THE HETEROGENEOUS EFFECTS OF MONETARY POLICY ON LABOR INCOME: DISENTANGLING THE EXTENSIVE AND INTENSIVE MARGINS

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ABSTRACT

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KEYWORDS

Household heterogeneity, Inequality, Labor market.

JEL

D1, E5, J3.

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Paul Hubert† Frédérique Savignac‡

November 2023

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1 Introduction

The prolonged period of low policy interest rates, large-scale asset purchases and the recent inflationary shock raised concerns about higher inequality and the distributional effects of monetary policy. These topics were highlighted by Jerome Powell at Jackson Hole in 2020 through the strategy of "*maximum employment as broad-based and inclusive goal*". The cost-benefit analysis of such a policy (higher inflation for longer vs. tighter labor market for longer) depends on the ability of monetary policy to affect transitions to employment and wage growth at the bottom of the distribution. Does the effect of monetary policy on the extensive and intensive margins of labor income differ across households? To answer this question, we use matched administrative-survey individual data to disentangle the distributional effects of monetary policy on transitions from/to unemployment (the extensive margin) and on labor income changes for individuals continuously employed (the intensive margin).

A growing literature based on Heterogeneous-Agents New Keynesian (HANK) models shows that monetary policy has heterogeneous effects on different groups of households. A key dimension of household heterogeneity in HANK models for analysing the aggregate effects of monetary policy is the heterogeneous cyclicality of earnings and unemployment risks (see McKay et al. (2016), Challe et al. (2017), Acharya and Dogra (2020), Challe (2020), Ravn and Sterk (2021)).[1] The fact that monetary policy may not affect all individuals in the labor market the same way is important to assess its welfare effects and for understanding its transmission mechanisms. The question of the distributional effects of monetary policy along the distribution of *total* income has been documented by Amberg et al. (2022) and Andersen et al. (2022) and the overall effect can be driven differently along the distribution by either labour or capital income. The heterogeneous effects on capital income reflect differences in the wealth-holding distribution and relate to the income composition channel. Instead, we focus on the earnings heterogeneity channel, which is directly related to labor market dynamics. Documenting the extensive and intensive margins of labor income provides new insights on the source and consequences of heterogeneous exposure to unemployment and earnings risks (Guvenen et al. (2017)) in relation to monetary policy.

To do so, we take advantage of matched administrative-survey data for France, the *Statistiques sur les Ressources et Conditions de Vie* (SRCV), which is produced by the national statistical institute (INSEE). SRCV combines individual-level detailed administrative income tax data with survey-based information about labor market status, the number of months employed each year, job characteristics and demographics. The survey dimension of this annual panel dataset enables us to investigate labor market transitions above and beyond labor income changes only. Our sample covers 2007 to

[1] Another important dimension is the heterogeneous marginal propensity to consume (Kaplan et al. (2018), Auclert (2019), Bilbiie (2020), Crawley and Kuchler (2023) and Patterson (2023)).

2019. To measure the causal effect of monetary policy, we use the ECB monetary policy shock series constructed by Jarociński and Karadi (2020) that uses a high-frequency identification strategy and adjusts monetary surprises for central bank information effects. These exogenous variations in the monetary policy stance capture both conventional and unconventional policy decisions. To assess potentially heterogeneous effects across households, we estimate the impact of monetary policy shocks on labor income changes for three income groups defined according to each individual ex-ante position in the labor income distribution: the Bottom 50% , the Middle 40% and the Top 10%. In order to cover labor market transitions, we depart from previous contributions that compute growth rates of individual income. A growth rate excludes zero-valued observations that characterize individuals finding a job and moving from zero labor income to a positive labor income.[2] Since part of our focus is on the extensive margin specifically, we need to circumvent this issue and retain all zero-valued observations. To do so, we consider *normalised* labor income changes rather than growth rates: we compute the change in individual labor income relative to the average labor income of each income group.

The starting point of this paper is to document the heterogeneous exposure of individual income to monetary policy. We find that the effect of an expansionary monetary policy shock on labor income exhibits a U-shaped pattern across the labor income distribution. A 10 basis points (bp) expansionary monetary policy shock (that corresponds to 1 standard deviation of monetary policy shock series) increases the labor income by 0.9% for the Bottom 50% and by 0.6% for the Top 10% of the labor income distribution over one year, while the effect is more limited on the middle of the distribution. The sizeable effects of monetary policy on labor income for top earners are new. This U-shaped pattern is robust to several alternative specifications and to quintile breakdown of the distribution. The magnitude of the effect is comparable to the existing literature, although slightly smaller than in Kaplan et al. (2018) for example. One potential concern with our empirical strategy based on annual data is that our monetary policy shocks rely on ECB meeting-level exogenous variations that are aggregated at the annual frequency and might be subject to confounding factors. In order to address this issue, we consider a panel regression that includes time-fixed effects and interact monetary shocks with a dummy variable that identifies individuals in the Top 10% or the Bottom 50% relative to the Middle 40%. We find higher marginal effects at the bottom and top of the distribution which confirms the U-shaped pattern. In addition, we control for other aggregate variables or restrict the sample to the pre-quantitative easing period or to after the Global Financial Crisis. We also control for the observed and unobserved individual heterogeneity, consider alternative dependent variables and sample definitions which all confirm the U-shaped pattern across income groups.

[2]When computing a growth rate, zero-valued observations at the denominator would be mechanically dropped from the sample, the same way as log(0) is undefined.

Second, we provide new and original evidence on the extensive and intensive margins of the heterogeneous effects of monetary policy on labor income. We find that the U-shaped pattern of monetary policy effects on labor income is driven by the extensive margin at the bottom of the distribution but by the intensive margin at the top. Regarding the extensive margin, we find that a 10 bp expansionary monetary policy shock lowers the unemployment transition probability by 0.6 percentage points for individuals in the Bottom 50%, while it has no significant impact on the unemployment probability of people with higher labor income. This finding supports the amplification mechanism highlighted by Bilbiie et al. (2023) in which poorer individuals insure themselves relatively more against the idiosyncratic risk of large income drops due to the higher procyclicality of their unemployment risk. Regarding the intensive margin, we find that, among individuals continuously employed, an expansionary monetary policy shock has a significant positive effect on labor income only for the Top 10%: a 10 bp decrease in the monetary policy stance increases by about 1.2% their labor income. This finding suggests an important role for the variable-pay and bonuses, which are likely to be highly procyclical.

Third, we also show the crucial role played by sectoral heterogeneity in explaining the distributional effects of monetary policy on labor income. Cross-sectoral differences in the effect of monetary policy shocks are large for both the intensive and extensive margins. We investigate some possible sources of this sectoral heterogeneity. We document that the effects of monetary policy on labor income are more pronounced in sectors with high levels of capital intensity or of leverage, suggesting that the sensitivity to monetary policy of a given sector explains its impact on labor income, especially at the bottom of the labor income distribution. We also find larger monetary policy effects at the bottom of the distribution in sectors with high shares of flexible contracts or of blue-collar workers in the labor force, or at the top of the distribution for sectors with more permanent contracts or managers. Such results suggest that a higher procyclicality of labor income in relation to the labor force composition plays a crucial role in explaining the monetary transmission to labor income.

Fourth, we investigate other dimensions of heterogeneity related to demographics (age and gender) and job characteristics (occupation and contract type). We find larger monetary policy effects on labor income at earlier stages of the carrier and for men. It suggests that the labor income of these individuals, which is more exposed to business cycle risks (Guvenen et al. (2017)), is also more affected by monetary policy shocks. We also find differences in extensive and intensive margin effects across occupations and type of contract. Monetary policy effects are much larger for managers or executives and permanent contracts on the intensive margin and for blue-collar workers and fixed-term contracts on the extensive margin. While the empirical literature focuses on differences across the income distribution, our results show that other dimensions of heterogeneity are also relevant to assess the distributional effects of monetary policy.

What are the consequences for labor income inequality of the heterogeneous impact of monetary policy? To address this question, we perform some simulation exercises based on our estimates. The expansionary monetary policy increases *overall* labor income inequality both in terms of Gini coefficient and of the share of labor income held by the Top 10%. It also increases, to a lesser extent, the Bottom 50% income share while it reduces the income share of the Middle 40%. As a result, the increase in *overall* inequality is also associated with a decrease in *bottom* inequality.

Related literature. The main contribution to the literature of this paper is to document new evidence on the distributional monetary policy effects on the intensive and extensive margins of *labor income* changes. The closest papers to ours on that respect are the recent works of Cantore et al. (2023) and Faia et al. (2022) that focus on *labor supply* and Lenza and Slacalek (2023) that documents a key role for the extensive margin following quantitative easing shocks. While Lenza and Slacalek (2023) estimate the aggregate effects of unconventional monetary policy and distribute them across households using micro-simulation models, we provide new and original estimates of the distributional effects of monetary policy on labor income in a large euro area country. Andersen et al. (2022), Amberg et al. (2022) and Broer et al. (2022) provide related evidence using Danish, Swedish and German data respectively. The positive effect of expansionary monetary policy on labor income at the bottom of the distribution we document is consistent with evidence in the latter two papers. However, in contrast to these papers, we also find a sizeable effect of monetary policy on labor income at the top of the distribution.[3] Finally, we also provide new evidence on the role of sectoral heterogeneity in explaining these distributional effects.

Another strand of the literature uses summary measures of income inequality like the Gini coefficient to document the distributional effects of monetary policy (see Coibion et al. (2017), Mumtaz and Theophilopoulou (2017), Furceri et al. (2018), Pereira da Silva et al. (2022), Creel and El Herradi (2022) and Samarina and Nguyen (2023)). Chang and Schorfheide (2022) estimate, using a functional VAR, the effect of monetary policy on the cross-sectional distribution of earnings and also highlight the role of employment dynamics for the bottom of the distribution. Cloyne et al. (2020) investigate the effects of monetary policy across home-ownership status while Holm et al. (2021) and Cumming and Hubert (2021) focus on monetary policy effects conditional on liquid asset positions and household indebtedness respectively. Fagereng et al. (2022) also analyse the role of household indebtedness in relation to unemployment risk, while Ravn and Sterk (2017) and Acharya et al. (2023) focus on

[3] Amberg et al. (2022) find that the response of labor income is large in the bottom, but small and mostly insignificant for the rest of the distribution. Andersen et al. (2022) obtain a hump-shaped relation between monetary policy and salary income. The gains of monetary policy are largest for households around the 25th percentile of the income distribution, significantly smaller at the top and close to zero for the very bottom. Broer et al. (2022) find a higher effect than the median effect for their highest ventile and tend to disregard it as they relate it to the top-coded observations they drop.

the aggregate consequences of the link between unemployment risk and precautionary savings. Cravino et al. (2020) document monetary policy effects on the prices of goods consumed by different groups of households. This paper also relates to the literature on the heterogeneity of labor market dynamics and of monetary policy effects on labor markets (see, e.g., Guvenen et al. (2017), Athreya et al. (2017), Dolado et al. (2021), Jašová et al. (2022), Bergman et al. (2022) and Gulyas et al. (2023)).

2 Data

2.1 Individual-level matched administrative-survey data

Our main data source is the *Statistiques sur les Ressources et Conditions de Vie* (SRCV) which is produced by the national statistical institute (INSEE). It combines administrative and tax data about income with survey-based information about labor market status, job characteristics, demographics, etc.[4] In addition, it provides individual-level information about labor market transitions, or the number of months employed each year. Another key advantage of this dataset is its panel structure that allows us to measure the change in income at the individual level. In this annual panel dataset, individuals are observed up to 9 years (and 5 years on average). It consists in around 20,000 individuals observed each year. We use all rounds from the 2008 one to the 2020 one which cover the years 2007 to 2019.[5] We focus on the labor force and exclude students, retired, stay-at-home or inactive individuals and keep individuals observed at least three consecutive years.

Labor income is defined at the individual level as the sum of employee income (PY010N, i.e. the total remuneration paid by an employer to an employee) and of self-employment income (PY050N).[6,7] As our sample covers a 13-years time span, we adjust nominal labor income values for inflation using the CPI index.[8] Our main variable of interest is the change in annual labor income at the individual level normalised by the average labor income of each group. We consider normalise labor income changes in absolute terms, not a log measure or a growth rate, as it allows us not to exclude zero labor income, which is crucial for our analysis as we are interested in considering labor market transitions. We trimmed our sample by 1% at each tail of labor income

[4] SRCV is part of the Eurostat EU-SILC. A unique feature of the French dataset is that administrative tax data are used to fill in income variables starting from the SRCV 2008 (i.e. reference year: 2007) onward while these variables are collected through a survey questionnaire in other countries.

[5] The pre-2008 rounds were fully survey-based and did not rely on administrative and tax data. As a robustness exercise, we extend the analysis from the start of the SRCV-SILC coverage (i.e. 2003).

[6] Our basline definition excludes unemployment benefits, but they are considered in a robustness test.

[7] As a robustness check, we also consider excluding people receiving self-employment income.

[8] We abstract from the question of the inflation heterogeneity across individuals since inflation differentials along the income distribution were low or even null for most of our sample and started to increase in 2021 (see Charalampakis et al. (2022)).

changes for each year.[9]

In order to assess the heterogeneity across the labor income distribution, we define income groups based on the year *t-1* position in the labor income distribution. In order to avoid attributing mechanically unemployed individuals in *t-1* to the bottom group of the distribution, when labor income is null in year *t-1*, we use the position in the distribution of the *t-2* year. As a robustness test, we consider an alternative group definition based on a measure of each individual's permanent income, defined as the average labor income over the observed years. We split the labor income distribution into three groups: the Bottom 50% (B50), the Middle 40% (M40) and the Top 10% (T10). Such a grouping is relevant to assess income inequality developments (e.g. Garbinti et al. (2018)), and additionally, it allows us to preserve the sample size of each groups for estimation purposes. As a robustness test, we split the distribution into quintiles.

Table A1 presents some descriptive statistics about our sample. We also compare our sample with the main source for income distribution in France (named ERFS), and show that average labor income by income groups are in line with both data sources.[10] The income share of each income group is also very close to the one measured by Garbinti et al. (2018), see Table A2 in Appendix.

2.2 Monetary policy shocks

Our dataset covers a period - from 2007 to 2019 - during which monetary policy is conducted at the supranational level by the ECB. As the French economy accounts for one-fifth of euro area GDP and the ECB grounds its decisions on euro area aggregate measures, one could argue that the euro area-level monetary policy is not directly determined by French macroeconomic (and more specifically, income) dynamics. However, the comovement in business cycles among euro area countries makes endogeneity a potential concern. Consequently, to measure the causal effects of monetary policy on labor income, we use the ECB monetary policy shock series constructed by Jarociński and Karadi (2020) based on a high-frequency identification strategy similar to that used in the literature on monetary non-neutrality (see Gürkaynak et al. (2005); Hanson and Stein (2015); and Nakamura and Steinsson (2018)) and adjusts monetary surprises for central bank information effects (see also Campbell et al. (2012), Melosi (2017), Cieslak and Schrimpf (2019), Miranda-Agrippino and Ricco (2021)).[11]

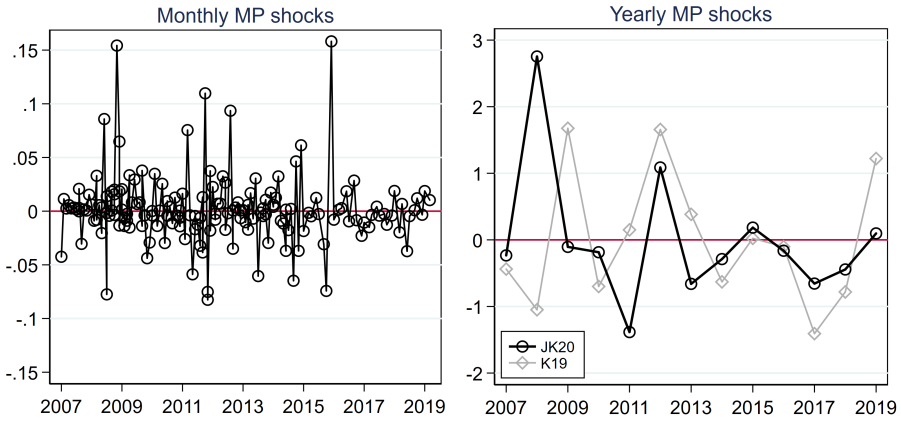
[9] This implies removing 1 522 observations, with annual labor income changes below -25 000 and above 25 000 euros. These excluded observations are distributed as follows: 348 in B50, 285 in M40 and 872 in T10. Among these outliers, 609 observations corresponds to individuals continuously employed and are thus excluded from the intensive margin sample (111 in B50, 108 in M40 and 390 in T10).

[10] The lower average income for the Bottom 50% observed in our sample is due to a better coverage of poor people in SRCV, as it is the source used by the French national statistical institute (INSEE) to compute the poverty rate.

[11] Jarociński and Karadi (2020) provide two different series. We use the one obtained from the "sign restrictions" approach. Our results are robust to using the series from the "poor-man" approach,

Their baseline measure of the monetary policy surprise is the change in the three-month EONIA interest rate swaps around policy announcements. These announcements happen after the ECB Governing Council meeting and are divided between a press release at 13.45 CET and a press conference at 14.30 CET which is not more than one hour long. They use 30-minute windows around press releases and 90-minute windows around press conferences, both starting 10 minutes before and ending 20 minutes after the event. Their surprise measure is the sum of the asset price changes in the two windows. This narrow window controls for the pre-FOMC drift documented by Lucca and Moench (2015) and all unrelated news releases that might happen on these days. The key identifying assumption underlying the approach is that no other news is released during this short window such that asset price movements during the window of the central bank announcement only reflect the effect of monetary news. This is crucial for identification since it strips out the endogenous variation in asset prices associated with other shocks. Although the monetary policy surprise is based on interest rate swaps, it captures both conventional and unconventional policy news, as these asset prices react to announcements on all policy instruments. Eventually, the larger these intraday changes in absolute value, the more the policy decision was not expected by financial market participants.

Figure 1: Meeting-level monetary shocks and yearly-aggregated series



Note: The y-axis unit on the left panel, at the meeting-level frequency, is percentage points and on the right panel, at the yearly frequency, is standard-deviation. Black circled lines are Jarociński and Karadi (2020) series (JK20) and grey diamond lines are Kerssenfischer (2019) series (K19).

Finally, we aggregate the meeting-level monetary shocks into an annual series by summing up all values in a given year, following what is done in this literature based on annual individual-level income (Amberg et al. (2022). Figure 1 plots the resulting shock series at the meeting-level and annual frequencies. We normalize the monetary shock series by their standard deviation over the sample period (10 basis points) so one unit change can be interpreted as the average monetary policy shock. We have also normalized the sign of the monetary shock so that a positive shock corresponds to

although they are less precisely estimated in this case due to the discrete nature of the decomposition.

an expansionary monetary policy, i.e. a decrease in the monetary policy stance.

We address a number of identification concerns in further robustness tests. First, we consider an alternative monetary policy shock series by Kerssenfischer (2019). Second, one may be concerned that we do not properly isolate exogenous monetary policy shocks and rely on annual aggregate variations that are likely to be endogenous to confounding shocks. We address this issue in subsection 3.3 by considering several types of robustness tests such as restricting the sample period to the post Global Financial Crisis period (i.e. 2011-2019), or to the period before the ECB implemented Quantitative Easing policies (i.e. 2007-2014). We specifically address the identification issue related to the yearly aggregation of monetary policy shocks needed here given our annual income dataset in subsection 3.4, where we estimate a panel regression with time-fixed effects and we also alternatively consider several macro-level control variables aiming at controlling for aggregate financial and economic developments.

3 The heterogeneous effects of monetary policy

3.1 Empirical strategy

Our baseline empirical approach estimates how the effect of monetary policy shocks on individuals' labor income changes varies across the labor income distribution without disentangling the extensive and intensive margins of labor income changes. We conduct this analysis using an econometric model similar to that of Amberg et al. (2022):

$$\Delta Y_{i,t,h} = \mathbb{I}^{g}_{t-1} \cdot (\alpha_g + \beta_g \widehat{\Delta i_t}) + \varepsilon_{i,t} \tag{1}$$

where $\Delta Y_{i,t,h}$ is the change in individual i real labor income $Y_{i,t}$ between years $t-1$ and $t+h$; $\widehat{\Delta i_t}$ is the monetary policy shock in year t, and $\mathbb{I}^{g}_{t-1}$ is a dummy variable that equals one if individual i belongs to the income group g={B50, M40, T10} in year $t-1$. As a benchmark regression, we also consider the impact of monetary policy shocks on the full population. The coefficients of interest are the β_g which capture the absolute change in labor income over an h-year horizon for individuals in income group g, following an expansionary monetary shock of 1 standard deviation (i.e. 10 basis points). We estimate our baseline specification using OLS and considering a one-year horizon over the sample period 2007-2019. Standard errors are clustered at the individual level in order to account for within-individual serial correlation in the dependent variable.

Since annual administrative income data do not provide information on when labor income changes happen within a given year, we perform a robustness test in which annual monetary policy shocks are computed weighting each meeting-level shock by the number of months remaining in the year after the shock occurs. This alternative strategy ensures that we weight shocks by the amount of time they can affect the econ-

omy. We also consider various alternative specifications to assess the robustness of the results which are detailed in subsection 3.3 below.

It is important to stress that the dependent variable is the annual change in labor income instead of a growth rate. Computing labor income growth would mechanically drop all zero-valued observations at the denominator (the same way as log(0) is undefined). As a result, all observations of an individual finding a job and moving from zero labor income to a positive labor income would be dropped from our sample, which would critically bias the estimates. In order to cover the transitions from unemployment to employment, we consider *normalised* labor income changes rather than growth rates. We compute the average relative change in labor income (in percentage) by dividing the annual change in individual labor income by the average labor income of the group.[12] Equation 1 then becomes:

$$\frac{\Delta Y_{i,t,h}}{\overline{Y^g_{t-1}}} = \mathbb{I}^g_{t-1} \cdot (\alpha_g + \beta_g \widehat{\Delta i_t}) + \varepsilon_{i,t} \tag{2}$$

where $\overline{Y^g_{t-1}}$ is the average labor income of group g in year $t-1$. An advantage of this approach is to get a measure of relative changes and to preserve the economic magnitude of these normalised changes for each income group.[13,14]

3.2 Baseline estimates

Before analysing the response of different groups of individuals, we investigate the aggregate effect of monetary policy shocks so as to validate our empirical framework. Column (1) of Table 1 displays the estimated effect of an expansionary monetary shock on the change in labor income for the overall labor force. A one standard-deviation exogenous decrease (equivalent to 10 basis points) in the monetary policy stance has a positive and significant effect such that annual labor income increases by about 95 euros (Panel A). Normalised by the average income of the sample, this corresponds to a 0.5% increase in the individual annual income over one year (Panel B). The sign and magnitude of the aggregate effect of monetary policy on labor income is consistent with what a standard macroeconomic model would predict after an expansionary monetary policy shock. Christiano et al. (2005) provide model- and VAR-based responses of real wages to an expansionary shock and find a 0.6% increase (when annualizing

[12] This issue is often faced in the literature and some alternatives have been proposed like using log(x+1), the arsinh transformation (see Bellemare and Wichman (2020)) or the Davis and Haltiwanger (1992)'s growth rate (the denominator being the mean of the two observations at the numerator). We have checked that our results are robust to using the Davis and Haltiwanger (1992) methodology.

[13] Normalising the estimated parameter or considering normalised labor income changes in Equation 2 produces the same point estimates and standard errors because the OLS is a mean estimator.

[14] A potential issue with this normalization by the average income of a group is that, if individuals at the bottom and top of that group have very different income levels, it would underestimate relative income changes for bottom earners and overestimate relative income changes for top earners of that group. We later consider smaller groups (quintiles) for which the within-group heterogeneity is smaller.

their quarter-over-quarter growth rate) after four quarters following the shock. Based on a HANK model rather than a representative-agent model, Kaplan et al. (2018) find a larger response of real wages - around 0.8% - in the first year.

Table 1: Effect of an expansionary monetary shock on labor income

	All	Bottom50	Middle40	Top10
Panel A: In euros				
MP shock	94.6***	87.3***	61.8**	351.4***
	[4.77]	[3.37]	[2.22]	[3.65]
N	76 704	38 533	31 330	6 841
Income (Mean)	21 352	9 686	27 110	60 692
Panel B: In % of each group's average labor income				
MP shock	0.443***	0.901***	0.228**	0.579***
	[4.77]	[3.37]	[2.22]	[3.65]
N	76 704	38 533	31 330	6 841

Note: Equation 1 (panel A) and Equation 2 (panel B) estimated with OLS and standard errors clustered at the individual level. Robust t-stats in parentheses. Sample period: 2007-2019. The sample is trimmed by 1% at each tail of labor income changes for each year. The dependent variable is the 1-year change in individual annual labor income, in euros in panel A and in % of each group's average labor income in panel B. The monetary policy (MP) shock is the annual cumulative sum of meeting-level pure monetary policy shocks of Jarociński and Karadi (2020) normalised to one standard deviation. An increase in this variable corresponds to an expansionary monetary policy equivalent to a 10 basis points decrease in the policy stance.

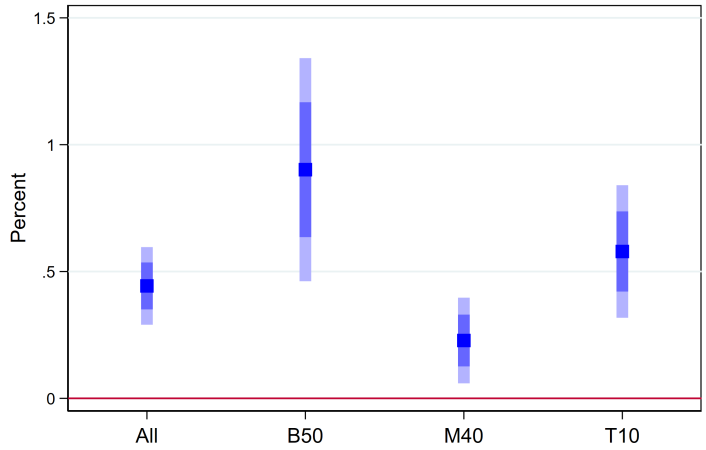
Columns (2)-(4) of Table 1 displays estimated effects of an expansionary monetary shock across the different labor income groups. While the aggregate effect is about +95 euros, there are large differences across income groups: the effect for the Top 10% (+350 euros) is 4 times larger than for the Bottom 50% (+87 euros). The minimum effect of monetary policy is for the Middle 40% with an increase of 62 euros. We then estimate Equation 2 with normalised individual labor income change relative to the average income of the group the individual belongs to. We find a U-shaped pattern (see Figure 2 and Panel B in Table 1): the monetary policy shock increases labor income by 0.9% for the Bottom 50% of the distribution and by 0.6% for the Top 10%, while it has a much more limited effect on the middle of the distribution (0.2%).[15] It is worth stressing that this U-shaped pattern provides a different information from the analysis of household behavior along the liquid asset distribution (Kaplan et al. (2014) and Slacalek et al. (2020)): wealthy "hand-to-mouth" households that respond more to monetary policy are likely to be in the Middle 40% income group.

One of the challenges with the estimation of the effect of monetary policy on income inequality is that the contribution of monetary policy shocks is small relative to

[15] These differentiated effects are consistent with differences in the labor income volatility of each income group, as reported by the higher standard deviation of labor income changes relative to labor income levels for the Bottom 50% compared to the Top 10% (see Table A1).

other factors that affect the cross-section of households. As a result, sampling variation can be a limitation for isolating the heterogeneous effects of monetary policy. One way of circumventing this issue is to estimate these effects across larger groups of households and supports our focus on three relatively homogeneous income groups as in Table 1 and Figure 2. We also provide estimates at a more granular level of the income distribution using quintiles to shed some more light on the decomposition of the heterogeneous effects of monetary policy. Although more tentative due to the reduction in the sample size of the groups, the evidence shown in Appendix Table B1 confirm the U-shaped pattern. In addition, we extend the estimation sample from 2003, using the first waves of SRCV even though they fully rely on survey, not administrative, data. The results are shown in Appendix Table B2 and lead to similar conclusions.

Figure 2: Change in labor income, in % of each group's average labor income



Note: Percent changes are computed from the OLS estimation of Equation 2 for which the change in labor income for each individual is divided by the average income of the group to which he/she belongs to. The monetary policy (MP) shock is the annual cumulative sum of meeting-level pure monetary policy shocks of Jarociński and Karadi (2020) normalised to one standard deviation. An increase in this variable corresponds to an expansionary monetary policy equivalent to a 10 basis points decrease in the policy stance. Sample period: 2007-2019. Shaded bars corresponds to 1 and 2 SE confidence intervals.

Compared to the existing literature, we provide new evidence of the monetary policy impact on labor income across income groups. The strong positive effect in the bottom of the distribution is consistent with previous evidence obtained by Amberg et al. (2022) for Sweden or Broer et al. (2022) for Germany.[16] However, the sizeable effects on labor income at the top of the distribution are new and not evidenced in previous studies. There are various reasons related to the data and empirical settings used, but also to individual and firm behavior, sectoral composition, and institutional settings that may explain such differences across countries. For instance, Almgren et al. (2022) shows that the differentiated effects of monetary policy across euro area countries can be explained by different levels of liquidity constraints in each country.

[16] Andersen et al. (2022) consider all individuals, not those in the labor force only, and rank these individuals along the total income distribution. This might explain why our results differ.

Another useful comparison relates to the effect of an unconditional one-percent change in aggregate earnings as proposed by Guvenen et al. (2017). This enables to put the effects of monetary policy shocks in perspective with some aggregate business cycle shocks. Appendix Table B3 reports these estimates, with aggregate earnings computed as the annual growth rate in the labour income average of our sample of individuals. The magnitude of the effects of monetary policy shocks is very comparable to the one of aggregate earnings in general as in Broer et al. (2022), with the effect of monetary policy on the Top 10% being slightly smaller.

3.3 Robustness tests

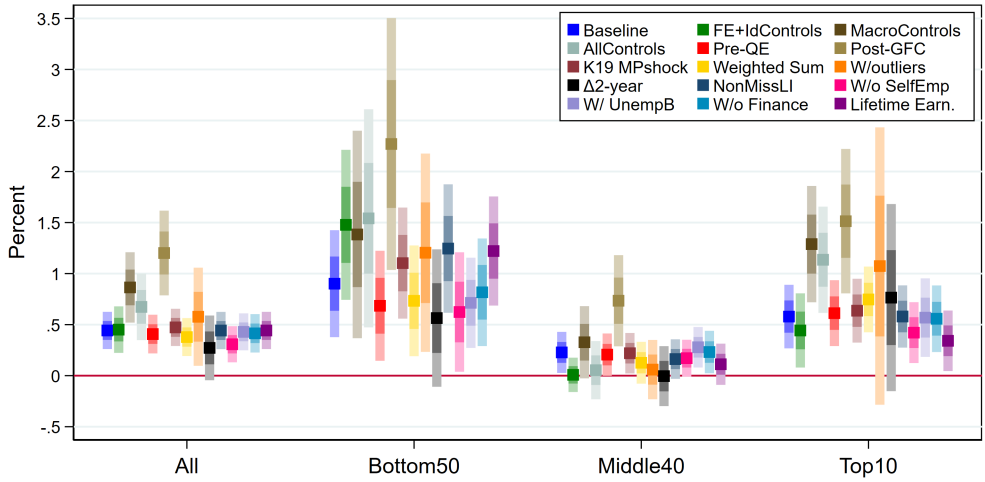
We conduct various tests which confirm the U-shaped pattern of the heterogeneous effects of monetary policy on labor income across the distribution: all estimated specifications show a U-shaped pattern across income groups, even if the estimated coefficients are more or less precisely estimated depending on the specification. This sensitivity analysis is summarized in Figure 3 and detailed estimated parameters are reported in the Appendix Table B4.

Controlling for individual heterogeneity. Our benchmark regression, in line with the specification of Amberg et al. (2022), does not include any controls for the observed or unobserved heterogeneity of individuals. However, one might argue that labor income responses to monetary policy could be driven by, or at least confounded with, some of the characteristics of individuals. We therefore augment our baseline model of Equation 2 with control variables related to the individual and its family (age, occupation, household composition, financial difficulties) or to his/her job (occupation, contract type and sector). We also augment our baseline model with individual fixed-effects to control for time-invariant unobserved individual characteristics. Estimates from this alternative specification confirms our baseline estimates.

Dependent variable definitions. We consider alternative definitions for the dependent variable. First, we do not include unemployment benefits in our baseline measure of labor income as they relate more to transfers and are not supposed to be affected by monetary policy shocks. When including unemployment benefits, the estimated coefficient of the bottom of the distribution tends to be lower, but our conclusions are not affected. Second, our baseline sample considers the overall labor force and includes individuals earning self-employment income. One might argue that these incomes do not result from an employee-employer relationship, so they do not relate to the labor market per se. When excluding them, our main message remains. Third, when considering two-year changes in labor income, the overall effect is much more limited: the aggregate effect of the 10 basis points expansionary monetary policy shock is $+0.27\%$ on labor income (compared to $+0.45\%$ after one year) and is only statistically significant at the 10% level. Moreover, the results by income groups show a decrease in point

estimates, especially for the Bottom 50%. The monetary policy effect on labor income is likely to occur mostly right after the shock and to vanish afterwards.

Figure 3: Sensitivity analysis



Note: Equation 2 estimated with OLS and standard errors clustered at the individual level. Sample period: 2007-2019. Shaded bars corresponds to 1 and 2 SE confidence intervals. The dependent variable is the 1-year change in individual annual labor income (in % of each group's average labor income). The monetary policy (MP) shock is the annual cumulative sum of meeting-level pure monetary policy shocks of Jarociński and Karadi (2020) normalised to one standard deviation. An increase in this variable corresponds to an expansionary monetary policy equivalent to a 10 basis points decrease in the policy stance. *Baseline*: Figure 2. *FE+Id Controls*: includes individual fixed effects and individual-level controls (age, occupation, household composition, financial difficulties, contract type and sector). *MacroControls*: includes macro indicators as control variables (GDP growth, unemployment, fiscal impulses, financial stress, stock and oil price changes). *AllControls*: includes individual control variables and macro controls. *K19 MPshock*: monetary policy shocks based on Kerssenfischer (2019). *Weighted Sum*: Cumulative sum of meeting-level monetary shocks weighted by the remaining number of months within a year. *Pre-QE*: estimation sample period restricted to 2007-2014. *Post-GFC*: sample period restricted to 2011-2019. *W/outliers*: without sample trimming. *Δ2-year*: dependent variable with two-year changes. *W/o SelfEmp*: excluding individuals with self-employed income. *W/UnempB*: dependent variable includes unemployment benefits. *W/o Finance*: excluding the Finance sector from the sample. *Lifetime Earn*: income groups defined based on the average income over the full period where we observe each individual.

Sample definitions. We conduct some sensitivity analyses regarding the composition of the sample. First, our definition of the labor force is based on a declarative variable in the survey part of the dataset. We alternatively define labor market participants based on non-missing values for labor income. Second, we consider an alternative definition of the income groups. We use the average income over the full period where we observe each individual as a proxy for permanent income. It confirms the U-shaped pattern, with statistically significant effects at the bottom and at the top of the distribution, while the lower effect obtained for the middle turns out to be not statistically significant. Third, including the tails of the distribution of labor income changes (i.e. without trimming our sample at 1% and 99%), point estimates are in line with the baseline, but the confidence intervals are much larger. Fourth, even if our results are robust when controlling for sector dummies, one may worry that people working in the financial sector (which is more sensitive to financial developments and monetary policy)

may drive part of our results. When excluding individuals from this sector from the sample, our results remain unchanged. Fifth, one may also wonder whether our results are not driven by some specific shocks like the Global Financial Crisis (GFC) or by the unconventional monetary policy and the quantitative easing (QE). When restricting the sample period to the post-GFC period (2011-2019) or to the pre-QE period (2007-2014), our results still hold. We tend to obtain higher coefficients for the post-GFC period, with larger confidence intervals though.

Alternative identification of monetary shocks. First, we consider an alternative series of monetary policy shocks provided by Kerssenfischer (2019) and shown in Figure 1. Although using different data and econometric methodology, these series are based on sign restrictions and high-frequency financial data to separately identify information and policy shocks. Even though their evolution is different from the one of Jarociński and Karadi (2020) - their correlation is 0.50 -, they lead to similar outcomes. Second - and this is in part related to the issue discussed in the next subsection -, we compute an alternative measure of yearly monetary shocks from the original meeting-level shocks. We weight each meeting shock by the number of months remaining in the year after the shock occurs. This time aggregation strategy ensures that we weight shocks by the amount of time individuals and firms have to react to them.

3.4 The issue of annual monetary policy shocks

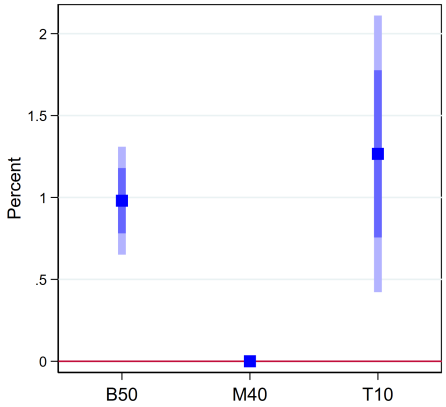
One may be concerned that we do not properly isolate exogenous monetary policy shocks as we rely on annually-aggregated variations that might be endogenous to confounding shocks (see subsection 2.2). In order to address this issue, we first consider a panel regression that includes year fixed-effects to control for any potential confounding factors - essentially macroeconomic shocks - that could be correlated with our yearly-aggregated monetary policy shock series. Doing so requires to interact monetary shocks with a dummy variable that separate individuals in two groups in the cross-section. Directly related to our research question, we chose to define two dummies that identify individuals in the Top 10% or the Bottom 50% relative to the Middle 40%. We estimate the following equation:

$$\frac{\Delta Y_{i,t,h}}{\overline{Y^g_{t-1}}} = \alpha_g + \beta_g(\widehat{\Delta i_t} \cdot \mathbb{I}^g_{t-1}) + \gamma_t + \varepsilon_{i,t} \tag{3}$$

where $\mathbb{I}^g_{t-1}$ equals one for individuals in the income group g=$\{$B50, T10$\}$ and zero for individuals in the income group of the Middle 40% and γ_t is the year fixed-effect. In other words, this specification estimates the marginal effect of monetary policy on labor income for individuals in the bottom or top of the distribution relative to a reference group (the Middle 40%). Figure 4 plots the estimated parameters of these marginal effects. By construction, the reference group is the Middle 40% and is equal to zero. Compared to that reference group (M40), we find higher marginal effects of monetary

policy on labor income for individuals in the bottom (about $+1\%$) or in the top of the distribution (about $+1.2\%$). These estimates suggests that our baseline results are not driven by some confounding factors. In addition, these estimates enable to directly infer that the monetary policy effects at the bottom and top of the distribution are larger and significantly different from the effect in the middle.

Figure 4: Marginal effects of monetary shocks



Note: Estimates based on Equation 3 that includes year-fixed effects, and an interaction term between the monetary policy shocks and income groups: $\beta_g(\widehat{\Delta i_t} \cdot \mathbb{I}_t^g)$. Middle 40% as the reference group. Sample period: 2007-2019. Shaded bars corresponds to 1 and 2 SE confidence intervals. The dependent variable is the 1-year change in individual annual labor income (in % of each group's average labor income). The monetary policy (MP) shock is the annual cumulative sum of meeting-level pure monetary policy shocks of Jarociński and Karadi (2020) normalised to one standard deviation. An increase in this variable corresponds to an expansionary monetary policy equivalent to a 10 basis points decrease in the policy stance.

Alternatively, we augment Equation 2 with a list of macro-level variables to control for other aggregate developments that may occur at the same time. More specifically, we control for GDP growth, variations in the unemployment rate, fiscal impulses, financial stress, stock and oil price changes. These different factors can all affect labor income for various reasons. The estimated effects across the different income groups are presented in Figure 3 above (and in Appendix Table B4) and confirm the U-shaped effects of monetary policy.

4 Disentangling the extensive and intensive margins

The main contribution of this paper is to analyse the differential effects of monetary policy shocks on the extensive margin (transitions from/to unemployment between t and $t+h$) and on the intensive margin (labor income changes for people that remain employed between t and $t+h$), along the income distribution. To do so, we consider Equation 4 for the impact of monetary policy on the extensive margin:

$$\Delta \mathbb{I}_{i,t,h}^{Unemp} = \mathbb{I}_{t-1}^{g} \cdot (\alpha_g + \lambda_g \widehat{\Delta i_t}) + \varepsilon_{i,t} \tag{4}$$

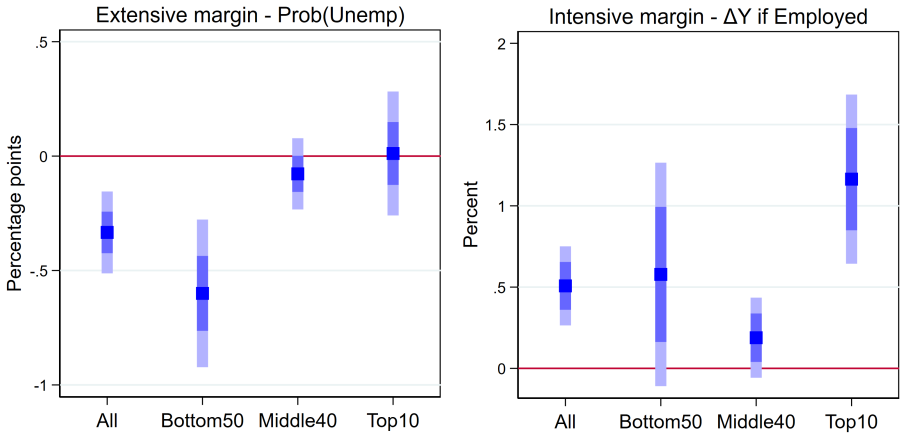
where $\Delta\mathbb{I}_{i,t,h}^{Unemp}$ is a variable reflecting the transition of individual i from/to unemployment between t and $t+h$. It is defined as the difference in unemployment status between t and $t+h$. The employment status is a dummy variable that equals one if unemployed at time t, and zero if employed. Alternatively, we also consider detailed labor market transitions as dependent variables, in particular the unemployment-to-employment and employment-to-unemployment transitions.

For the impact of monetary policy on the intensive margin, we define Equation 5 below, where $\Delta Y_{i^*,t,h}$ is the change in labor income for individuals i^* continuously employed between $t-1$ and $t+h$:

$$\frac{\Delta Y_{i^*,t,h}}{\overline{Y}_{t-1}^{g}} = \mathbb{I}_{t-1}^{g} \cdot (\alpha_g + \theta_g \widehat{\Delta i_t}) + \varepsilon_{i^*,t} \tag{5}$$

The coefficients of interest are λ_g in Equation 4 and θ_g in Equation 5 which capture the effect of monetary policy shocks on the probability of transition to unemployment at time t+h for individuals in the income group g and on labor income change for people in group g who have been never unemployed between $t-1$ and $t+h$ respectively.

Figure 5: Extensive and intensive margins



Note: Estimates for the effects of monetary policy along the extensive and intensive margins based on Equation 4 and Equation 5 respectively, estimated with OLS and standard errors clustered at the individual level. Sample period: 2007-2019. Shaded bars corresponds to 1 and 2 SE confidence intervals. The dependent variable is the 1-year change in the labor market status (defined by the variation in a dummy variable that equals one when an individual is unemployed) in the left panel and in individual annual labor income (in % of each group's average labor income) for individuals continuously employed in the right panel. The monetary policy (MP) shock is the annual cumulative sum of meeting-level pure monetary policy shocks of Jarociński and Karadi (2020) normalised to one standard deviation. An increase in this variable corresponds to an expansionary monetary policy equivalent to a 10 basis points decrease in the policy stance.

The estimation results are summarized in Figure 5. We find that the U-shaped pattern obtained in section 3 results from differentiated impacts of monetary policy shocks on the extensive and intensive margins across the labor income distribution: monetary policy shocks affect the extensive margin in the bottom of the labor income

distribution and the intensive margin in the top of the distribution.

4.1 Extensive margin

We find that a 1 SD expansionary monetary policy shock (equivalent to 10 bp) lowers the unemployment transition probability after one year by 0.6 percentage points for individuals in the Bottom 50% of the labor income distribution, while it has no significant impact on the unemployment probability of people with higher labor income.[17] When looking in more details at labor market transitions (see Table 2), we find that the monetary policy shocks significantly decreases the employment-to-unemployment transition probability (Panel A) and increases the unemployment-to-employment transition probability (Panel B). These additional regressions confirm that these effects on employment transitions are only concentrated among the Bottom 50%. In addition, the fact that we find significant evidence of extensive margin effects only for the Bottom 50% group is presumably driven by higher wage rigidity for that group due to minimum wage regulations. This mechanism is consistent with Coglianese et al. (2022) who show that in response to a tightening monetary policy, sectors with more rigid wages experience larger increases in unemployment.

Our results are also in line with Faia et al. (2022) who find that contractionary policy leads bottom earners to exit the labor market by more and to have lower re-employment probabilities in the U.S and with Broer et al. (2022) who find that job loss is more countercyclical for lower-earnings households in Germany.[18] Taking advantage of our data, we are also able to assess the effect of monetary policy on the number of months where individuals are unemployed each year, which could be viewed as a measure of the "intensity" of the extensive margin (Table 2, Panel C). As expected based on our previous findings, we find a negative impact of the expansionary monetary policy shocks on the number of months where individuals are unemployed, which is only statistically significant for the Bottom 50%.

4.2 Intensive margin

Among individuals continuously employed, expansionary monetary policy has a significant positive effect on labor income only for the top earners: an exogenous 10 bp decrease in the monetary policy stance increases by about 1.2% the labor income of the Top 10% earners (see Figure 5).[19] Such a result contrasts with Faia et al. (2022) who

[17] The observed unemployment probability for individuals in the Bottom 50% group is 17%.

[18] Broer et al. (2022) find that monetary policy has a stronger effect on employment-to-employment probabilities, but that the effect on the share of unemployed transiting to employment is flat along the income distribution. In contrast, we find stronger effects of monetary policy at the bottom of the distribution for the U-to-E transitions.

[19] We checked that this effect is not driven by the very top of the income distribution for which variable pay and bonuses are likely to be large and would be highly procyclical. Our result is robust to excluding the Top 1% or Top 2%.

Table 2: Alternative measures of the extensive margin

	All	Bottom50	Middle40	Top10
Panel A: E-to-U transitions				
MP shock	-0.201***	-0.330***	-0.064	-0.020
	[-3.19]	[-2.93]	[-0.94]	[-0.16]
N	69 409	33 152	29 784	6 473
Panel B: U-to-E transitions				
MP shock	0.179***	0.385***	0.013	0.002
	[3.53]	[3.93]	[0.37]	[0.04]
N	71 690	34 403	30 610	6 677
Panel C: Nb of months unemployed/year				
MP shock	-0.023***	-0.031***	-0.010	-0.042
	[-3.23]	[-2.98]	[-0.92]	[-1.56]
N	63 286	29 999	27 413	5 874

Note: Equation 4 estimated with OLS and standard errors clustered at the individual level. t-stats in parentheses. The dependent variable measures the 1-year change from employment-to-unemployment (panel A), from unemployment-to-employment (panel B) and the number of months unemployed/year (panel C). The monetary policy (MP) shock is the annual cumulative sum of meeting-level pure monetary policy shocks of Jarociński and Karadi (2020) normalised to one standard deviation. An increase in this variable corresponds to an expansionary monetary policy equivalent to a 10 basis points decrease in the policy stance.

find a strong *positive* income effect for UK and US households on the *bottom* of the income distribution after *contractionary* monetary policy shocks. This effect for bottom earners that remain in the market is driven by a selection effect through reallocation. Cantore et al. (2023) focus on the intensive margin of labor supply and find that labor income is procyclical at the bottom of the distribution because although hours worked are countercyclical for bottom earners, hourly wages respond more than hours worked. Such an intensive margin effect for *bottom* earners is not observed in Figure 5: the fact that labor income is procyclical at the bottom stems from the extensive margin in our empirical analysis. The specific role played by wage bargaining institutions in France, including minimum wage regulations, may be a potential reason for the different findings at the bottom of the distribution (Gautier et al. (2022)).

In order to further assess the channels through which the intensive margin is affected for top earners, we would need additional detailed data sources on the composition of earnings (wages, bonuses, etc), hours worked, changes in the position within the firm or changes of employers. Such a detailed analysis on the intensive margin is beyond the scope of this paper. We take nevertheless advantage of our dataset to test the robustness of our result controlling for some of these factors. Controlling for changes in employer, for the number of jobs or for the number of months working full time, we still find a significant income increase in the top of the labor distribution (see Appendix Table B6). As a result, we cannot exclude that an increase in the variable component of earnings (like variable pay and bonuses) after an expansionary monetary

policy shock may explain the effect on the intensive margin we find at the top of the distribution.

Finally, our conclusions both on the extensive and intensive margins are robust when considering quintile income groups (see Appendix Table B7). We find a significant negative impact of monetary policy shocks on the unemployment transition probability in the first two quintiles (about 0.8 and 0.7 percentage points for respectively the bottom 20% and the p20-p40 deciles) and no significant effect for the upper quintiles. Regarding the intensive margin, we observe a significant effect of the monetary policy shock on labor income for individuals in the top quintile only.[20]

4.3 Inequality implications

Our results show that expansionary monetary policy increases labor income for bottom and top earners, while the effect is more limited for the middle of the distribution. What are the consequences for labor income inequality of this heterogeneous impact of monetary policy across the distribution? To address this question, we perform some simulation exercises based on our estimates. First, we compute several inequality indicators over our sample period (Gini coefficient and shares of the aggregate labor income by groups). Second, we apply at the individual level our estimated coefficients (subsection 3.2) to simulate the labor income distribution after a 10 basis points expansionary monetary policy shock. We then compute the inequality indicators on the simulated labor income distribution. The results are summarized in Table 3.

Table 3: Implications for standard measures of inequality

	Benchmark	After easing MP shock	Percent change
Gini coefficient	0.358	0.399	11.3%
Top10 income share	0.252	0.253	0.3%
Middle40 income share	0.502	0.500	-0.2%
Bottom50 income share	0.246	0.246	0.1%

Note: Simulated labor income based on estimates in Table 1. The monetary policy (MP) shock is the annual cumulative sum of meeting-level pure monetary policy shocks of Jarociński and Karadi (2020) normalised to one standard deviation. An increase in this variable corresponds to an expansionary monetary policy equivalent to a 10 basis points decrease in the policy stance.

We find that the expansionary monetary policy increases labor income inequality both in terms of the Gini coefficient (+11.3% increase in the Gini coefficient) and in terms of the share of labor income held by the Top 10% (+0.3%). It also moderately increases the Bottom 50% share (+0.1%) while the Middle 40% shares decreases

[20] Although not significant, the magnitude of the effect for the first quintile at the bottom of the distribution is supportive of the evidence provided in Cantore et al. (2023).

(-0.2%). Such an increase in labor income inequality following an expansionary monetary policy shock is consistent with Faia et al. (2022), while some other papers find opposite effects (Coibion et al. (2017), Mumtaz and Theophilopoulou (2017), Lenza and Slacalek (2023) or Samarina and Nguyen (2023)). Most of these papers use VAR estimates where the impact of monetary policy is directly estimated on a summary inequality measure (i.e. Gini coefficient). Lenza and Slacalek (2023) use a reduced-form simulation which redistributes the aggregate decline in unemployment estimated from a VAR model across individuals. These papers explain most of the effect of monetary policy on labor income inequality by its impact on employment status, while we find that the increase in inequality following an expansionary monetary policy shock is the result of both the monetary policy effect on the employment status at the bottom of the labor income distribution, combined with the effect on the intensive margin at the top.

5 The role of sectoral heterogeneity

The effects of monetary policy on labor income evidenced so far are likely to be second-round effects resulting from general-equilibrium adjustments following monetary policy direct effects. The direct effects of monetary policy on households and firms work through the intertemporal substitution channel and the interest rate and credit channels, among others. A recent strand of the literature has also emphasized the role of mortgage refinancing in the propagation of monetary policy to household spending (see Beraja et al. (2019)), Berger et al. (2021), Eichenbaum et al. (2022)). In general equilibrium, the extra demand induced by monetary policy from both consumption and investment sides translates to higher economic activity and lower unemployment, and therefore to tighter labor markets and increasing labor incomes.

Because of structural differences across sectors and different sensitivities of each sector to monetary policy, these second-round effects could be different across sectors.[21] A large literature has shown that the gains of some expansionary monetary policy that stimulates the aggregate economy and raises labor income are unlikely to be distributed equally, as labor incomes of low-income households tend to be disproportionately exposed to the business cycle (see Guvenen et al. (2014), Guvenen et al. (2017), Patterson (2023), Kramer (2022)). One reason for such a mechanism, among others, is that low-income households can be over represented in some sectors more sensitive to monetary policy changes. We first analyse the role of sectoral heterogeneity by looking at the effect of monetary policy by sector, and second by assessing some relevant sources of heterogeneity across sectors that may explain their crucial role for the distributional impact of monetary policy on labor income.

[21] It is well documented in the literature that the transmission of monetary policy differs across sectors (see Peersman and Smets (2005) and more recently Kreamer (2022) on the importance of sectoral heterogeneity for monetary policy).

Table 4: Effect of monetary shocks by sectors

	All	Industry	Construc	Transport	Cat-Acc	Finance	Admin
Panel A: Labor income change (In % of average income of each group)							
MP shock	0.443***	0.775***	0.367	0.467	1.271	1.090***	2.589**
	[4.77]	[3.86]	[1.02]	[1.32]	[1.29]	[3.34]	[1.99]
N	76 704	7 437	4 875	3 353	1 936	1 916	1 625
Panel C: Extensive Margin (in percent. points)							
MP shock	-0.334***	-0.793***	-0.995***	-0.886***	-1.797***	-0.381**	-1.675*
	[-3.65]	[-5.87]	[-6.15]	[-4.76]	[-4.35]	[-2.23]	[-1.66]
N	76 704	7 437	4 875	3 353	1 936	1 916	1 625
Panel D: Intensive Margin (in % of labor income of each group)							
MP shock	0.508***	1.498***	-0.164	0.285	-0.731	1.684***	2.152*
	[3.43]	[3.70]	[-0.27]	[0.56]	[-0.56]	[3.06]	[1.72]
N	41 324	4 418	2 936	2 180	1 061	1 199	1 106

Note: Subset of 6 sectors - the results for the other 12 sectors are available in Appendix in Table B10. Equation 2 (Panel A), Equation 4 (Panel B) and Equation 5 (Panel C) estimated with OLS and clustered standard errors. t-stats in parentheses. The dependent variable is the 1-year change in individual annual labor income (in % of each group's average labor income) in panel A, in the labor market status (defined by the variation in a dummy variable that equals one when an individual is unemployed) in panel B, and in individual annual labor income (in % of each group's average labor income) for individuals continuously employed in panel C. The monetary policy (MP) shock is the annual cumulative sum of meeting-level pure monetary policy shocks of Jarociński and Karadi (2020) normalised to one standard deviation. An increase in this variable corresponds to an expansionary monetary policy equivalent to a 10 basis points decrease in the policy stance.

First, we estimate Equation 2, Equation 4 and Equation 5 for all 18 sectors of the NAF classification defined by the French Statistical Institute (INSEE) to categorize activities, after the exclusion of non-profit organisations (sector S) and extraterritorial organisations (sector U).[22] Table 4 shows estimates for a subset of sectors for which the outcomes is salient (Estimates for the other 12 sectors are shown in Table B10 in the Appendix). We find strong differences across sectors, both for the extensive and intensive margins. Extensive margin effects are more pronounced for Industry, Catering and Accommodation, Construction, Transport and Administrative services while the intensive margin effects are more pronounced for Finance and Administrative services.[23] This large sectoral heterogeneity may be driven by several factors, including differences across sectors in financing constraints and sensitivity to monetary policy as well as the procyclicality of labor income.

Second, we investigate these issues by estimating the impact of monetary policy shocks across the labor income distribution, separately for subgroups of sectors classified depending on their capital intensity and leverage (as proxies for their sensitivity

[22] NAF rev.2, see https://www.insee.fr/en/metadonnees/nafr2/section/A. and Appendix Table B9.

[23] Additional estimation results, based on Equation 4 and Equation 5 augmented with sector fixed-effects are available in Appendix Table B8. The results suggest that the extensive margin effects of monetary policy are driven by structural differences across sectors, as the impact of monetary policy on the extensive margin vanishes when accounting for the sector-fixed effects. In contrast, the estimated coefficient for the intensive margin at the top of the labor distribution is not dramatically affected and suggests that effect on the intensive margin is likely driven by structural differences within sectors.

Table 5: Sources of sectoral heterogeneity

	High				Low			
	All	Bottom50	Middle40	Top10	All	Bottom50	Middle40	Top10
Panel A: Capital intensity								
MP shock	0.807***	1.912***	0.224	0.892***	0.181	0.103	0.257*	0.345
	[6.27]	[5.62]	[1.56]	[3.83]	[1.39]	[0.26]	[1.77]	[1.58]
N	30507	14 704	13 101	2 702	46 197	23 829	18 229	4 139
Panel B: Leverage								
MP shock	0.975***	1.942***	0.294	0.798***	0.16	0.076	0.197	0.455**
	[5.81]	[4.92]	[1.53]	[2.72]	[1.45]	[0.21]	[1.64]	[2.43]
N	28688	15 871	10 512	2 305	48 016	22 662	20 818	4 536
Panel C: Share of flexible contracts								
MP shock	0.946***	2.759***	0.030	0.211	0.213**	-0.284	0.316***	0.730***
	[4.93]	[6.07]	[0.14]	[0.64]	[2.05]	[-0.86]	[2.77]	[4.04]
N	26417	14 532	10 000	1 885	50 287	24 001	21 330	4 956
Panel D: Share of blue-collar workers in labor force								
MP shock	0.725***	2.261***	0.063	0.471**	0.235*	-0.176	0.345**	0.665***
	[5.28]	[6.22]	[0.40]	[2.01]	[1.89]	[-0.47]	[2.52]	[3.09]
N	29319	13 971	12 638	2 710	47 385	24 562	18 692	4 131

Note: Equation 2 estimated with OLS and clustered standard errors. t-stats in parentheses. The dependent variable is the 1-year change in individual annual labor income (in % of each group's average labor income). The monetary policy (MP) shock is the annual cumulative sum of meeting-level pure monetary policy shocks of Jarociński and Karadi (2020) normalised to one standard deviation. An increase in this variable corresponds to an expansionary monetary policy equivalent to a 10 basis points decrease in the policy stance. For each of the four metrics, we compute the sample average for each sector. High and low groups of sectors correspond to above and below the median of these sample averages. Capital intensity and leverage are computed from the FIBEN database.

to monetary policy) and on the share of flexible contracts and of blue-collar workers in total employment (as proxies for the procyclicality of labor income in relation to the labor force composition). In order to measure these sectoral characteristics, we use the FIBEN (Fichier Bancaire des Entreprises) firm-level database, maintained by the Banque de France. It is an administrative database gathering financial and tax statements of a wide set of non-financial firms operating in France. It covers all sectors, both small and large firms and a large share of the aggregate value added (more than 70%, see Lé and Vinas (2022)). For each sector characteristics, we first compute the sample average of the related metric for each sector and second define two groups: high versus low levels of the metric, measured as above and below the median value of that metric across sectors (see Appendix Figure B1 for detailed statistics by sector). In order to preserve the sample size for each subsample, we focus on overall labor income changes (based on Equation 2) and do not disentangle intensive and extensive margins. The results are displayed in Table 5.

We find that the effects of monetary policy on labor income are more pronounced in sectors with a high level of sensitivity to monetary policy (i.e. with high capital intensity or with high leverage, Panels A and B). This result is consistent with Jašová et al. (2022). Based on linked employee-employer data and firm loan-level credit registry, they find that expansionary monetary policy disproportionately increases wages

and hours worked and employment in firms more likely to be financially constrained. The effects of monetary policy are also more pronounced where the procyclicality of labor income is higher: at the bottom of the distribution in sectors with a high share of flexible contracts or of blue-collar workers in the labor force, and at the top of the distribution in sectors with more permanent contracts and executive or managers (see panels C and D) where variable pay such as bonuses should be more important.

6 Other dimensions of heterogeneity

While demographics such as age or gender are correlated with the income groups and the heterogeneity discussed in the previous sections (see Table A1 in the Appendix), it is also crucial to provide more insights on the heterogeneous effect of monetary policy across demographic groups. These issues have recently gained ground, both from an academic perspective and policy perspective (e.g. Bergman et al. (2022), Bartscher et al. (2021), Gerardi et al. (2018)). In this section we further assess how the effect of monetary policy on labor income differs depending on age and gender. We also take advantage of our data to assess the heterogeneity in monetary policy effects across job characteristics (occupation and type of contract).

6.1 Demographics

Table B11 reports estimates of the effect of monetary policy shock on labor income change by age and gender, based on Equation 4 and Equation 5. We find that extensive margin effects are more pronounced for people aged 25-44 (the effect is twice the aggregate effect), while the intensive margin effects are more pronounced for 25-34 (more than twice the aggregate effect) and men (twice the effect for women). Such results can be related to Guvenen et al. (2017) who show that males are more exposed to aggregate risk than females. They also find younger workers more exposed to aggregate risk than older workers (except at the top of the income distribution). They conclude that the cost of business cycles is borne asymmetrically across the population depending on gender and age, (as well as on worker's earnings level, and industry), and argue that monetary policy that stabilizes business cycles would also have heterogeneous benefits across the population. Our results are thus in line with such mechanisms and suggest that the labor income of people more exposed to aggregate earnings risk is also more affected by monetary policy shocks.

6.2 Job characteristics

To assess the heterogeneity across job characteristics, we estimate Equation 4 and Equation 5 splitting the overall sample by occupations (Table B12) and type of contracts (Table B13). Depending on their occupation, individuals are not impacted to the same extent by the the effect of monetary policy on the intensive and extensive

margins: the effect on the extensive margin impacts workers/technicians (the effect is similar to the aggregate effect when the effects for other occupations is not significant), while the effect on the intensive margin affects executive and managers only (the effect is more than twice the aggregate effect). We also find heterogeneous effects across the type of contracts, although less notable: extensive margin effects, measured by the number of months unemployed per year, are more pronounced for flexible contracts (with the effect more than six times the aggregate effects for temporary contracts and more than twice for fixed contracts), while intensive margin effects are only statistically significant for permanent contracts.

These differences across sectors, occupations and type of contract may be important to assess the inequality consequences of monetary policy shocks, which differ not only across the income distribution but also across other dimensions. Regarding the intensive margin, the fact that labor income seems to be more affected for individuals working in the finance sector or as manager or executives (Table B12, Panel B) and with permanent contracts (Table B13, Panel C) seems to point out a crucial role played by variable pay. This is an interesting issue left for future research.

7 Conclusion

We study the distributional effects of monetary policy on labor income, by accounting for the extensive and intensive margins. In this respect, we provide new results regarding the earning heterogeneity channel of monetary policy. Our empirical analysis is based on the ECB monetary policy and on matched administrative-survey data of a French dataset covering 2007 to 2019. This annual panel dataset combines individual-level administrative and income tax data with survey-based information about labor market status, job characteristics, demographics, and individual-level information about labor market transitions or the number of months employed each year. To measure the causal effect of monetary policy, we use high-frequency monetary surprises adjusted for central bank information effects.

First, the effect of expansionary monetary policy on labor income exhibits a U-shaped pattern across the labor income distribution. As a result, we find that expansionary monetary policy increases labor income inequality. This U-shaped pattern is robust to several alternative specifications and contrasts with previous results obtained for other countries, especially at the top of the distribution. Such differences suggest that the monetary policy effects may depend on each country's economic structures (such as the strength of various monetary transmission channels or sectoral composition effects) and different institutional contexts. Second, we find that this U-shaped pattern is driven by the extensive margin at the bottom of the distribution and by the intensive margin at the top. We also provide evidence of the crucial role played by sectoral heterogeneity in explaining these distributional effects of monetary policy.

Overall, these findings suggest two implications for monetary policy. First, the heterogeneity of labor income responses across sectors suggests differentiated impacts in firms' marginal costs, so potential different price-setting dynamics across sectors. Second, the distributional effects of monetary policy may generate another amplification mechanism consistent with the Keynesian multiplier logic of Bilbiie (2020). The larger monetary policy effect for bottom earners, who are also likely to be more financially constrained and have larger propensities to consume, implies that this effect on labor income may induce disproportionate consumption responses from these households and thus affect aggregate consumption. Distributional monetary policy effects might therefore have aggregate implications beyond inequality issues.

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Appendix
For online publication

A Descriptive statistics

Table A1: Sample descriptive statistics

	N	Labor inc. (€)	Δ Lab. inc. SD	Age	%Women
All	76 704	21 352	5 882	42.6	0.505
Bottom50	38 533	9 686	5 695	40.0	0.603
Middle40	31 330	27 110	5 232	44.4	0.437
Top10	6 841	60 692	8 495	48.7	0.268

Note: SRCV data (Insee) 2008-2020, covering 2007 to 2019. Sample used for estimation. Students, retired, stay-at-home or inactive individuals are excluded. We keep individuals observed at least three consecutive years (i.e. in *t-1*, *t* and *t+1*). Trimming at 1% each tail of the labor income changes for each year. Labor income defined at the individual level as the sum of employee income (PY010N, i.e. the total remuneration paid by an employer to an employee) and of self-employment income (PY050N).

Table A2: Comparison with benchmark administrative data

Average income in each group		
	ERFS	**SRCV** (our sample)
Bottom50	13 701	10 090
Middle40	27 101	26 764
Top10	55 913	58 745
Labor income shares		
	WID	**SRCV** (our sample)
Bottom50	0.268	0.252
Middle40	0.490	0.502
Top10	0.242	0.246

ERFS data: In euros. For year 2016. Labor income. Household level data with rp employed or unemployed, divided by the number of providers of resources at the individual level (the average number of provider of resources by households is 1.63 for B50, 1.63 for M40 and 1.54 for T10).
WID data: Garbinti, Goupille-Lebret and Piketty (2018). Average share over 2007-2014. Pre-tax labor income, adults (equal split).

B Additional results

Table B1: Distributional effects across quintiles of labor income

	All	Q1	Q2	Q3	Q4	Q5
MP shock	94.6***	136.5***	44.8	14.6	13.9	263.1***
	[4.77]	[3.30]	[1.09]	[0.46]	[0.36]	[4.64]
N	76 704	15 313	15 416	15 658	15 776	14 541
Mean	21 352	2 196	12 733	19 694	26 222	47 166
SD	18 557	2 424	2 883	1 543	2 403	25 150

Note: Equation 2 estimated with OLS and standard errors clustered at the individual level. t-stats in parentheses. Sample period: 2007-2019. The dependent variable is the 1-year change in individual annual labor income (in euros). The monetary policy (MP) shock is the annual cumulative sum of meeting-level pure monetary policy shocks of Jarociński and Karadi (2020) normalised to one standard deviation. An increase in this variable corresponds to an expansionary monetary policy equivalent to a 10 basis points decrease in the policy stance.

Table B2: Extended sample 2003-2019

	All	Bottom50	Middle40	Top10
Panel A: in euros				
MP shock	103.8***	98.9***	83.7***	203.8**
	[5.43]	[3.95]	[3.13]	[2.23]
N	105 903	53 290	43 156	9 457
Panel B: in percent of average income of each group				
MP shock	0.494***	1.050***	0.312***	0.342**
	[5.43]	[3.95]	[3.13]	[2.23]
N	105 903	53 290	43 156	9 457

Note: Equation 2 estimated with OLS and standard errors clustered at the individual level. t-stats in parentheses. Sample period: 2003-2019. The dependent variable is the 1-year change in individual annual labor income (in euros in panel A and in % of each group's average labor income in panel B). The monetary policy (MP) shock is the annual cumulative sum of meeting-level pure monetary policy shocks of Jarociński and Karadi (2020) normalised to one standard deviation. An increase in this variable corresponds to an expansionary monetary policy equivalent to a 10 basis points decrease in the policy stance.

Table B3: Aggregate business cycle shocks

	All	Bottom50	Middle40	Top10
Agg. Earnings	0.542***	0.966***	0.272***	0.758***
	[8.24]	[5.03]	[3.88]	[6.91]
N	76 704	38 533	31 330	6 841

Note: Equation 2 estimated with OLS and standard errors clustered at the individual level. t-stats in parentheses. Sample period: 2003-2019. The dependent variable is the 1-year change in individual annual labor income (in % of each group's average labor income). The "aggregate earnings" variable is the unconditional annual growth rate in the labour income average of our sample of individuals.

Table B4: Estimated parameters for robustness tests

	All	Bottom50	Middle40	Top10
Baseline				
MP shock	0.443***	0.901***	0.228**	0.579***
	[4.77]	[3.37]	[2.22]	[3.65]
N	76 704	38 533	31 330	6 841
FE estimation + Individual-level controls				
MP shock	0.451***	1.478***	0.008	0.443**
	[3.88]	[3.94]	[0.10]	[2.39]
N	58 830	25 408	27 891	5 531
Including macro controls				
MP shock	0.865***	1.383***	0.328*	1.289***
	[4.92]	[2.67]	[1.82]	[4.44]
N	76 704	38 533	31 330	6 841
All controls				
MP shock	0.674***	1.542***	0.054	1.136***
	[4.06]	[2.83]	[0.37]	[4.28]
N	58 830	25 408	27 891	5 531
2y-variation				
MP shock	0.272*	0.564	-0.004	0.765
	[1.68]	[1.64]	[-0.03]	[1.64]
N	76 704	38 533	31 330	6 841
Without self-employed income				
MP shock	0.308***	0.624**	0.171*	0.422***
	[3.41]	[2.09]	[1.86]	[2.77]
N	76 704	38 125	31 420	7 159
With unemployment benefits				
MP shock	0.429***	0.714***	0.278***	0.569***
	[4.65]	[3.17]	[2.75]	[2.90]
N	76 704	38 654	31 227	6 823

To be continued on next page.

Table B4 continued: Estimated parameters for robustness tests

	All	Bottom50	Middle40	Top10
Baseline				
MP shock	0.443***	0.901***	0.228**	0.579***
	[4.77]	[3.37]	[2.22]	[3.65]
N	76 704	38 533	31 330	6 841
Labor participation status from non-missing labor income				
MP shock	0.442***	1.245***	0.163	0.580***
	[4.75]	[3.88]	[1.64]	[3.73]
N	76 352	34 326	34 514	7 512
Benchmark income based on lifetime earnings				
MP shock	0.443***	1.221***	0.112	0.342**
	[4.77]	[4.48]	[1.09]	[2.26]
N	76 704	38 487	31 316	6 901
With outliers				
MP shock	0.577**	1.205**	0.06	1.074
	[2.35]	[2.43]	[0.40]	[1.55]
N	78 226	38 898	31 615	7 713
Without financial sector				
MP shock	0.415***	0.817***	0.232**	0.558***
	[4.32]	[3.04]	[2.18]	[3.35]
N	74 788	38 159	30 276	6 353
Pre-QE (2007-2014)				
MP shock	0.408***	0.685**	0.206*	0.613***
	[4.21]	[2.49]	[1.95]	[3.72]
N	53 828	27 298	21 857	4 673
Post-GFC (2011-2019)				
MP shock	1.202***	2.270***	0.734***	1.514***
	[5.68]	[3.61]	[3.22]	[4.20]
N	45 321	22 460	18 729	4 132
Kerssenficher (2019)'s MP shocks				
MP shock	0.473***	1.103***	0.220**	0.637***
	[5.08]	[3.97]	[2.18]	[3.99]
N	76 704	38 533	31 330	6 841
Weighted sum of meeting-level MP shocks				
MP shock	0.378***	0.733***	0.127	0.747***
	[3.99]	[2.65]	[1.21]	[4.55]
N	76 704	38 533	31 330	6 841

Note: Equation 2 estimated with OLS and standard errors clustered at the individual level. t-stats in parentheses. Sample period: 2007-2019. The dependent variable is the 1-year change in individual annual labor income (in % of each group's average labor income). The monetary policy (MP) shock is the annual cumulative sum of meeting-level pure monetary policy shocks of Jarociński and Karadi (2020) normalised to one standard deviation. An increase in this variable corresponds to an expansionary monetary policy equivalent to a 10 basis points decrease in the policy stance.

Table B5: Baseline intensive/extensive parameters

	All	Bottom50	Middle40	Top10
Extensive Margin				
MP shock	-0.334***	-0.600***	-0.078	0.011
	[-3.65]	[-3.65]	[-0.98]	[0.08]
N	76 704	38 533	31 330	6 841
Intensive Margin				
MP shock	128.9***	76.2	51.0	704.1***
	[3.43]	[1.38]	[1.26]	[3.68]
N	41 324	15 645	21 237	4 442
Intensive Margin (in % of average income of each group)				
MP shock	0.508***	0.578	0.189	1.164***
	[3.43]	[1.38]	[1.26]	[3.68]
N	41 324	15 645	21 237	4 442

Note: Equation 2 estimated with OLS and standard errors clustered at the individual level. t-stats in parentheses. Sample period: 2007-2019. The dependent variable is the 1-year change in the labor market status (defined by the variation in a dummy variable that equals one when an individual is unemployed) in the upper panel, in individual annual labor income (in euros in the middle panel and in % of each group's average labor income in the bottom panel). The monetary policy (MP) shock is the annual cumulative sum of meeting-level pure monetary policy shocks of Jarociński and Karadi (2020) normalised to one standard deviation. An increase in this variable corresponds to an expansionary monetary policy equivalent to a 10 basis points decrease in the policy stance.

Table B6: Robustness measures of the intensive margin

	All	Bottom50	Middle40	Top10
Controlling for employer change				
MP shock	0.471***	0.485	0.176	1.086***
	[3.17]	[1.14]	[1.20]	[3.41]
N	39 429	14 488	20 573	4 368
Controlling for number of jobs				
MP shock	0.508***	0.566	0.189	1.162***
	[3.43]	[1.36]	[1.26]	[3.67]
N	41 322	15 644	21 236	4 442
Controlling for number of months at full time				
MP shock	0.460***	0.487	0.143	1.145***
	[3.11]	[1.17]	[0.96]	[3.64]
N	41 311	15 640	21 230	4 441

Note: Equation 2 estimated with OLS and standard errors clustered at the individual level. t-stats in parentheses. Sample period: 2007-2019. The dependent variable is the 1-year change in individual annual labor income (in % of each group's average labor income) for individuals continuously employed. The monetary policy (MP) shock is the annual cumulative sum of meeting-level pure monetary policy shocks of Jarociński and Karadi (2020) normalised to one standard deviation. An increase in this variable corresponds to an expansionary monetary policy equivalent to a 10 basis points decrease in the policy stance.

Table B7: Extensive and intensive margin effect across quintile income groups

	All	Q1	Q2	Q3	Q4	Q5
Extensive Margin						
MP shock	-0.334***	-0.795**	-0.669***	-0.098	-0.007	-0.041
	[-3.65]	[-2.46]	[-2.91]	[-0.71]	[-0.07]	[-0.40]
N	76 704	15 313	15 416	15 658	15 776	14 541
Intensive Margin						
MP shock	128.9***	198.2	-10.0	57.0	4.4	397.1***
	[3.43]	[1.30]	[-0.13]	[1.22]	[0.08]	[3.89]
N	41 324	2 830	7 720	10 508	10 689	9 577

Note: Equation 2 estimated with OLS and standard errors clustered at the individual level. t-stats in parentheses. Sample period: 2007-2019. Sample period: 2007-2019. The dependent variable is the 1-year change in the labor market status (defined by the variation in a dummy variable that equals one when an individual is unemployed) in the upper panel and in individual annual labor income (in euros) in the bottom panel. The monetary policy (MP) shock is the annual cumulative sum of meeting-level pure monetary policy shocks of Jarociński and Karadi (2020) normalised to one standard deviation. An increase in this variable corresponds to an expansionary monetary policy equivalent to a 10 basis points decrease in the policy stance.

Table B8: Controlling for sector fixed-effects

	All	Bottom50	Middle40	Top10
Panel A: Extensive Margin (in p.p.)				
MP shock	0.066	0.198	0.027	0.044
	[0.74]	[1.22]	[0.36]	[0.33]
N	76 704	38 533	31 330	6 841
Pane B: Intensive Margin (in % of labor income)				
MP shock	0.519***	0.475	0.184	1.217***
	[3.49]	[1.14]	[1.22]	[3.82]
N	41 324	15 645	21 237	4 442

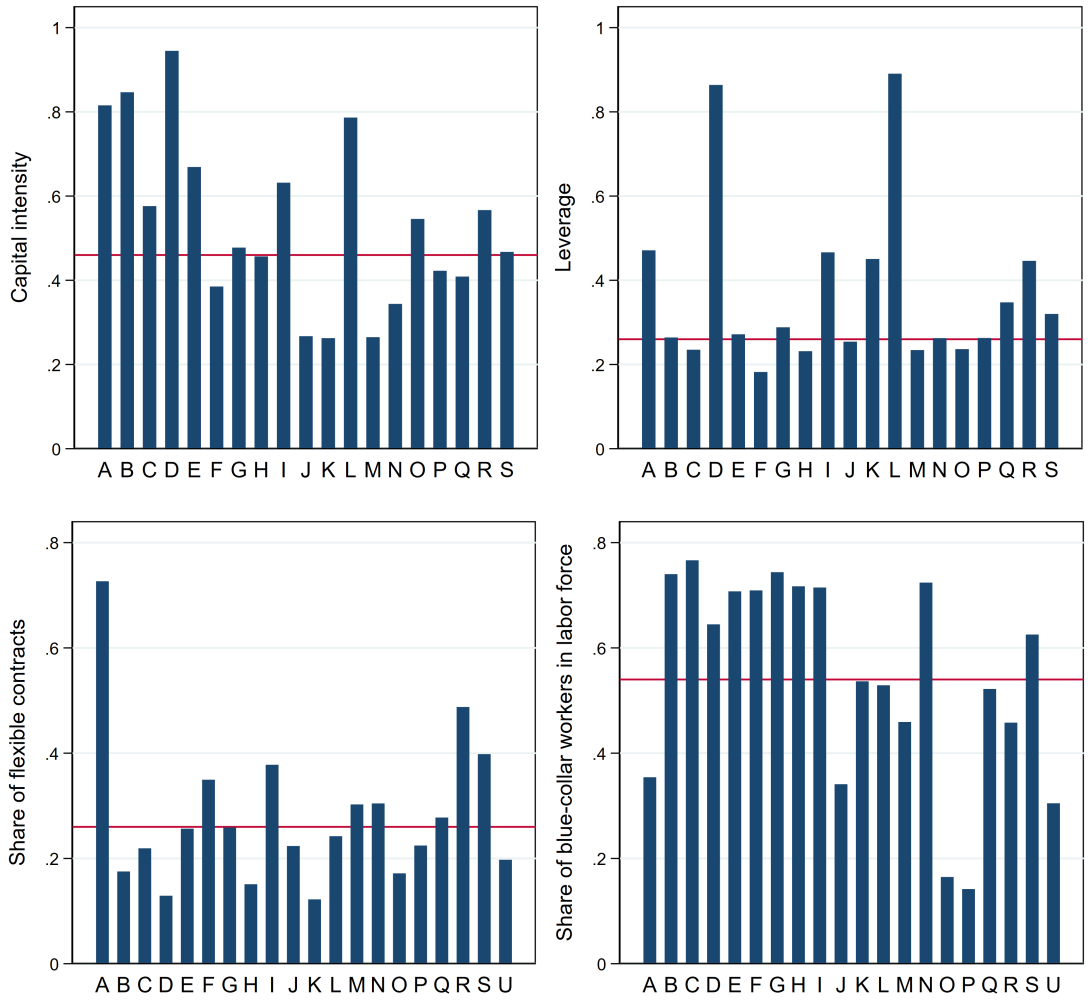
Note: Equation 4 and Equation 5 augmented with sector (NAF2_REV2_1P) fixed-effects and based on OLS estimates with clustered standard errors. t-stats in parentheses. Sample period: 2007-2019. The dependent variable is the 1-year change in individual annual labor income (in % of each group's average labor income) for individuals continuously employed. The monetary policy (MP) shock is the annual cumulative sum of meeting-level pure monetary policy shocks of Jarociński and Karadi (2020) normalised to one standard deviation. An increase in this variable corresponds to an expansionary monetary policy equivalent to a 10 basis points decrease in the policy stance.

Table B9: NAF2 sectors

NAF2	Sector	Worker share
A	Agriculture	3.91%
B	Extraction	0.13%
C	Industry	11.83%
D	Energy	0.86%
E	Water management	0.78%
F	Construction	7.76%
G	Car retail/repair	11.34%
H	Transports	5.33%
I	Food/accomodation	3.08%
J	Information/communication	3.13%
K	Finance	3.05%
L	Real estate	1.58%
M	Specialized activities (legal, consultancy, engineering, marketing)	4.02%
N	Administrative services	2.59%
O	Public administration	10.36%
P	Education	9.34%
Q	Health	16.25%
R	Arts, culture	1.48%
S	Non-profit organisations	2.94%
U	Extraterritorial organisations	0.23%

Note: Sample from 2007 to 2019. The "Extraterritorial organisations" sector (NAF2: U) is not reported in the FIBEN database, so we do not have it for the capital intensity and leverage metrics.

Figure B1: Sources of sectoral heterogeneity



Note: This figure shows the sample average, for each sector, of capital intensity (measured as the ratio of physical capital stock over the sum of physical capital stock and gross yearly payroll), leverage, share of flexible contracts, and share of blue-collar workers in labor force. The "Extraterritorial organisations" sector (NAF2: U) is not reported in the FIBEN database, so we do not have it for the capital intensity and leverage metrics.

Table B10: Table 4 for other 12 sectors

	Overall			Extensive Margin			Intensive Margin		
Sector	MP shock	t-stat	N	MP shock	t-stat	N	MP shock	t-stat	N
A	2.384**	[2.34]	2 459	-0.223	[-0.90]	2 459	2.046	[1.32]	1 054
B	6.554	[1.60]	82	0	[.]	82	2.191	[1.20]	64
D	-0.482	[-0.79]	542	-0.254	[-0.46]	542	-0.328	[-0.33]	383
E	0.810	[1.15]	492	-0.972	[-1.17]	492	-0.096	[-0.06]	317
G	0.893***	[2.80]	7 127	-0.514***	[-3.06]	7 127	0.610	[1.29]	4 320
J	0.209	[0.38]	1 968	-0.682**	[-2.45]	1 968	-0.101	[-0.11]	1 195
L	0.614	[0.81]	994	-0.585	[-1.33]	994	-0.494	[-0.53]	687
M	1.226**	[2.38]	2 525	-0.355	[-1.59]	2 525	1.331	[1.44]	1 577
O	0.331**	[2.02]	6 512	-0.182	[-1.29]	6 512	0.592*	[1.81]	4 215
P	0.470**	[2.14]	5 869	-0.716***	[-4.94]	5 869	0.036	[0.09]	4 036
Q	0.759***	[2.61]	10 214	-0.857***	[-6.42]	10 214	0.820*	[1.73]	6 654
R	2.057*	[1.80]	933	-1.093*	[-1.96]	933	1.219	[0.72]	489

Note: Equation 2 (Overall), Equation 4 (Extensive) and Equation 5 (Intensive) estimated with OLS and clustered standard errors. t-stats in parentheses. The dependent variable is the 1-year change in individual annual labor income (in % of each group's average labor income) in panel A, in the labor market status (defined by the variation in a dummy variable that equals one when an individual is unemployed) in panel B, and in individual annual labor income (in % of each group's average labor income) for individuals continuously employed in panel C. The monetary policy (MP) shock is the annual cumulative sum of meeting-level pure monetary policy shocks of Jarociński and Karadi (2020) normalised to one standard deviation. An increase in this variable corresponds to an expansionary monetary policy equivalent to a 10 basis points decrease in the policy stance.

Table B11: Effect of MP shocks by age & gender

	All	16-24	25-34	35-44	45-54	55-64	Men	Women
Panel A: Extensive Margin (in percent. points)								
MP shock	-0.334***	-0.317	-0.613***	-0.535***	-0.250*	0.320	-0.427***	-0.240*
	[-3.65]	[-0.62]	[-2.62]	[-3.56]	[-1.89]	[1.63]	[-3.31]	[-1.86]
N	76 704	6 022	14 590	20 259	21 668	13 545	37 941	38 763
Panel B: Intensive Margin (in % of labor income)								
MP shock	0.508***	-0.533	1.378***	0.343	0.342	0.359	0.659***	0.296
	[3.43]	[-0.21]	[2.98]	[1.33]	[1.59]	[1.13]	[3.41]	[1.29]
N	41 324	1 140	7 470	11 801	13 361	7 311	20 725	20 599

Note: Equation 4 (Panel A) and Equation 5 (Panel B) estimated with OLS and clustered standard errors. t-stats in parentheses. The dependent variable is the 1-year change in the labor market status (defined by the variation in a dummy variable that equals one when an individual is unemployed) in panel A, and in individual annual labor income (in % of each group's average labor income) for individuals continuously employed in panel B. The monetary policy (MP) shock is the annual cumulative sum of meeting-level pure monetary policy shocks of Jarociński and Karadi (2020) normalised to one standard deviation. An increase in this variable corresponds to an expansionary monetary policy equivalent to a 10 basis points decrease in the policy stance.

Table B12: Effect of MP shocks by occupation

	All	CivilServ	Work/Tech	Employee	Manag/Exec
Panel A: Extensive Margin (in percent. points)					
MP shock	-0.334***	-0.077	-0.313***	-0.212	-0.011
	[-3.65]	[-0.67]	[-3.23]	[-1.12]	[-0.16]
N	76 704	9 630	32 693	3 772	13 006
Panel B: Intensive Margin (in % of labor income)					
MP shock	0.508***	0.129	0.021	0.331	1.131***
	[3.43]	[0.45]	[0.09]	[0.68]	[4.85]
N	41 324	6 440	20 566	2 657	8 946

Note: Equation 4 (Panel A) and Equation 5 (Panel B) estimated with OLS and clustered standard errors. t-stats in parentheses. The dependent variable is the 1-year change in the labor market status (defined by the variation in a dummy variable that equals one when an individual is unemployed) in panel A, and in individual annual labor income (in % of each group's average labor income) for individuals continuously employed in panel B. The monetary policy (MP) shock is the annual cumulative sum of meeting-level pure monetary policy shocks of Jarociński and Karadi (2020) normalised to one standard deviation. An increase in this variable corresponds to an expansionary monetary policy equivalent to a 10 basis points decrease in the policy stance.

Table B13: Effect of MP shocks by contract type

	All	Trainee	Temp.	Fixed	Perm.
Panel A: Extensive Margin - Prob(Unemp), in p.p.					
MP shock	-0.334***	-1.293	-0.87	-0.546	-0.078*
	[-3.65]	[-1.62]	[-0.92]	[-1.56]	[-1.72]
N	76 704	1 374	1 266	6 395	50 233
Panel B: Extensive Margin - Nb of months unemployed/year					
MP shock	-0.023***	-0.156**	-0.143**	-0.056**	-0.014*
	[-3.23]	[-2.22]	[-2.08]	[-2.07]	[-1.77]
N	63 286	1 178	1 119	5 454	44 479
Panel C: Intensive Margin (in % of labor income)					
MP shock	0.508***	1.206	1.496	0.055	0.442***
	[3.43]	[0.27]	[0.65]	[0.05]	[3.28]
N	41 324	357	488	2 906	34 991

Note: Equation 4 (Panel A) and with the number of months unemployed by year (Panel B), and Equation 5 (Panel C) estimated with OLS and clustered standard errors. t-stats in parentheses. The dependent variable is the 1-year change in the labor market status (defined by the variation in a dummy variable that equals one when an individual is unemployed) in panel A, the number of months unemployed/year in panel B, and the 1-year change in individual annual labor income (in % of each group's average labor income) for individuals continuously employed in panel C. The monetary policy (MP) shock is the annual cumulative sum of meeting-level pure monetary policy shocks of Jarociński and Karadi (2020) normalised to one standard deviation. An increase in this variable corresponds to an expansionary monetary policy equivalent to a 10 basis points decrease in the policy stance.

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