are serious issues, especially when one aims to focus on short duration and low-paid working spells.

2. Daily wages – obtained by dividing the monthly earnings by the corresponding days to depurate from the influence of the heterogeneity in the number of worked days in a month;
3. Hourly wages – obtained by dividing daily earnings according to the number of worked hours, where we assume 8 and 4 working hours per day for full-time employees and part-time employees, respectively. This proxy of hourly wages (being not available in INPS archives information about the exact number of working hours) thus allow us to depurate monthly earnings from the influence of both the heterogeneity in worked days and in the spread of part-time contracts.

We keep in each month all individuals aged 15-65 with positive earnings in private employment.

Starting from these microdata assembled from administrative archives, tracking approximately 1.5 million individuals per month, we computed a set of indicators of the labour income distribution for each of the three aforementioned earnings variables. Specifically, we focus on mean earnings, on various percentiles of the earnings distribution, and on the Gini index of inequality.

Furthermore, to distinguish the role played by worker's and firm's characteristics as a mediator of the link between monetary policy and the earnings distribution we also run a set of subgroup decompositions of the Theil index of inequality where we distinguish workers according to three sets of characteristics: i) occupation; ii) class of firm's size; iii) sector of activity.

In other terms, to better investigate the role played by these three features as a driver of income inequality in reaction to a different stance of monetary policy, we compute, through a decomposition exercise, the relative size of the inequality that emerges within the same group (i.e. within workers with the same occupation) and between different groups (e.g. between blue-collars, white-collars and managers). By doing so, we can measure the share of total inequality due to differences in mean incomes between the various groups (hereafter 'between inequality') and the share of inequality for individuals belonging to the same subgroup (hereafter 'within inequality').

To this aim we use the Theil index of inequality which, unlike the Gini index, is perfectly decomposable among groups, being expressed as the sum of between and within inequality. In more detail, the between-group inequality is computed through a counterfactual distribution, imputing the mean wage of the jth group to

all the individuals who fall in that specific group, while the within-group inequality is the weighted average of the inequality within each group.[10]

Observing the effect of monetary policy on the two sub-components of the Theil index thus allows us to assess whether the effects occur because of changes in mean earnings between individuals belonging to different groups and/or within individuals belonging to the same group.

Henceforth, our variables of interest y_t, encompass: i) mean and various percentiles of the distribution of monthly, daily and hourly gross wages of employees in the private sector; ii) Gini index of inequality in the three earnings variables; iii) between and within inequality of monthly earnings, when workers are distinguished according to occupation, sector of activity, firm's size.

The set of control variables, w_{it}, includes three lags of the dependent variable, the logarithm of the industrial production index, the logarithm of the consumer price index, the unemployment rate and the European Central Bank's shadow rate, developed by Wu and Xia (2020), as a measure of the monetary policy stance[11].

As exogenous monetary policy shock, i.e. x_t, we use the series of pure monetary policy shocks developed by Jarociński and Karadi (2020). Following the approach of Gürkaynak et al. (2005) and Gertler and Karadi (2015), the monetary policy surprise series is derived from high-frequency responses of EONIA swap rates with various maturities and the EURO STOXX 50, a market capitalization-weighted stock market index, observed around the European Central Bank (ECB) Governing Council's monetary policy meetings. Then, to identify a pure monetary policy shock, Jarociński and Karadi (2020) employ the "poor man's sign restrictions" approach. In line with standard theoretical predictions, this method selects innovations that cause a negative co-movement between interest rates and EURO STOXX 50 price changes. By doing so, the authors effectively disentangle monetary policy from information shocks, which are reactions of market participants to the Governing Council's judgment of the Euro Area economic perspective.

Echoing the approach employed by several studies (see among the others, Auer et al., 2021, and Hülsewig and Rottmann, 2022), we consider Jarociński and

[10] In the Theil decomposition, inequality within each group is weighted by the relative income earned by each group.

[11] Wu and Xia (2020) employ nonlinear state space models to generate an effective rate, providing a more precise measure of the ECB's unconventional monetary policy stance.

Karadi (2020) series as a direct measure of monetary policy shock, and we transform it to reflect an expansionary shock.[12]

4 Results

Before delving into the results specific to our inequality indexes, we first examine the overall effects of monetary policy shocks on the Italian economy. Figure 1 shows the impulse responses for industrial production, price level, and unemployment over 2 years ($H = 24$) following a one-standard-deviation expansionary monetary policy shock. The shaded red area indicates the 90-percent error bands. Consistent with the monetary policy literature, industrial production shows a significant increase, peaking around ten months before gradually declining. The price level response is positive but not substantial. Unemployment experiences a modest initial increase on impact, it then decreases significantly and remains negative for the entire horizon considered. Figure 2 shows the IR for monthly, daily, and hourly average wage. The responses are positive and significant in all cases, with hourly wages exhibiting the strongest increase.

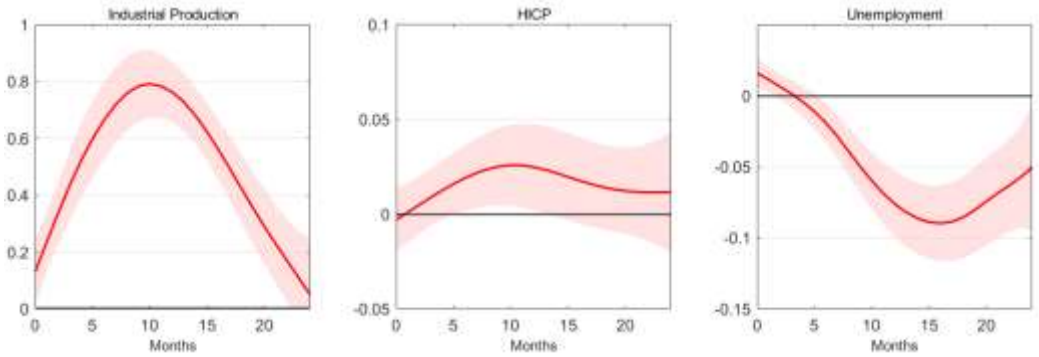

Figure 1. Impulse responses of macroeconomic aggregates to an expansionary monetary policy shock. The red shaded area shows 90% confidence interval.

[12] The Instrumental Variable (IV) approach might be a feasible alternative; however, it may result in less precise estimates due to the uncertainty added during the first-stage regression. As discussed in Auer et al. (2021), the IV approach is especially advantageous when the shock does not have a well-defined economic interpretation since it adjusts the shock in terms of the units of the instrumented variable. Nevertheless, the economic interpretability provided by the Jarociński and Karadi (2020) shock series offers a clear advantage for our analysis.

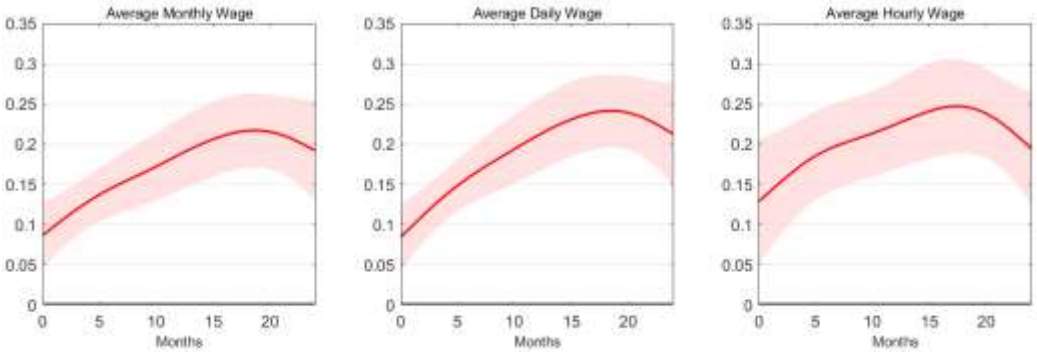

Figure 2. Impulse responses of Wages to an expansionary monetary policy shock. The red shaded area shows 90% confidence interval.

Figure 3 compares Gini indexes capturing monthly, daily, and hourly wage inequality. Overall, responses provide evidence of a substantial decline in inequality after expansionary monetary policy shocks. Among them, the Gini index based on hourly wages exhibits the strongest decrease. This evidence can be attributed to the fact that the Gini index calculated at hourly frequency represents the earnings measure more directly linked to wage settlements over the cycle. Indeed, in the Italian institutional settings social partners bargain hourly wages, while the job intensity (contractual arrangements and number of worker hours per week) is usually chosen by the employers. Hence, hourly wages can be envisaged to straightforwardly capture the beneficial effect imparted by expansionary policy to the capability of workers to bargain better wage conditions in a favourable phase of the cycle. Differently, the Gini indexes based on daily and monthly frequencies also encompass adjustments along the intensive margin.

Figure 3. Impulse responses of the Gini Indexes to an expansionary monetary policy shock. The red shaded area shows 90% confidence interval.

It is convenient to read the evidence on the respective responses of unemployment, average wages, and the labour income Gini index in combination. In fact, a

substantial drop in unemployment as the one we show could lead to a rise in inequality, were the 'quantity effect' to manifest alone. An employment expansion per se might indeed increase wage inequality when low-skilled low-productive workers enter the labour market. However, the 'price effect' – i.e. changes in wages or worked hours among the incumbents, i.e. those already employed – that emerges because of the considerable rise in mean wages (measured at all frequencies) is capable of more than offsetting the 'quantity effect'. This is well-represented by the continuous decline in the Gini indexes calculated on labour incomes at all frequencies. Once again, this trend becomes especially evident when looking at the hourly frequency. Such a pattern is consistent with the evidence presented by Dolado et al. (2021), where what they call the demand amplification channel runs through a positive quantity effect that results in lower unemployment. However, given the presence of search-and-matching frictions, the rise in employment also results in a rise in wages. A similar mechanism is also present in Komatsu (2023), where those frictions prevent a full-blown effect running through new employment.

We further explore the evolution of wages to gain deeper insights into the mechanisms driving our main findings. Figure 4 shows the responses across various percentiles of monthly, daily, and hourly wage distributions. Again, the impulse responses are remarkably similar in all three cases. The most significant increase in earnings and wages occurs at the 10th percentile, with responses consistently rising to a peak of approximately 1.6% after about 20 months. As we move to higher percentiles, the responses become increasingly flat. However, at the 99th percentile, there is a slightly stronger increase in wages which is nonetheless insufficient to revert the overall evidence that consistently displays the neatly greater benefits reaped by subjects in the lower percentiles of the distribution. Furthermore, another clear-cut piece of evidence regards the fact that at all frequencies the lowest percentiles of the distribution exhibit an increase in wages whose size is higher than that of the highest percentiles at impact, but it also keeps on increasing over the 20-month horizon on which the IRFs are projected.

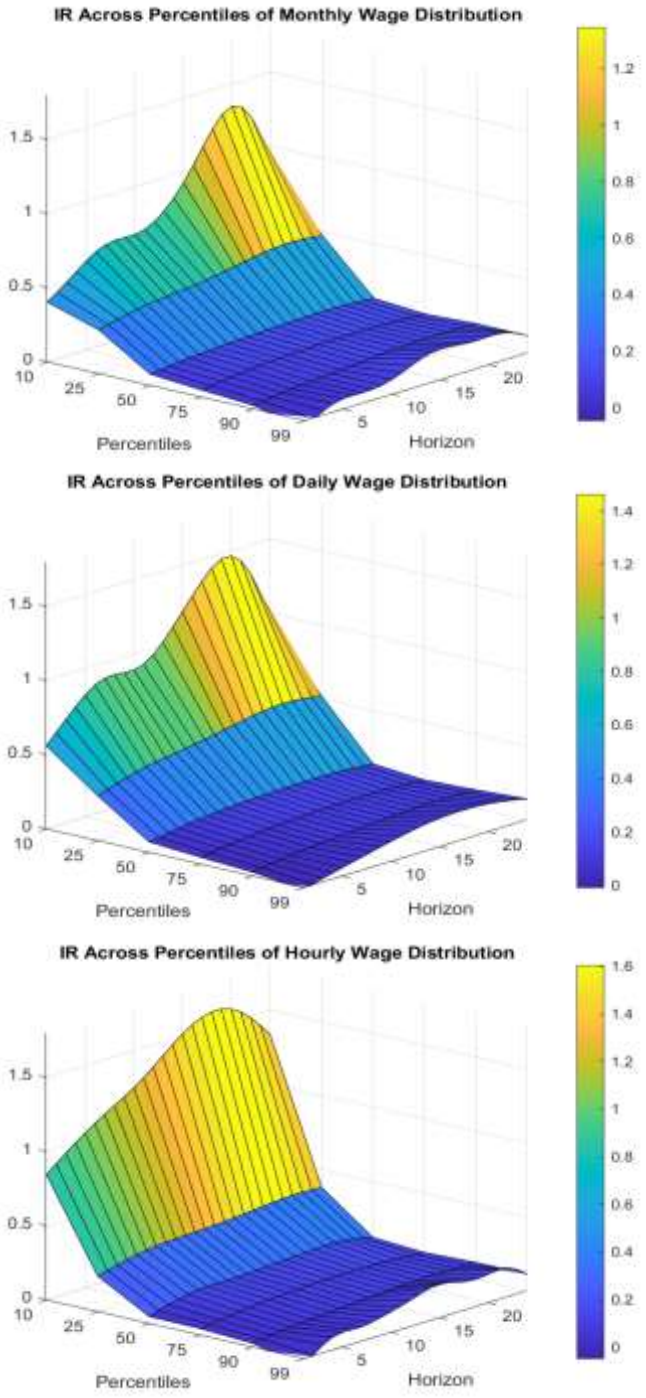

Figure 4. Impulse responses across wage distribution percentiles following an expansionary monetary policy shock.

Such set of results is in line with the literature that is now increasingly pointing the attention towards a remarkably differentiated effect of monetary policy across the percentiles of the income distribution.

This picture was already present in studies addressing several aspects of inequality across the distribution, as in the case of the above-mentioned contributions dealing with Scandinavian countries (consumption in Holm et al., 2021, income in Amberg et al., 2022; Andersen et al., 2023) and Eurozone countries (Samarina and Nguyen, 2024). In particular, the latter contribution made clear the substantially more important role of the labour market channel compared with the financial channel, something that also Corrado and Fantozzi (2021) single out for the case of Italy. Things are even more aligned with emerging literature when we recall recent contributions addressing in more detail the heterogeneity in labour incomes by means of high-frequency administrative data, as in Broer et al. (2022) and Groiss (2023), where the equalizing effects of expansionary monetary policy run principally via the beneficial impact on the lowest percentiles of labour income distribution.

Overall, we argue that an expansionary monetary policy reduces inequality and stimulates firms to operate on both extensive and intensive margins, reducing unemployment and increasing average wages. Additionally, it appears that new workers do not fall into the lower tail of the income distribution, and there is a decrease in inequality among those who are already employed.

To better understand the mechanisms behind the reduction in inequality, it could be useful to split workers into mutually exclusive subgroups according to some of their major characteristics. To this aim, we construct the Theil index of inequality to examine disparities within and between groups of workers. These groups are categorized by firm size, industry, and workers' occupations.

Row 1 of Figure 5 displays the Theil index responses that measure the level of total inequality due to differences in mean earnings between various groups – hereafter, ‘between inequality’. An expansionary monetary policy shock reduces inequality between workers with different occupations and those employed by firms of different sizes. Conversely, the level of inequality between workers in different 2-digit NACE level industries appears to increase for much of the time horizons considered.

Row 2 of Figure 5 shows responses of the Theil index that measures the level of inequality stemming from variations in earnings among individuals within the same subgroup—referred to as 'within inequality'—rather than from average differences between subgroups. An expansionary monetary policy shock consistently reduces within inequality across all subgroups analysed.

Overall, all elements considered contribute with a varying degree of intensity to reducing labour income inequality except for the between inequality due to

NACE classification. Therefore, this means that inequality between average workers with different occupations and average workers working in firms of different sizes is continuously reduced by expansionary monetary shocks. On the contrary, the average workers employed in firms falling under different NACE classifications experienced a rise in labour income inequality.

Furthermore, it can be observed that in the respective groups, the two main elements driving the drop in labour income inequality hitherto described are the between inequality due to firms' size and the within inequality due to NACE classification. Thus, an evidence that is present in our set of results is the ambivalent role played by the share of inequality explained through the sector of activity, driving the pattern of overall inequality in opposite directions.

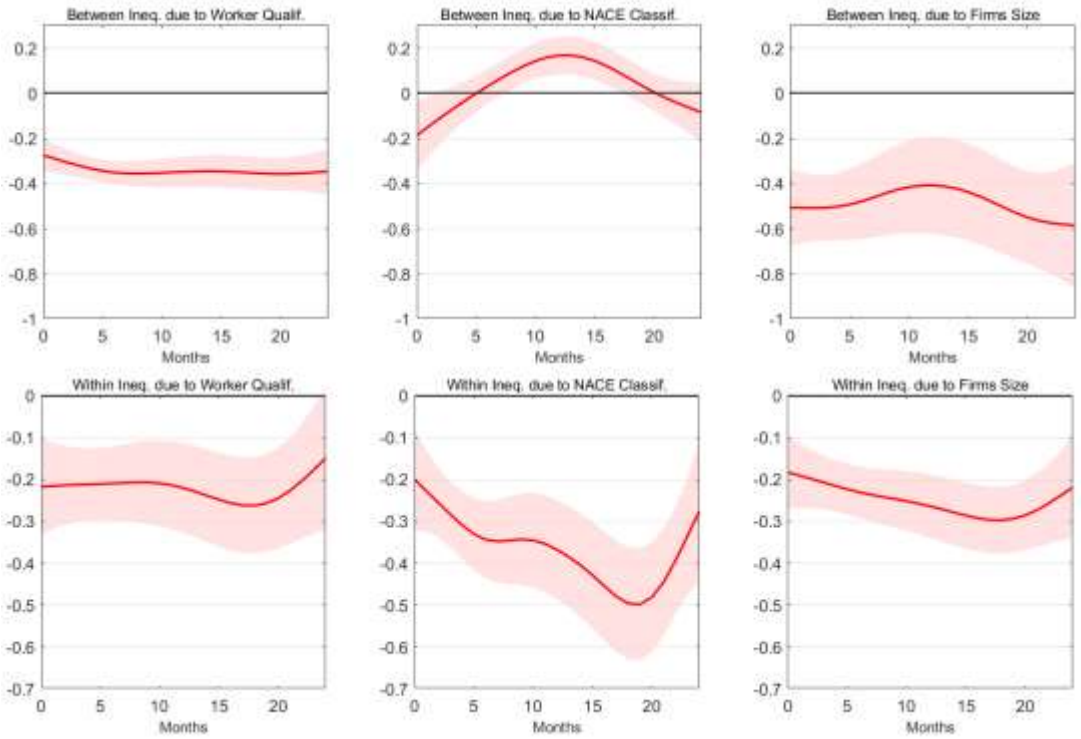

Figure 5. Between- and within- inequality responses to an expansionary monetary policy shock. The red shaded area shows 90% confidence interval.

5 Conclusions

This study analysed the impact of monetary policy on income inequality in Italy from 1999 to 2018, utilizing a newly assembled dataset based on administrative data on private-sector employees collected by INPS, from which we derived monthly measures of wages and Gini and Theil indexes of inequality. Impulse

responses to monetary policy shocks were estimated using Smooth Local Projections, with the ECB pure monetary policy shock series developed by Jarociński and Karadi (2020) as the shock measure.

Our findings demonstrate the effectiveness of expansionary monetary policy in stimulating economic growth, reducing unemployment, and increasing average wages. Interestingly, the most substantial and sustained wage increases are observed at the lower percentiles of the income distribution. These results, together with the negative and significant responses of the Gini indexes indicate that expansionary monetary policy can play a crucial role in reducing income inequality in Italy, by stimulating firms to operate on both extensive and intensive margins.

Additionally, further analysis decomposing by workers' subgroups the Theil index of inequality reveals that expansionary monetary policy reduces both 'between' and 'within' inequality among different worker subgroups. The reduction is most significant among workers with different occupations and those employed by firms of diverse sizes. However, an increase in inequality is observed among workers in different 2-digit NACE-level industries, suggesting that while monetary policy reduces overall inequality, industry-specific factors may offset these gains.

Overall, this study contributes to the academic debate around the effects of monetary policy on inequality focusing on the earning heterogeneity channel of transmission, demonstrating that expansionary monetary policy not only stimulates economic activity but also contributes to reducing wage disparities. Furthermore, this analysis could offer valuable insights for policymakers seeking to understand the overall effectiveness of monetary policy and suggests that similar effects could potentially be observed in other EA member countries with comparable economic and institutional characteristics.

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