Who takes the cake?
The heterogeneous effect of ECB accommodative monetary policy across income classes

IARIW–Bank of Italy conference

"Central Banks, Financial Markets and Inequality"

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Overview

1. Introduction

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Motivation

- Well-documented increase in *within-country* inequality in advanced economies (AEs) since the 80s. Arising of theories supporting that AEs do not inevitable evolve toward more egalitarian sociates, opposed to the widely refuted traditional views based on Kuznets (1955).

- Trend mostly attributed to deep and far-reaching "structural" drivers (beyond the reach of monetary policy) such as globalization, skill-biased technological progress, demographic trends, and changes in labour market institutions, among others.

- The GFC and its aftermath highlighted how inequality interacts with the business cycle and renewed focus on the "cyclical" dimension/fluctuations of inequality and the importance of factors that might affect it in shorter horizons, such as monetary policy (MP). Far-reaching implications of QE (when compared to "conventional" MP tools) also increased the interest.

- **Traditional view:** MP expected to be neutral (or nearly so) in the long-run (i.e., over the cycle). But trend and cyclical changes are hardly ever independent → **"Hysteresis" or "Scarring" view:** by limiting cyclical deterioration, (countercyclical) monetary policy might help avoid long-lasting scars in inequality.

1. Introduction

Theoretical framework

The causal relationship between monetary policy and inequality is bi-directional.

This investigation focuses on how monetary policy might affect (income) inequality.

- Wealth inequality: Savings redistribution channel, portfolio channel, interest rate exposure channel, and financial segmentation channels.

- Income inequality: Income composition channel and earnings heterogeneity channel.

Income composition channel	MP shocks affect different sources of income (e.g., wages vs. financial assets prices) differently, thus having a heterogeneous impact on agents depending on the composition of their income. E.g., households located at the leftmost part of the distribution more likely to rely on labour income *("intensive margin")*
Earnings heterogeneity channel	Risk of being or becoming unemployed is unequally distributed across the population. Sensitivity of such "employment status" to the economic cycle (and thus to countercyclical policies) varies across income groups, and tends to be higher for lower income HHs *("extensive margin")*

2. Data and contribution

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Contribution

- Main literature includes Coibion et al. (2017), Mumtaz and Theophilopoulou (2017), Inui et al. (2017), Guerello (2018), Furceri et al. (2018), Lenza and Slacalek (2018), Colciago et al. (2019), BIS (2022), Corrado and Fantozzi (2023).

- Most studies use (annual) "aggregate" inequality measures such as the Gini index or S90/S10 and similar ratios. → We are among the firsts in this literature to use household survey micro-data of EU-SILC (EU Survey on Income and Living Conditions – repeated cross-section experiment) to derive <u>class-specific metrics for unemployment and labour income.</u>

- **Our focus.** Class-specific reaction to (conventional and unconventional, jointly) ECB monetary policy shocks. Impact via labour market on both the "extensive margin" (unemployment rate) and "intensive margin" (real labour income).

2. Data and contribution

Dataset

- **Sample:** EMU-11 countries (AT, BE, DE, ES, FI, FR, IT, IE, LU, NL, PT)

- **Period:** 2006-2019 // 2006Q4-2019Q4

- **Variables:**

|	
Monetary policy and financial markets	• Wu and Xia's shadow rate • 10y EA BMK bond yield • Eurostoxx 600
Macro variables (country-specific)	• GDP deflator • Real GDP
Micro-derived metrics (country and income-class specific)	• Unemployment rate • Real labour income (2015 prices)

2. Data and contribution

Micro-derived metrics

- Class-specific labour market metrics derived for four income classes, namely (i) **lower class** (<75% of median income), (ii) **lower-middle class** (75-125%), (iii) **upper-middle class** (125-200%), and (iv) **upper class** (>200%). As usual in the delimitation of income classes, the concept used to compute the limit is household disposable income.

- Original data at annual frequency used for LP (Methodology II). For SVAR (Methodology I), we disaggregate it quarterly using regressions based on quarterly country-level figures (implicit assumption that the annual co-movement holds intra-annually).

Unemployment rate:

- Unemployment falls disproportionately on the shoulders of the lower class. Their UR is also the first one to increase during the recession (already in 2007/08) and the last one to decrease (only in 2016/17).

- Deterioration in UR for the lower class recovers only partially, thus leaving long-lasting "scars". See bottom chart, where the correlation is -0.7 (away from "best fit" -45-degrees line).

Evolution of unemployment rate by income class (2006-2019; %)
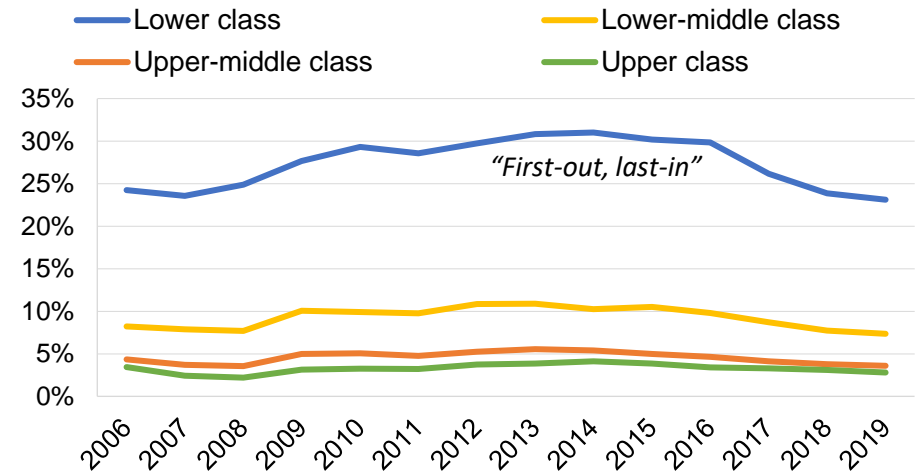
Source: EU-SILC and authors' calculations. Note: Figure displays the weighted aggregate figures for the countries included in our sample (namely AT, BE, DE, ES, FI, FR, IT, LU, NL, PT) using active population as weights.

Scarring effect of unemployment rate by income class (2006-2019; pps)

Source: EU-SILC and authors' calculations. Note: Dots in the figure represent each of the countries included in our sample. The increase in unemployment represented in the x-axis refers to the difference between the higher unemployment rate witnessed during the recession period (2008-2013) and the lower unemployment rate during the pre-crisis period (2006-2007). The y-axis represents the sharpest decline in unemployment rate during the post-crisis period (2014-2019), with respect to the largest value during the recession (2008-2013).
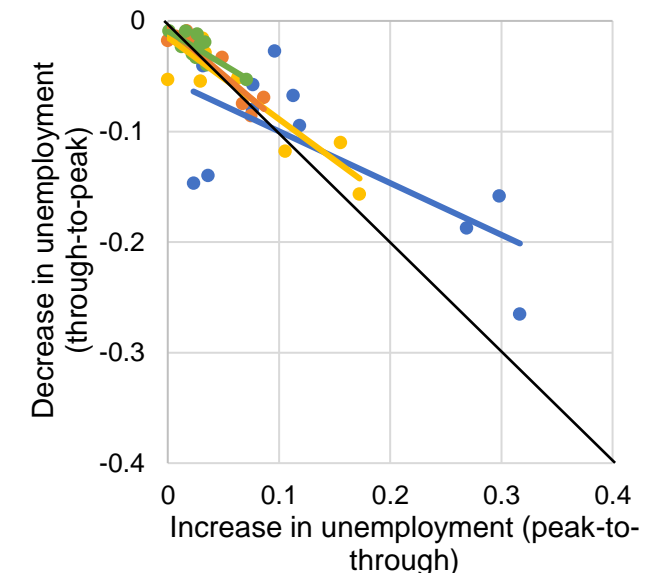
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- Original data at annual frequency used for LP (Methodology II). For SVAR (Methodology I), we disaggregate it quarterly using regressions based on quarterly country-level figures (implicit assumption that the annual co-movement holds intra-annually).

Real labour income:

- The concept of labour income used is gross employee cash or near-cash income (before transfers and taxes to try to exclude to the extent possible the significant redistributive effects of the tax and transfers system).*

- Divergent path in the growth rate of salaries by income classes. Higher growth rate for the upper class.

- Salaries only went below pre-crisis values for the lower class, for which it stagnated and remained ~5% lower for a period of seven years hence displaying long-lasting scarring effect.

**Evolution of real labour income
by income class** (2006-2019; 2007=100)
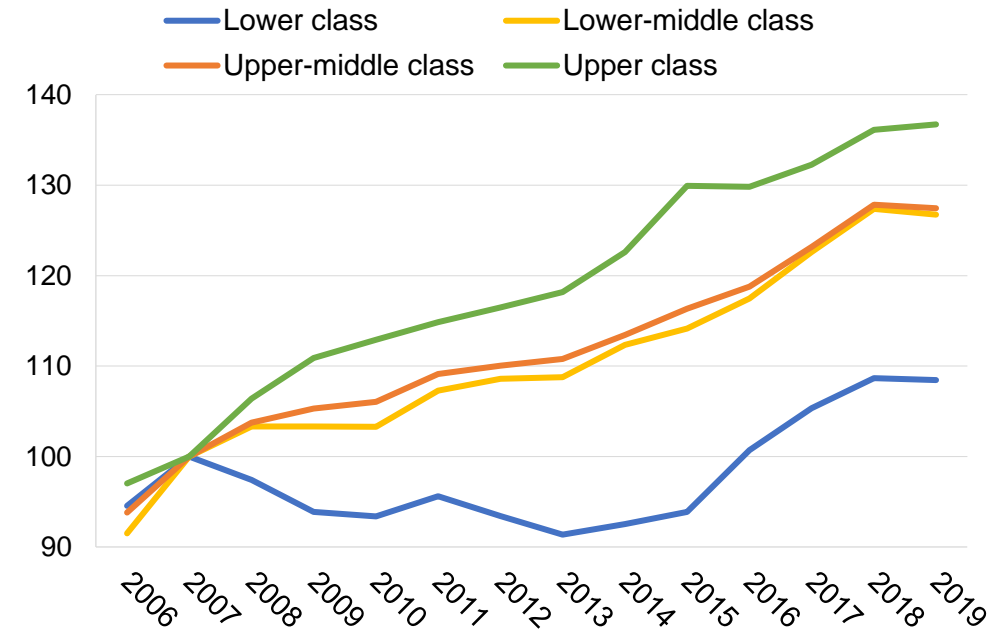
Source: EU-SILC and authors' calculations. Note: Figure displays the weighted aggregate figures for the countries included in our sample (namely AT, BE, DE, ES, FI, FR, IT, LU, NL, PT) using active population as weights. Nominal values are deflated using the country-specific GDP deflator (2015 prices).

*Solely considering market income implies that households that live on transfer payments such as retirees cannot be included in the analysis (as their market income is close to zero in most cases). For this reason, once the income-classes are delimited, we drop from our sample those individuals with zero market income. This way, we avoid including in our analysis individuals whose disposable income comes only from transfer and benefit payments and thus should not be affected by the transmission of monetary policy via the labour channel (see Annex 1).

3. Empirical approach I - SVAR

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Empirical approach

- **Empirical technique.** We estimate one structural vector autoregressive (SVAR) model per country (11) and income-class (4), where p = 8.

- **Sample.** We cover 2006Q1-2019Q4 (T=56). Each of the seven variables below is included in the model.

$$Y_{it} = C + A_1 Y_{it-1} + A_2 Y_{it-2} + \cdots + A_p Y_{it-p} + \varepsilon_{it}$$

$$Y_{it} = C + \sum_{j=1}^{p} A_j Y_{it-j} + \varepsilon_{it}$$

$$\varepsilon_{it} \sim N(0, \Sigma_\varepsilon)$$

Metric	Transformation	Source
GDP deflator	Log-levels	Eurostat
Shadow rate	Percentage points	Wu and Xia
Long-term rate	Percentage points	ECB SDW
Stock prices	Log-levels	ECB SDW
Real GDP	Log-levels	Eurostat
Unemployment rate	Percentage points	EU-SILC
Real labour income	Log-levels	EU-SILC

3. Empirical approach I - SVAR

Empirical approach

- **Identification scheme.** Both via triangular factorization (i.e., Cholesky decomposition) and sign restrictions.

Identification strategy I – Triangular factorization restrictions (contemporaneous)

Shock:	GDP deflator	Shadow rate	Term spread	Stock prices	Real GDP	Unemp. rate	Labour income
Response:							
GDP deflator		0	0	0	0	0	0
Shadow rate			0	0	0	0	0
Term spread				0	0	0	0
Stock prices					0	0	0
Real GDP						0	0
Unemp. rate							0
Labour income							

Identification strategy II – Sign restrictions (contemporaneous and one-period ahead)

| Shock:	Demand	Supply	Monetary policy
Response:			
GDP deflator	+	-	-
Shadow rate			+
Term spread	+	+	+
Stock prices	+	+	-
Real GDP	+	+	
Unemp. rate	-	-	
Labour income			

3. Results I - SVAR

IRFs to an unexpected -1pps expansionary shock to the shadow rate

━━ Sign restrictions ━━ Triangular factorisation

Main take-aways

- An expansionary MP shock (equal to -1pps) results in a long-lasting effect on prices, leading the deflator of GDP to increase around 0.10-0.15%.

- The term spread reacts to the shock, displaying a negative peak impact between -0.1 and -0.3 pps around three quarters later.

- Stock prices seem to increase ~3% during the first four quarters after the shock.

- Real GDP remains 0.3-0.5% above the pre-shock level for a few years after the shock.
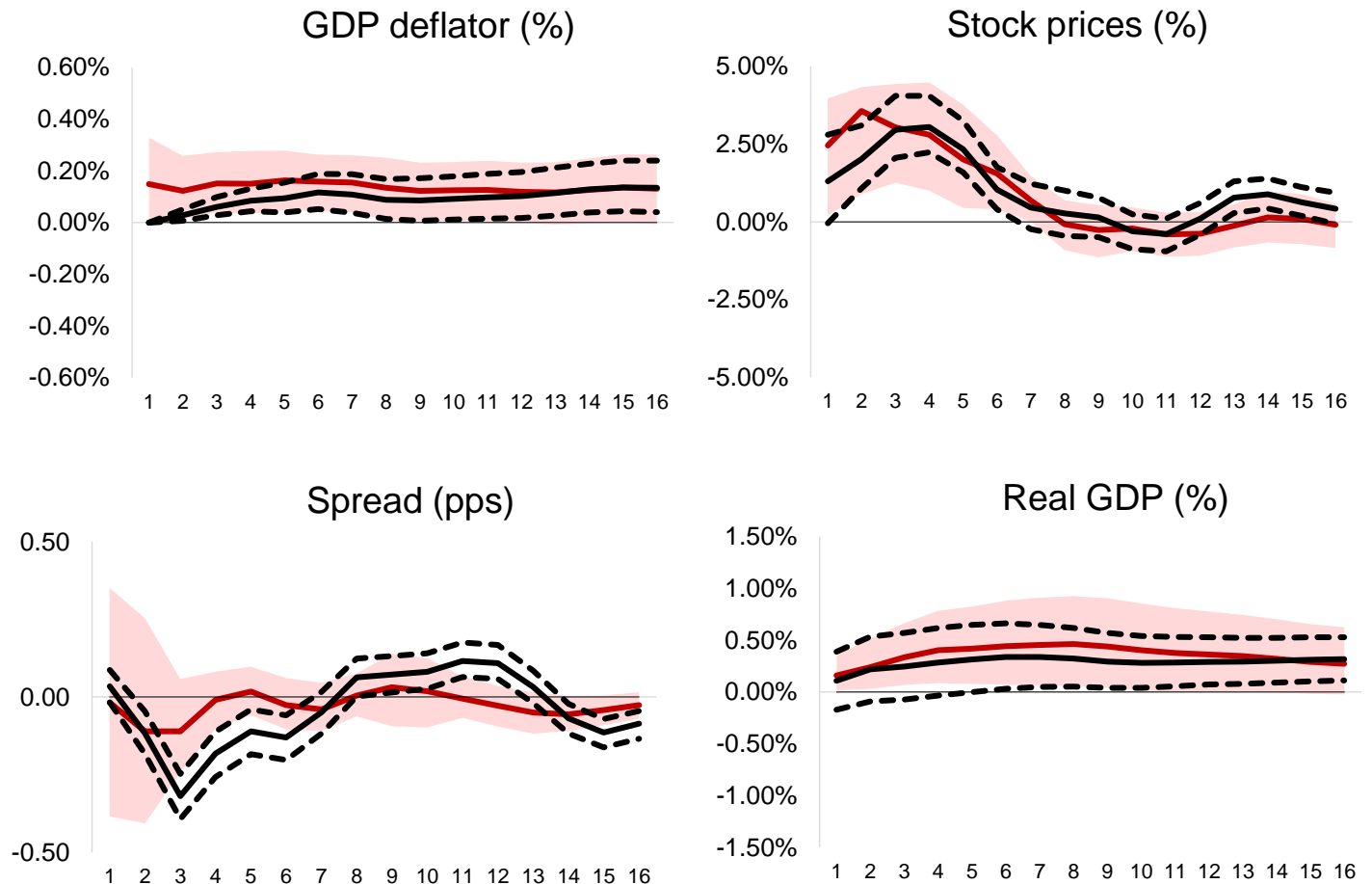
GDP deflator (%)

Stock prices (%)

Spread (pps)

Real GDP (%)

Notes: Shaded areas and dotted lines refer to 90% confidence bands. X-axis refers to the number of quarters after the shock.

3. Results I - SVAR

Main take-aways

- The response of unemployment rate to monetary easing is largely heterogeneous across income classes.

- Lower-income class displays the most sizeable reaction, as it stays around -0.3 and -0.6 pps below the pre-shock value around 7-10 quarters after the shock.

- The overall magnitude of the response decreases as we go up through the income strata.

- Unemployment rates react around -0.15 and -0.25 for the lower-middle class and between -0.1 and -0.15 for the upper-middle class.

- The employment status of the upper class does not seem to be significantly affected by monetary policy shocks.

Part 2. Unemployment rate by income class

IRFs to an unexpected -1pps expansionary shock to the shadow rate

Sign restrictions   Sign restrictions   Triangular factorisation
Sign restrictions   Sign restrictions

Notes: Shaded areas and dotted lines refer to 90% confidence bands. X-axis refers to the number of quarters after the shock.

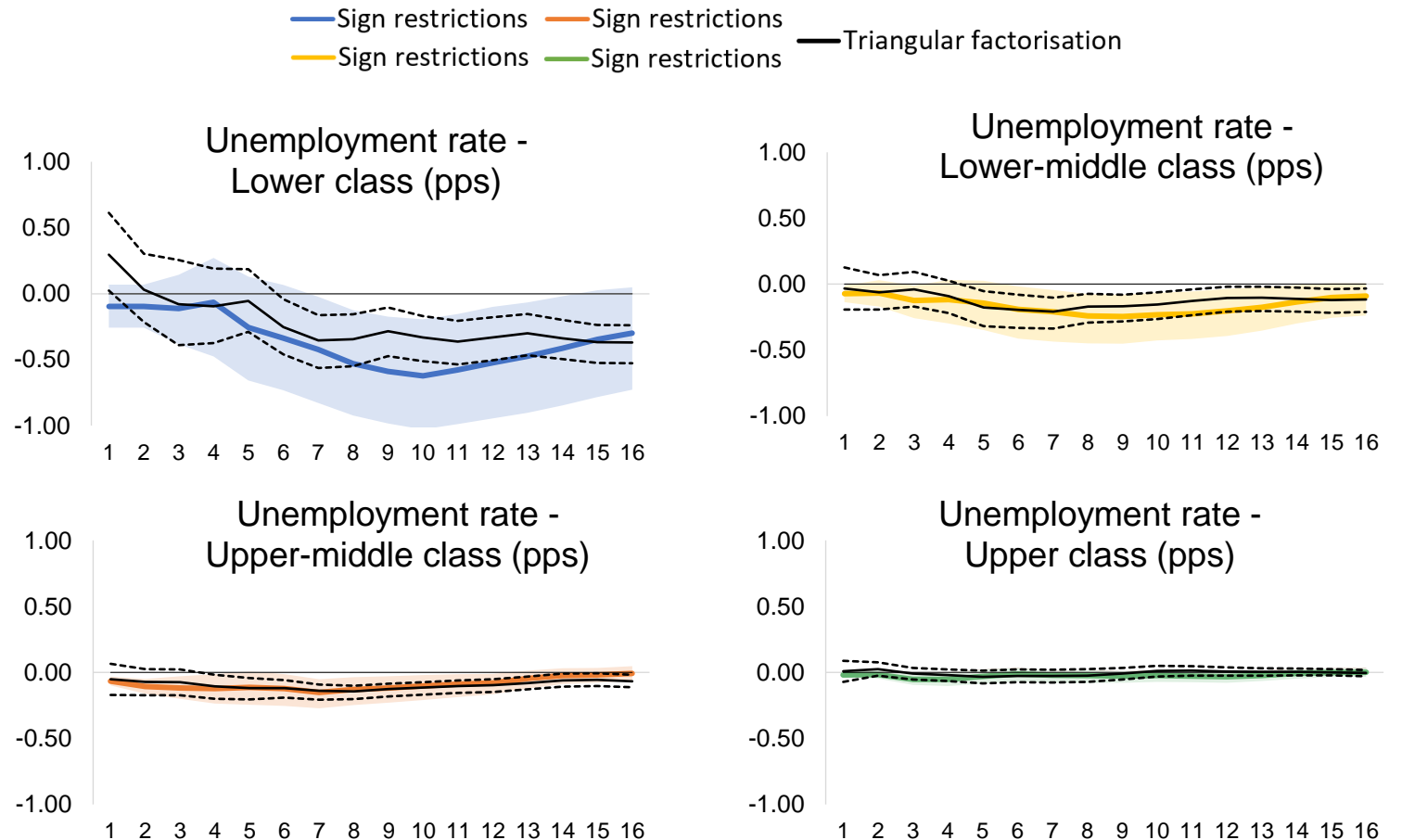# 3. Results I - SVAR

Main take-aways

- The labour income perceived by the lower class has not been significantly affected by monetary shocks.

- For the rest of the income classes, the results paint a mixed picture both in terms of magnitude and time evolution.

- Wages accrued by middle classes (both lower- and upper-middle) are positively affected However, this effect seems to materialise slowly and only becomes significant around 8-12 quarters after the shock (peak impact around 0.15-0.25%).

- By contrast, labour income obtained by the upper-class reacts comparatively more swiftly to monetary policy shocks. Wages are around 0.3-0.5% higher already three to five quarters after the shock.

Part 3. Real labour income by income class

IRFs to an unexpected -1pps expansionary shock to the shadow rate

Notes: Shaded areas and dotted lines refer to 90% confidence bands. X-axis refers to the number of quarters after the shock.
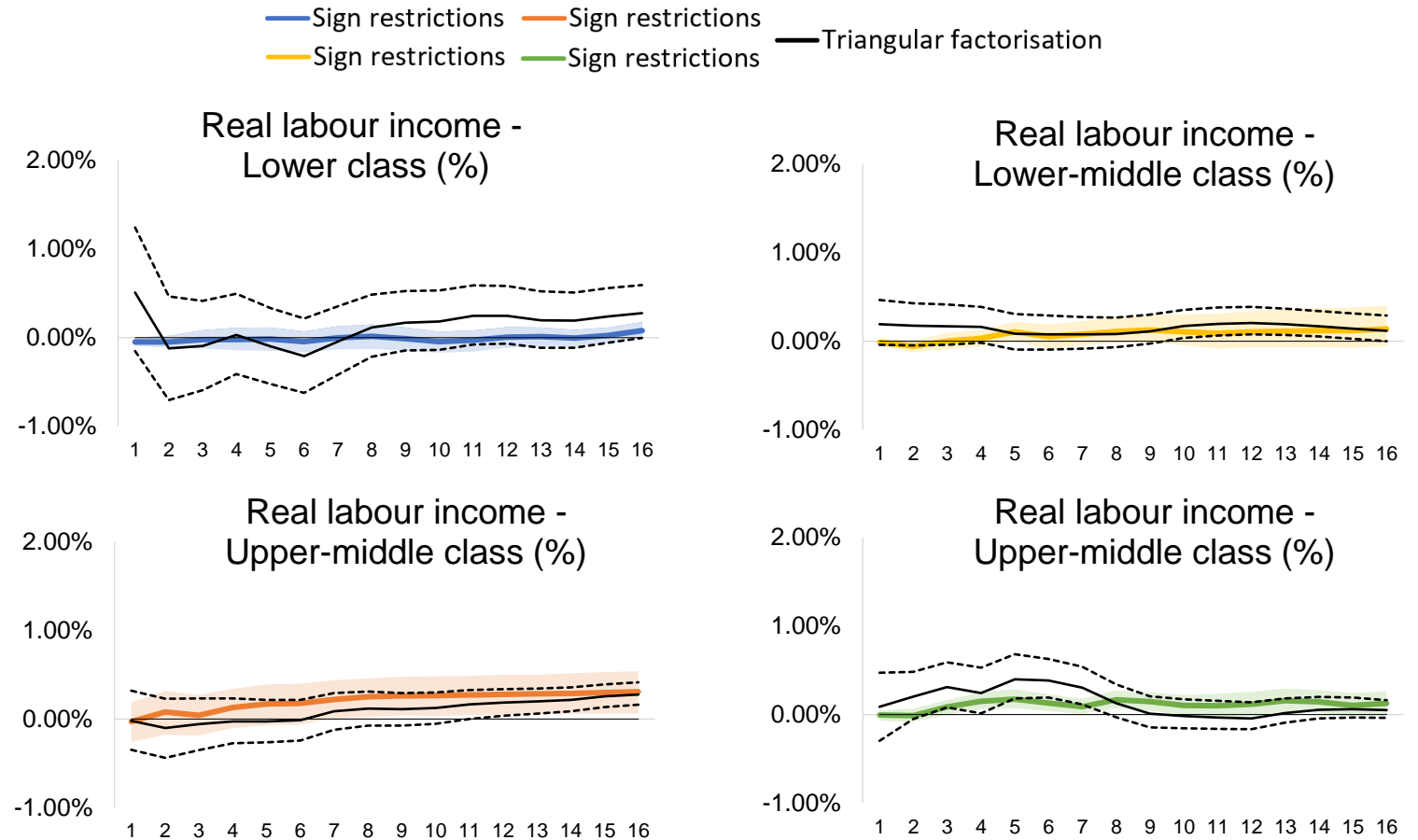
3. Results I - SVAR

Main take-aways

- The estimated impacts of monetary policy both on the extensive and the intensive margin appear to be largely heterogeneous across countries.

- Regarding the effect on the unemployment rate, it appears to be particularly sizeable for Ireland, Luxembourg and Spain, in stark contrast with the Netherlands, Germany and Finland, which display more moderate impacts.

- The salaries of the upper class in Ireland, Luxembourg, Spain, France and Italy seem to be particularly benefitted.

- These disparities relate to the different labour market dynamics across countries. In particular, our analyses identify more sizeable reactions for the countries that suffer larger relative increases in unemployment rate and larger relative decreases in salaries during the recession (i.e., countries for which the metrics of interest seem to have been more sensitive to the economic cycle).

Part 4. Unemployment rate and real labour income

by income class and by country

IRFs to an unexpected -1pps expansionary shock to the shadow rate

Unemployment rate

		AT	BE	DE	ES	FI	FR	IE	IT	LU	NL	PT	EMU-11
Sign restrictions	Lower-class	-0.53	-0.56	-0.36	-0.93	-0.41	-0.72	-2.36	-0.70	-0.98	-0.24	-0.59	-0.62
	Lower-middle class	-0.24	-0.23	-0.17	-0.19	-0.31	-0.18	-1.55	-0.21	-0.51	0.00	-0.30	-0.21
	Upper-middle class	-0.19	-0.15	-0.11	-0.15	-0.27	-0.11	-1.07	-0.14	-0.39	-0.08	-0.23	-0.15
	Upper class	-0.05	-0.05	-0.05	-0.06	-0.09	-0.03	-0.31	-0.05	-0.11	-0.05	-0.10	-0.05
Triangular factorisation	Lower-class	-0.19	-0.17	-0.18	-0.65	-0.18	-0.35	-2.20	-0.34	-0.58	-0.18	-0.22	-0.34
	Lower-middle class	-0.19	-0.26	-0.19	-0.13	-0.15	-0.20	-0.71	-0.16	-0.15	-0.16	-0.13	-0.19
	Upper-middle class	-0.08	-0.09	-0.10	-0.07	-0.07	-0.08	-1.16	-0.09	-0.09	-0.05	-0.08	-0.11
	Upper class	-0.01	-0.02	-0.04	-0.05	0.00	-0.01	-0.05	-0.01	-0.02	0.00	0.03	-0.02

Real labour income

		AT	BE	DE	ES	FI	FR	IE	IT	LU	NL	PT	EMU-11
Sign restrictions	Lower-class	0.02%	0.03%	0.03%	0.00%	0.02%	0.02%	0.05%	0.00%	0.03%	0.02%	0.01%	0.02%
	Lower-middle class	0.10%	0.07%	0.12%	0.09%	0.09%	0.09%	0.00%	0.11%	0.10%	0.07%	0.13%	0.10%
	Upper-middle class	0.22%	0.16%	0.15%	0.17%	0.22%	0.13%	0.76%	0.16%	0.32%	0.11%	0.21%	0.17%
	Upper class	0.26%	0.23%	0.20%	0.31%	0.29%	0.38%	0.41%	0.32%	0.41%	0.14%	0.23%	0.28%
Triangular factorisation	Lower-class	0.06%	-0.16%	0.07%	0.02%	0.05%	0.04%	0.08%	-0.02%	0.07%	0.05%	0.03%	0.03%
	Lower-middle class	0.16%	-0.01%	0.20%	0.10%	0.10%	0.21%	0.61%	0.08%	0.08%	0.17%	0.30%	0.17%
	Upper-middle class	0.10%	0.02%	0.33%	0.27%	0.12%	0.16%	0.19%	0.14%	-0.07%	0.12%	0.19%	0.21%
	Upper class	0.15%	0.10%	0.34%	0.76%	0.27%	0.60%	0.42%	0.70%	0.36%	0.16%	0.27%	0.47%

4. Empirical approach II - LP

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Empirical approach

$$Y_{it+h} - Y_{it} = C^h + A_1^h Y_{it-1} + \beta^h MP_t + \partial^h MP_{t-1} + FE_i^k + \varepsilon_{it+h}$$

$$\varepsilon_{it+h} \sim N(0, \Sigma_\varepsilon^h)$$

- **Empirical technique.** We estimate one panel local projections (LP) model à la Jordà (2005) per endogenous variable.
  - The orthogonal shock is not internally estimated in the system, but is an exogenous variable included directly in the regression. Coefficients of IRFs are retrieved directly through the RHS equation
  - Jarocinski and Karadi (2020) EA shock aggregated annually.
  - Benefits of LPs over SVAR: (i) no underlying dynamics imposed, (ii) no curse of dimensionality, (iii) accommodates non-linearities, (iv) potential misspecification errors not compounded over time.
- **Sample.** We use the original frequency of the micro-level data and cover the period 2006-2019 (T=14).

EA shock by Jarocinski and Karadi
(2006-2019; pps)
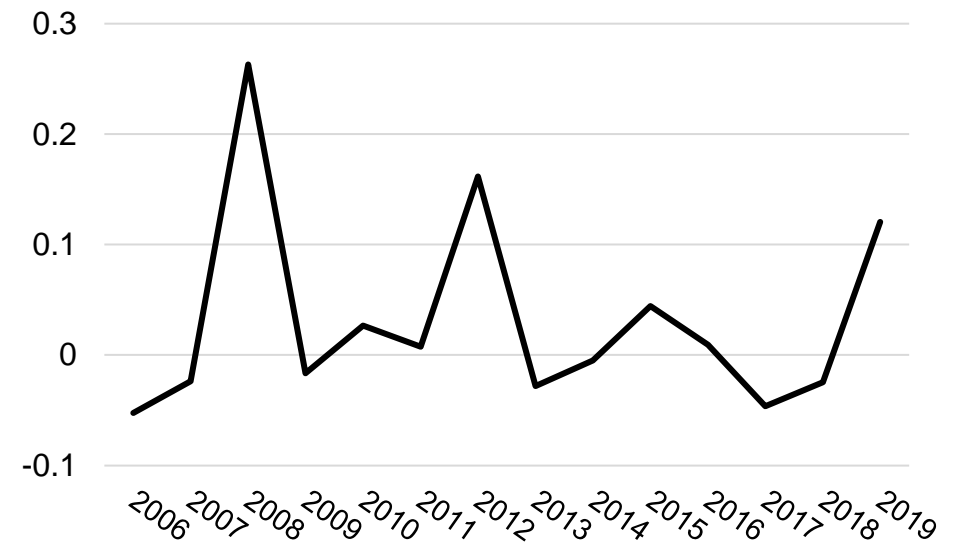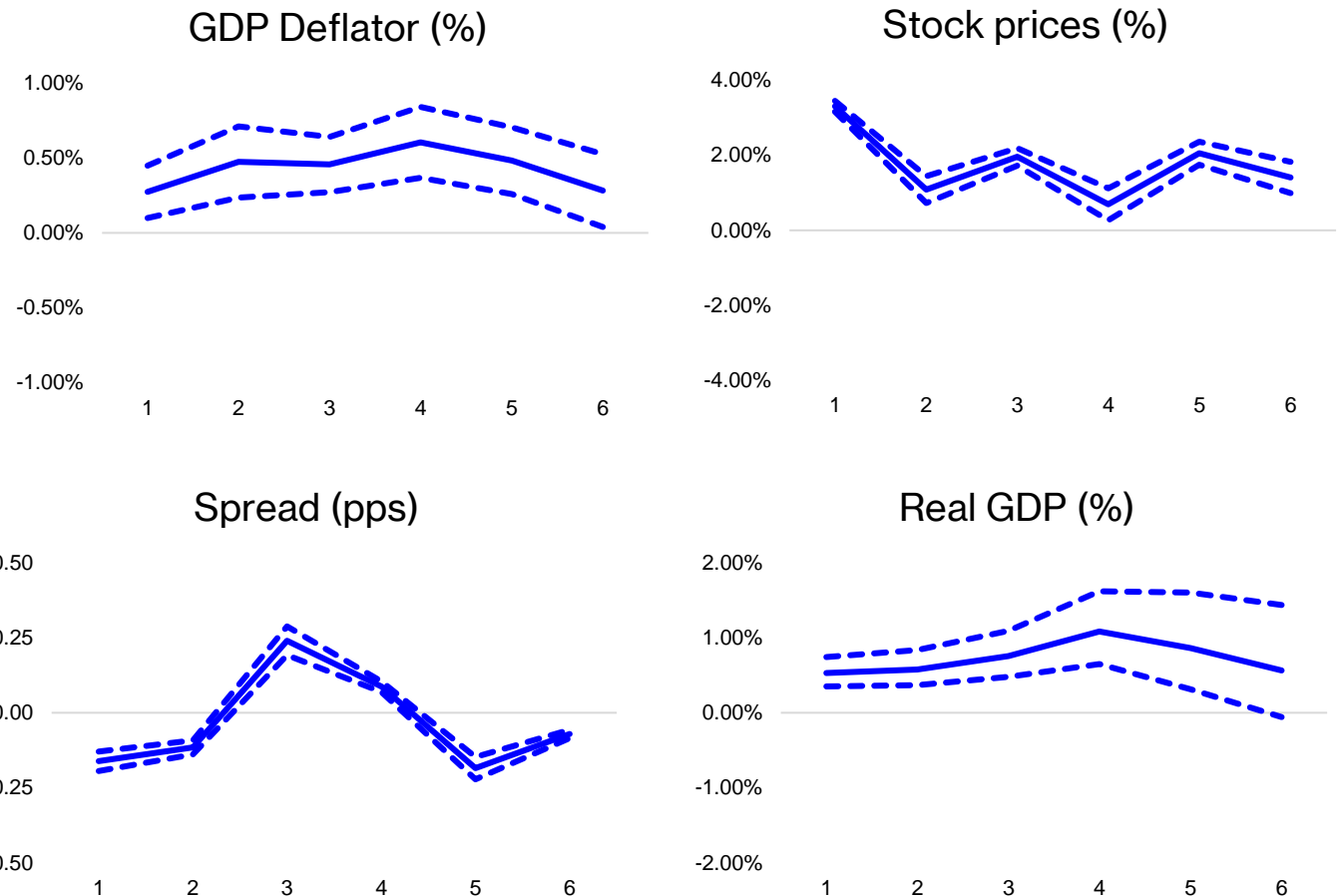
4. Results II - LP

IRFs to an unexpected -1pps expansionary deviation to the EA shock

Main take-aways

- The reaction of the macro variables to a negative -1pps impact on the EA shock by Jarocinski and Karadi (2020) are aligned with Results I (SVAR).

- Both real GDP and the GDP deflator display a positive and long-lived positive reaction that lasts for around four years.

- Stock prices also react strongly and stand around >3% in the first year after the shock.

- In line with previous estimate, short-term response of the term spread is negative.

Notes: Shaded areas and dotted lines refer to 90% confidence bands. X-axis refers to the number of years after the shock.

4. Results II - LP

Main take-aways

- The reaction of unemployment rates to a monetary policy easing shock is heterogeneous across income classes, being particularly larger for the lower class.

- For the most vulnerable households, unemployment rates seems to remain around -0.3 and -0.5 pps below during the first two years after the shock.

- In comparison, the impact is around -0.25 and -0.15 for the lower-middle and upper-middle classes, respectively.

- In line with previous results, the unemployment rate of the upper class does not seem to react to the monetary policy shock in a statistically significant manner.

Part 2. Unemployment rate by income class

IRFs to an unexpected -1pps expansionary deviation to the EA shock

Notes: Shaded areas and dotted lines refer to 90% confidence bands. X-axis refers to the number of years after the shock.
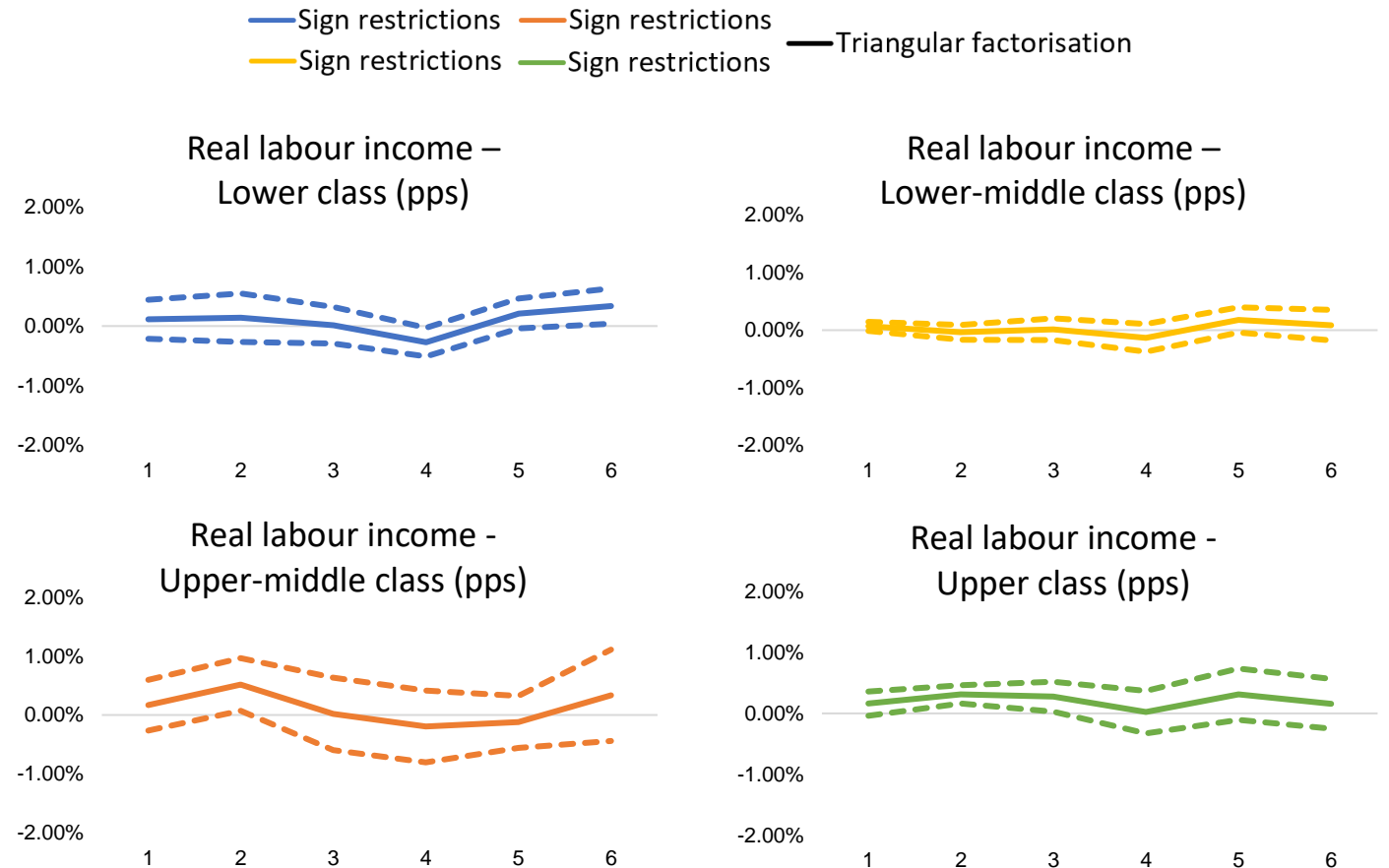
4. Results II - LP

Main take-aways

- The reaction of real labour income display different time patterns across income classes.

- In particular, wages received by lower- and lower-middle class only seem to react to the easing shock in the long run, around 5 years after the shock.

- In comparison, the reaction of upper-middle and upper classes appear earlier in time, as their labour income is statistically around 0.2-0.5% larger already two years after the shock.

- The earlier reaction of the upper class is aligned with the findings in the previous section.

Part 3. Real labour income by income class

IRFs to an unexpected -1pps expansionary deviation to the EA shock

Legend: Sign restrictions, Sign restrictions, Sign restrictions, Sign restrictions, Triangular factorisation

Real labour income – Lower class (pps)

Real labour income – Lower-middle class (pps)

Real labour income - Upper-middle class (pps)

Real labour income - Upper class (pps)

Notes: Shaded areas and dotted lines refer to 90% confidence bands. X-axis refers to the number of years after the shock.

# 5. Conclusions and policy implications

5. Conclusions and policy implications

- Our results suggest expansionary monetary policy boosts real GDP and creates employment opportunities which seem to have been unevenly distributed across income classes. Implications for salaries also differ.

- Regarding the earnings heterogeneity channel (i.e., the extensive margin), monetary policy shocks seem to particularly support employment for those at the leftmost part of the income distribution. The impact estimated for the middle classes is comparatively more modest, while the employment status of the upper class is largely unaffected.

- Regarding the income composition channel (i.e., the intensive margin), salaries accrued by most vulnerable households have not been significantly affected. Monetary easing shocks seems to have particularly increased wages reaped by the upper-middle and upper class.

- When considering the joint impact via both channels, we observe the overall "labour channel" has helped decrease (labour-related) income inequality, as the positive effect via the extensive margin dominates.

- Heterogeneity across countries is wide, highlighting differing labour market dynamics. Countries where unemployment rate and salaries have fluctuated the most during the cycle tend to display a larger estimated impact.

- What might be at stake now that MP stance is reversing? How could other (mostly structural and fiscal) policies take over?

Decomposition of the overall impact on mean labour income (in real terms) into the extensive and the intensive margin
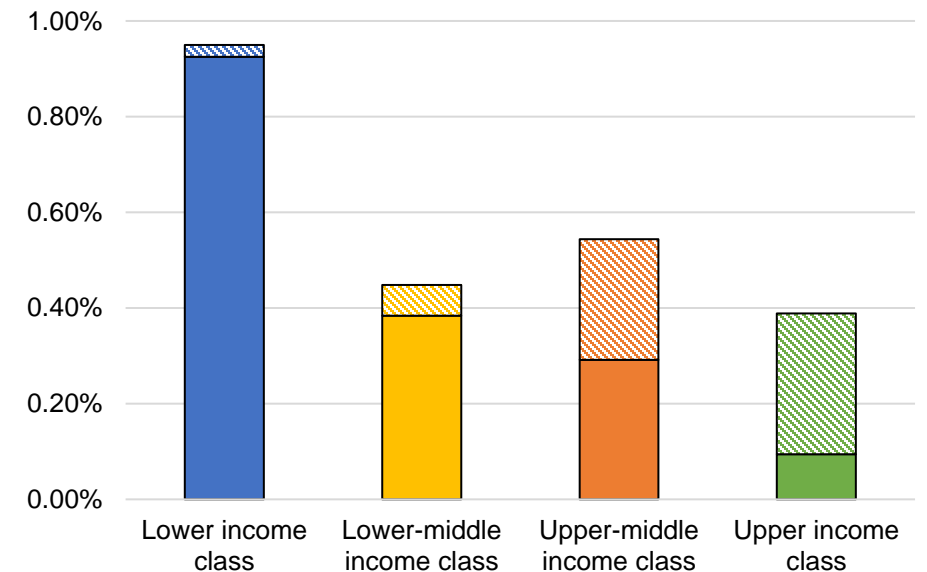
Notes: Figure displays the total effect for all countries in our sample. Impacts used for the computation are the peak impacts estimated via the SVAR set up with sign restrictions.

Thank you for your attention! 😊

Appendix

Appendix I

Percentage of total population represented by each income class

Legend: ■ Lower class ■ Lower-middle class ■ Upper-middle class ■ Upper class ■ Excluded from our sample

Categories: AT, BE, DE, ES, FI, FR, IE, IT, LU, NL, PT, EMU-11