EUROPEAN CENTRAL BANK

EUROSYSTEM

The effect of monetary policy on inflation heterogeneity along the income distribution

QCGBF Annual Conference

2 July 2024

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Introduction

- Effect of distribution on monetary policy
  - E.g. via different MPCs along the distribution (HANK models)

- Distributional effects of monetary policy
  - Known for long with respect to standard policy
  - Reignited interest and public debate following unconventional monetary policy
  - Focus on wealth and income

- Here: Distributional effects of monetary policy on household-specific inflation
  - Via the consumption distribution and shopping behaviour

Research question

What are the effects of monetary policy on inflation heterogeneity along the income distribution?

Income groups might differ in their

(1) consumption baskets

- Cravino et al. (2020): inflation for high-income HHs responds less to monetary policy shocks.
- Kiss & Strasser (2024): product choice within category important source of inflation heterogeneity

(2) shopping behaviour

- Kaplan & Schulhofer-Wohl (2017): cross-sectional variation in US inflation largely due to differences in prices paid
- Argente & Lee (2021): high-income HHs had lower inflation following Great Recession by changing shopping behaviour and substituting product qualities

Main result

- Monetary policy affects inflation differently along the income distribution

- Two different channels
  1. Differences in **consumption baskets**:
     inflation of high-income HHs responds **less**
  2. Differences in **shopping behaviour**:
     inflation of high-income HHs responds **more**

Overview

1. HICP category and micro price data
2. Estimation methodology
3. Results
4. Conclusion

1

HICP category and micro price data

Income-specific inflation based on the HICP and the Household Budget Survey (HBS)

(1) **HBS expenditure shares** for top and bottom income quintile at 2-digit COICOP level

- 1999, 2004, 2010, 2015
- linearly interpolated for missing years

+

(2) **HICP inflation** at 2-digit COICOP level

- seasonally adjusted (Banbura and Bobeica 2020)
- (same for all households)

- Output: Inflation series by income quintile
- Time period: 1999-2018 (2005-2018 to match household panel)

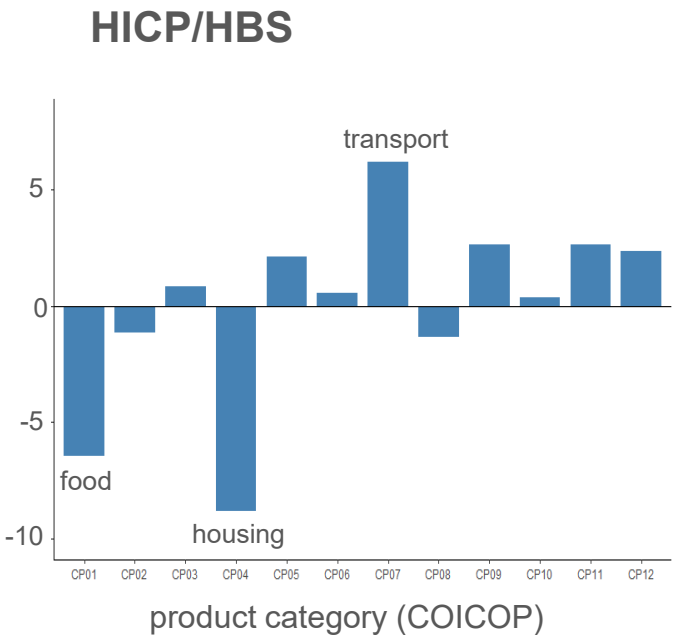
Largest expenditure share difference in food, housing and transport

Expenditure share difference between high- and low-income households

(by product category, percentage points)

Higher share for **high-income** households

Higher share for **low-income** households

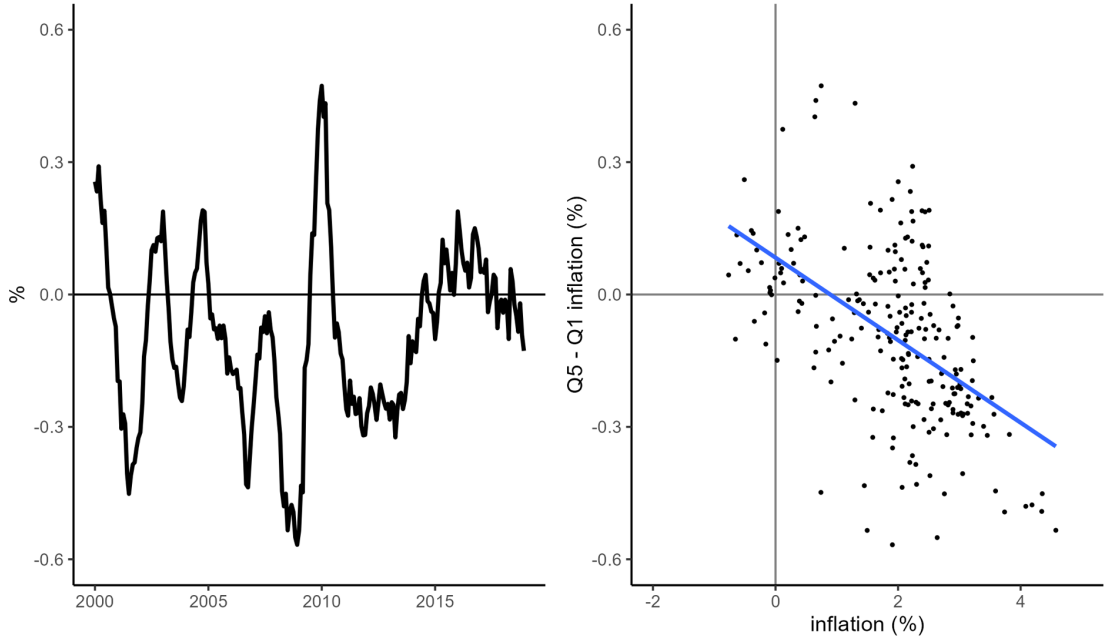


Data: HBS euro area, average of 1999, 2004, 2010, 2015 waves; household panel for six largest EA countries 2005/2012–2018

Inflation for low-income households is higher than inflation for high-income households when inflation is high

Inflation differential between high and low income households

(year-on-year HICP inflation, euro area, monthly)



Data: HBS + HICP, euro area in changing composition

Micro price data: household panel

- Household panels of GfK and Kantar
- Information on purchases (transaction date, barcode, price, quantity purchased), plus socio-demographic information
- 2005 (BE, DE) / 2008 (FR, NL, ES) / 2011 (IT) – 2018
- 160k-420k barcode items per country after data cleaning

- High frequency tracking of i) differences in baskets and ii) prices paid by household
- Limited scope of products (fast-moving consumer goods “FMCG”)
  - Here: food and beverages only (COICOPs 1.1,1.2, 2.1)
  - 15% of consumption, 4.5 pp exp. difference between high and low-income HHs
  - Prominent product differentiation
  - COICOP1 inflation from panel very close to HICP analogue

Inflation by income in household panel

Income-specific inflation based on household panel

- For each month, aggregate all shopping transactions by households belonging to income group for each barcode item (quantity-weighted average price paid)
- Repurchased items only, chained monthly indices
- 12month rolling weights (Laspeyres backward, Paasche forward)
- Decomposition possible
- Output: Inflation series by income quintile (Laspeyres, Paasche) + decomposition

Expenditure share differences within FMCG smaller than between HICP categories

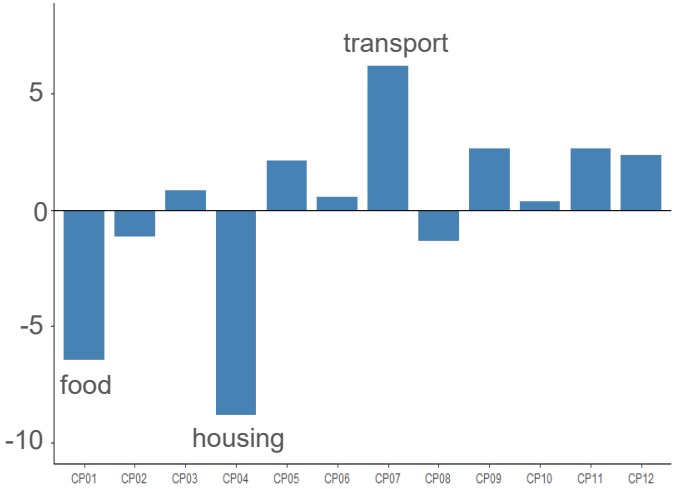
Expenditure share difference between high- and low-income households

(by product category, percentage points)

Higher share for **high-income** households

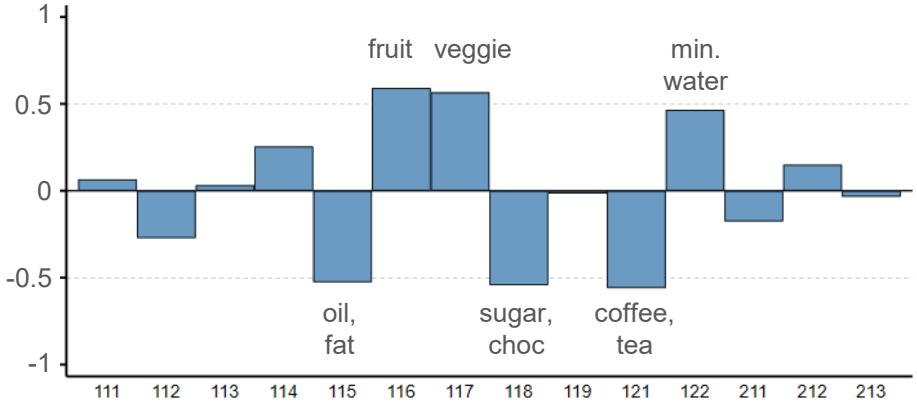
Higher share for **low-income** households

HICP/HBS



product category (COICOP)

Food and beverages (household panel)



product category (COICOP)

Data: HBS euro area, average of 1999, 2004, 2010, 2015 waves; household panel for six largest EA countries 2005/2012–2018

Monetary policy shocks

- Identified in a narrow window around ECB policy announcements
- Jarocinski and Karadi (2020) identification of monetary policy shocks: negative co-movement of interest rates and stock market returns
- “Poor man’s” identification

2

Estimation methodology

Estimation methodology

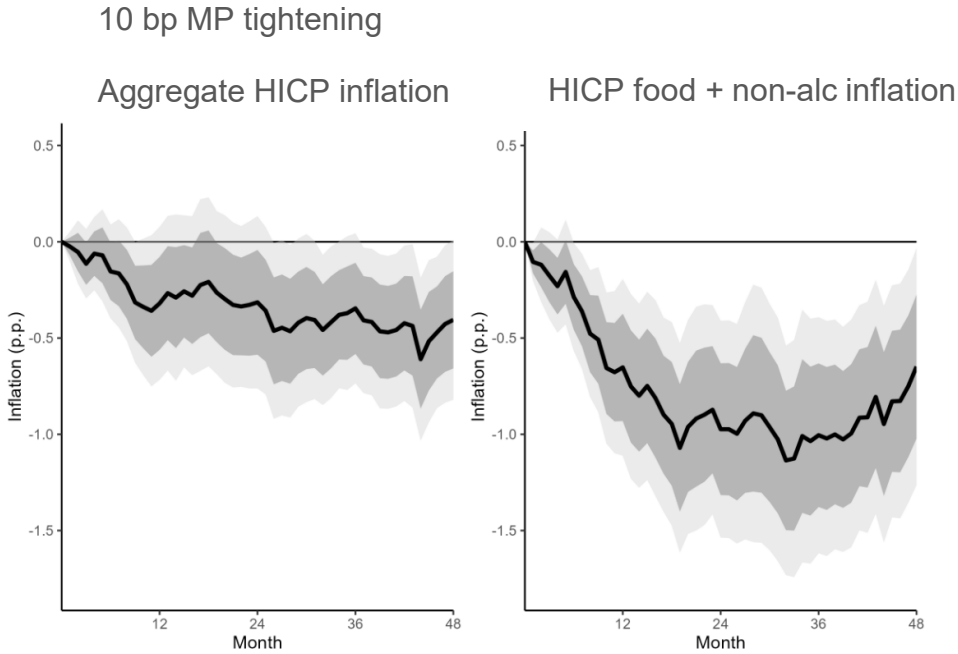
Local projections (Jorda 2005)

- Response of cumulative inflation $\pi_{t,t+h}$ to monetary policy shock ϕ_t
- Panel set-up with country fixed effects.
- Control for lagged values of one-year OIS rate x_t
- For parsimony: group lags of shocks and controls, drop insignificant lags of inflation

$$
\begin{aligned}
\pi_{cty,t,t+h} &= \alpha_h + \theta_h \phi_t \\
&+ \gamma_h^{1M}\phi_{t-1} + \gamma_h^{2M3M}\phi_{t-2,t-3} + \gamma_h^{4M12M}\phi_{t-4,t-12} + \gamma_h^{2Y}\phi_{t-13,t-24} + \gamma_h^{3Y}\phi_{t-25,t-36} \\
&+ \kappa_h^{1M}x_{t-1} + \kappa_h^{2M3M}x_{t-2,t-3} + \kappa_h^{4M12M}x_{t-4,t-12} + \kappa_h^{2Y}x_{t-13,t-24} + \kappa_h^{3Y}x_{t-25,t-36} \\
&+ \pi_{cty,t,t-1} + \delta_{cty} + \epsilon_{cty,t},
\end{aligned}
$$

Estimation methodology

- Aggregate effects same ballpark as Jarocinski and Karadi (2020)
- Response of COICOP01 larger and more tightly estimated
- Starting sample in 2005 significance lost but pattern remains
- Pattern also found for high and low-income groups
- Pattern and magnitude similar across countries



3

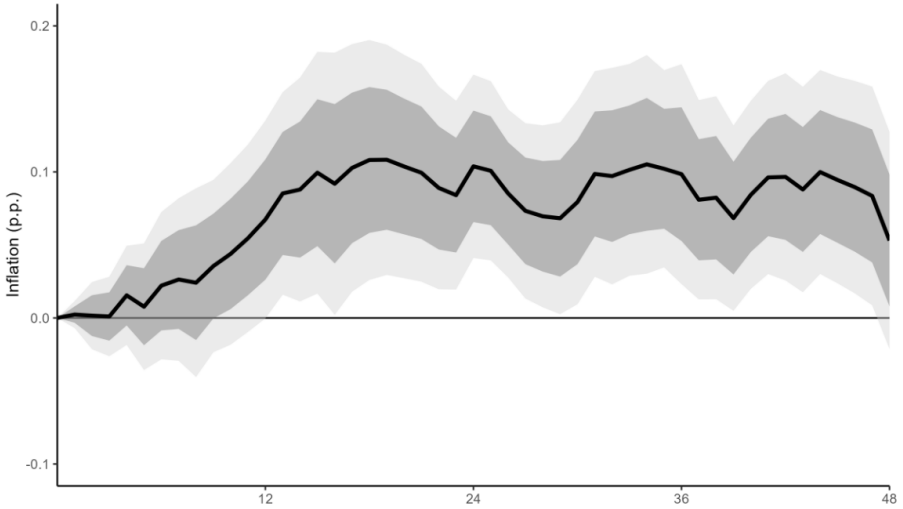
Results

Response of inflation differential (high-low income) to a monetary policy shock

Entire HICP basket

- **HBS/HICP** data, six largest euro area countries
- High-income inflation responds **less**
- Sign and magnitude similar to Cravino et al. (2020)

(10 bp MP tightening, Laspeyres index)

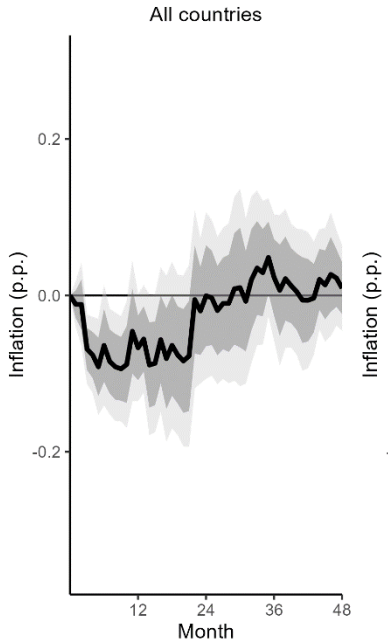


Response of FMCG inflation differential (high-low income) before substitution

Food and beverages

- **Household panel** data, food and beverage only

(10 bp MP tightening, Laspeyres index)

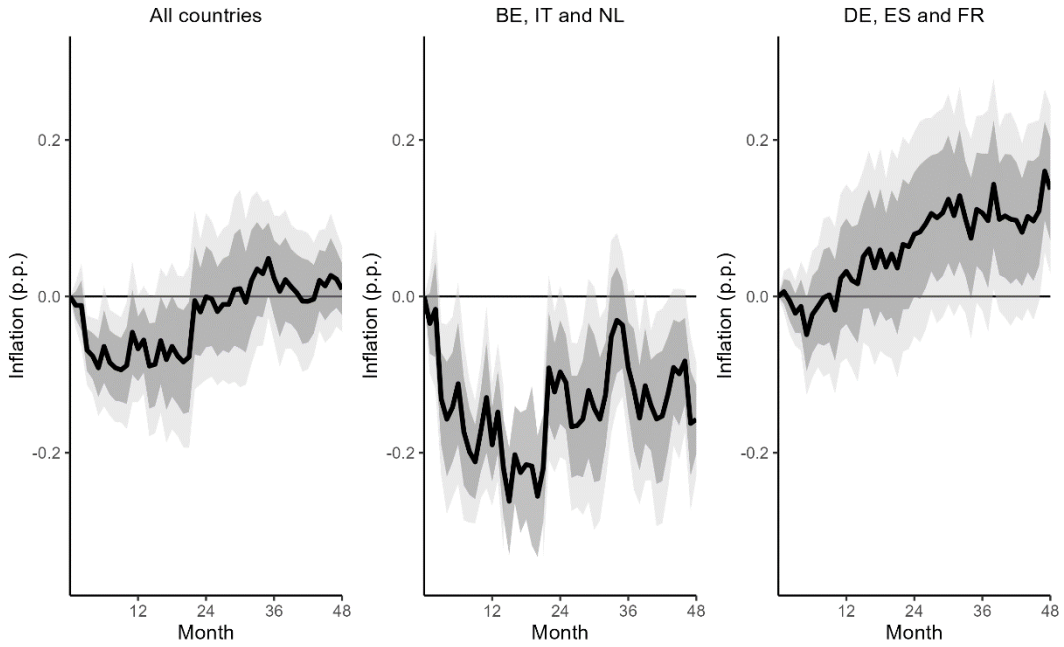


Response of FMCG inflation differential (high-low income) before substitution

Food and beverages

- **Household panel** data, food and beverage only
- Country grouped by size of price ranges = scope for saving
- High-income inflation responds **more** in country group where price differences between possible substitutes are larger (BE, IT, NL)

(10 bp MP tightening, Laspeyres index)



Response of shopping behaviour to monetary policy shocks

- Change in shopping behaviour, in product substitution? (Argente and Lee, 2021)
- Difference between income groups?

➢ Differences in **substitution**
  - Comparison of Paasche and Laspeyres indices

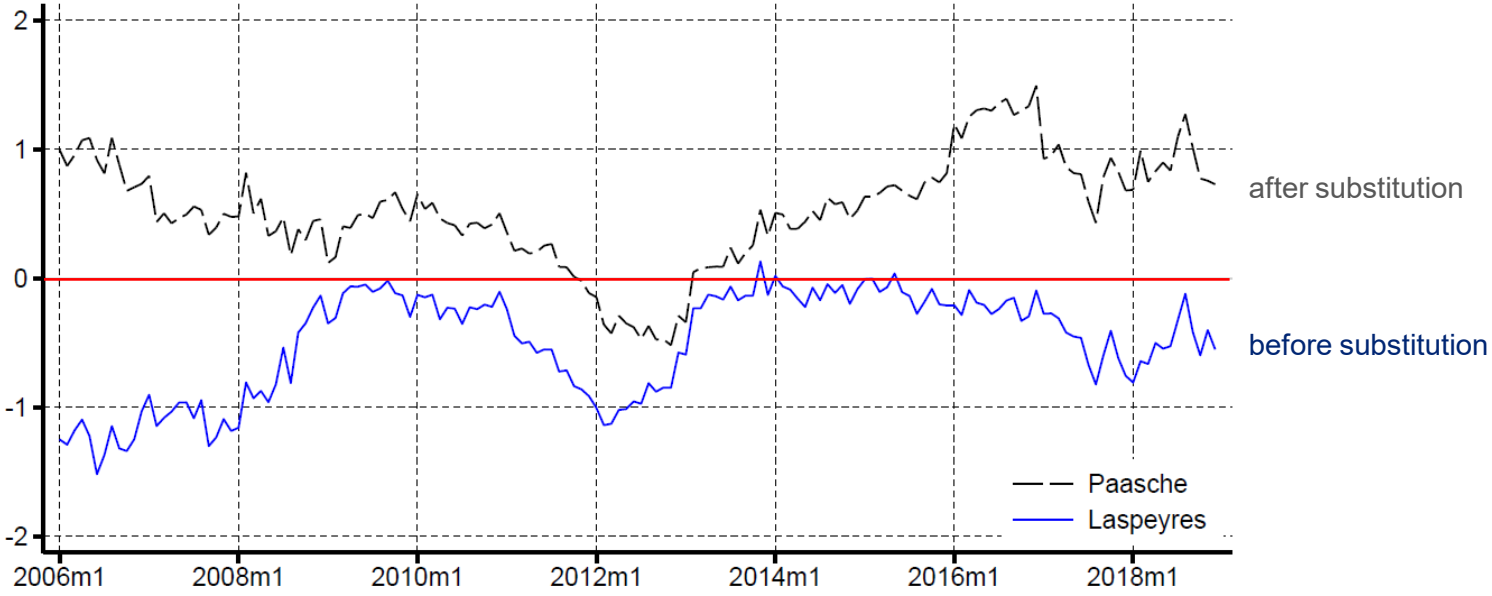
➢ Differences in **shopping behaviour**
  1. Changes in quantities purchased
  2. Number of shopping trips

Unconditionally, low-income households offset higher inflation by product substitution

Food and beverages

Inflation difference between top and bottom income groups

(12-months rolling avg. of six-country weighted avg. inflation rate)



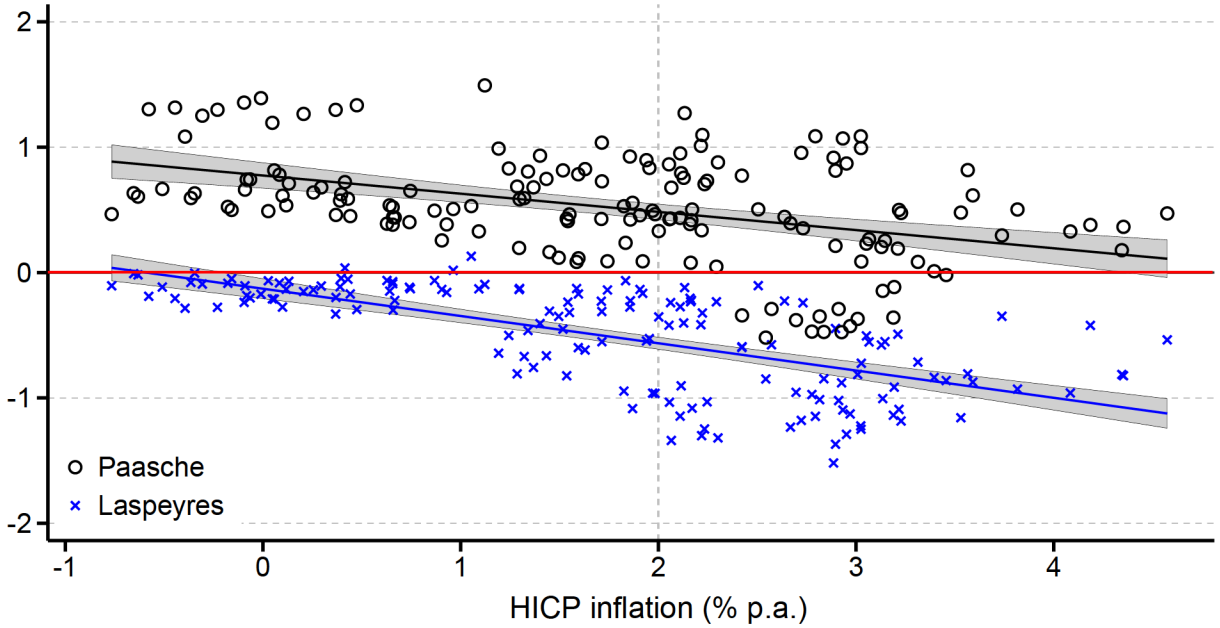
Data: household panel, COICOPs 1.1, 1.2 and 2.1, expanding sample

Difference in shopping behaviour varies with level of aggregate inflation

Food and beverages

FMCG inflation differential versus the level of HICP inflation

(percent p.a., high-income minus low-income)

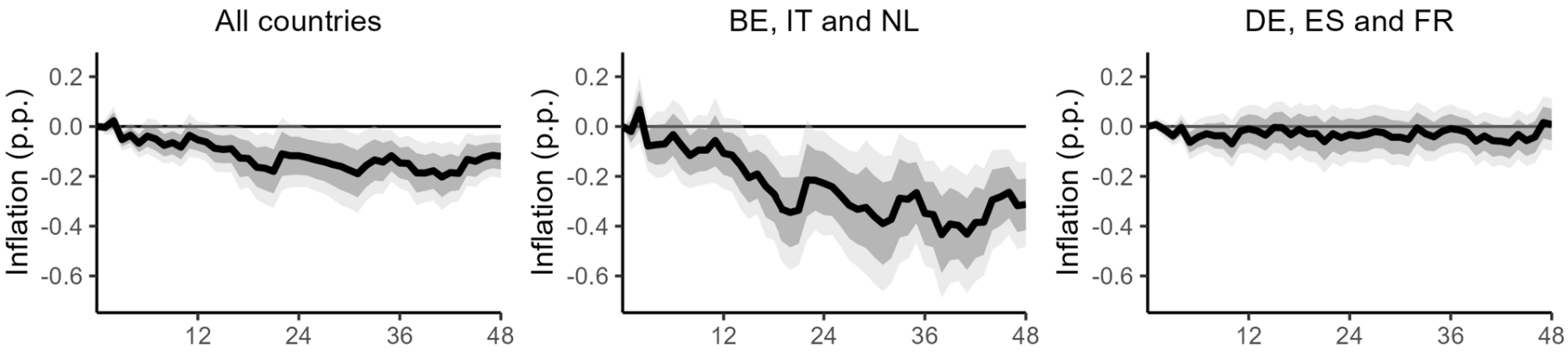


Data: household panel, COICOPs 1.1, 1.2, 2.1
difference of six-country weighted avg.

Response of FMCG inflation differential (high-low income) to a MP shock after substitution

Food and beverages

(10 bp MP tightening, Paasche index)

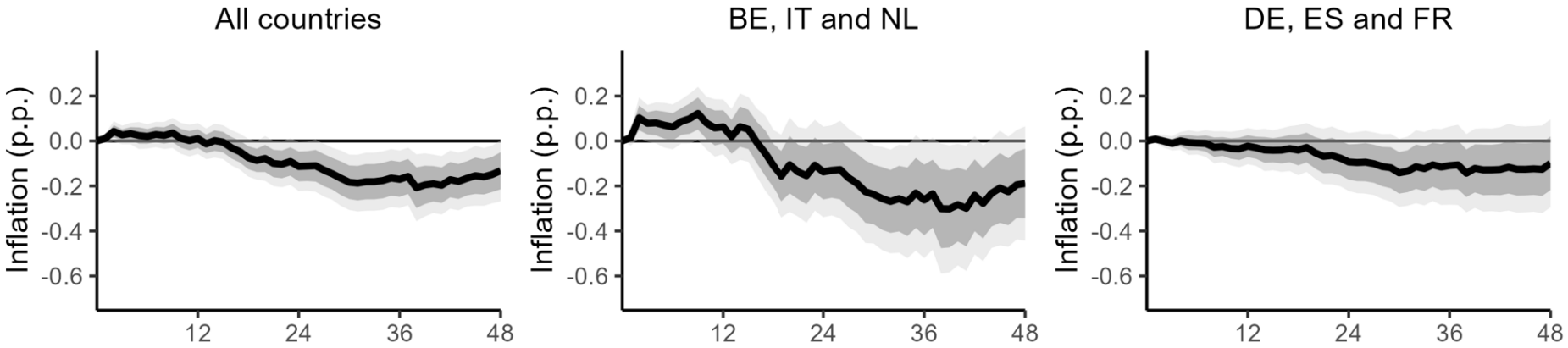


- High-income respond more than low-income households (similar to Laspeyres)
- Heterogeneity across countries

Differences in substitution (high-low income) after a MP shock

Food and beverages

(10 bp MP tightening, Paasche minus Laspeyres differential)



- Initial response: high-income change their shopping behaviour more than low-income hh
- Over time: high-income household product substitution more effective

After a MP shock, high-income households adjust their food and beverage shopping relatively more

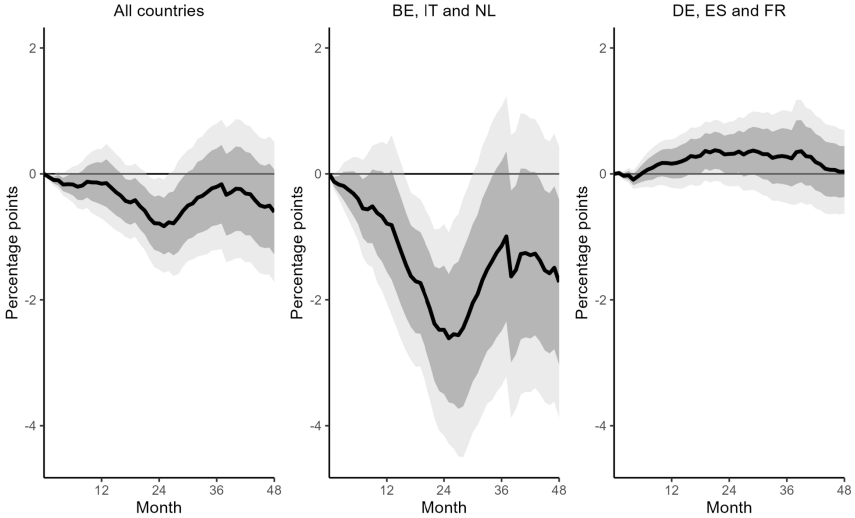
Food and beverages

Response of shopping behaviour (high- minus low-income households)

(10 bp MP tightening, one and 1.65 std. dev. error bands in grey)

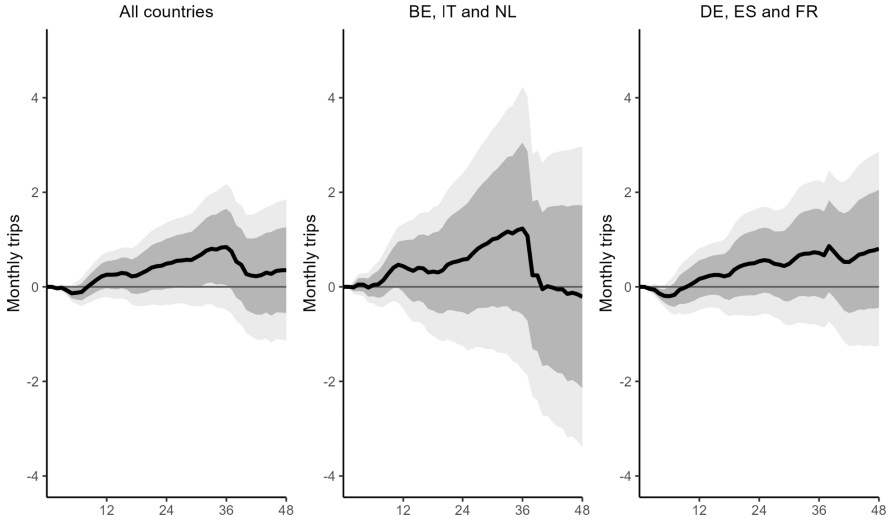
Quantity of repurchased products

(percentage points p.a.)



Number of shopping trips

(monthly trips, cumulative)



Data: household panel for six EA countries 2005/2012–2018, COICOPs 1.1, 1.2 and 2.1, expanding sample

4

Conclusion

Monetary policy affects inflation differently along the income distribution

- Differences in **consumption baskets**: high-income inflation responds **less**
- In line with Cravino et al. (2020)

- Allowing for differences in **prices paid**, high-income inflation responds **more**
- In line with Argente and Lee (2021)
- Changes in **shopping behaviour**

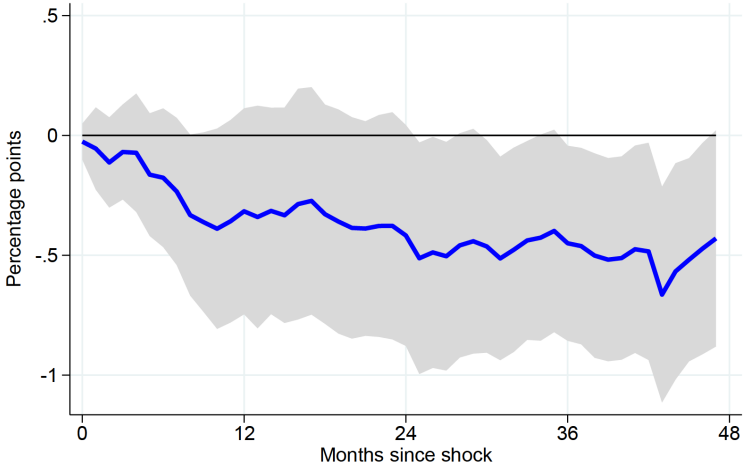
- Response to MP shocks different from unconditional behaviour, heterogenous across markets.
- Determining the overall sign for HICP would require (timely) quantities for all HICP categories.

B

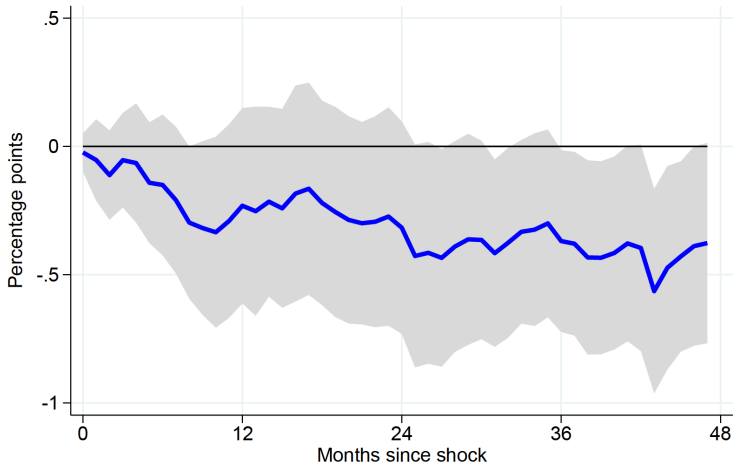
Backup slides

Response of HICP inflation by income group (HBS)

Low-income households



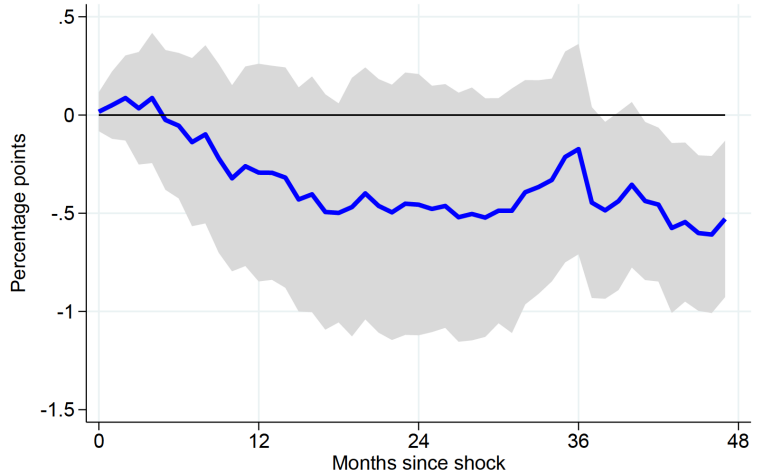
High-income households



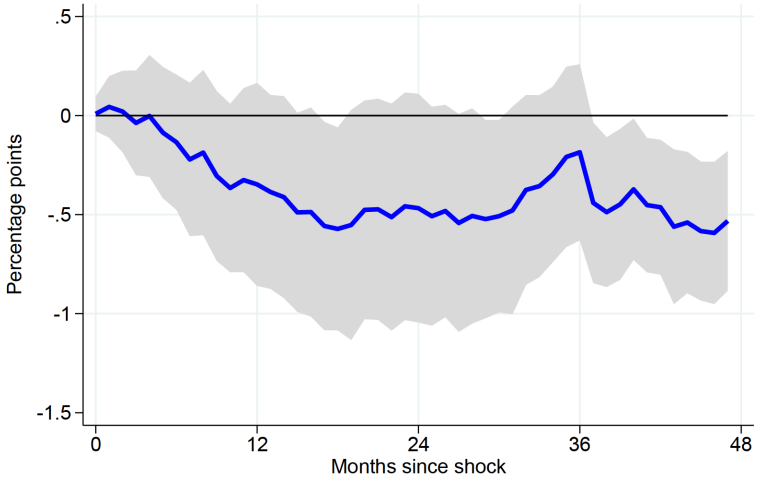
- 10 bp tightening ECB monetary policy shock
- Six euro area countries, sample period 2005-2018

Response of FMCG inflation by income group (household panel)

Low-income households



High-income households



- 10 bp tightening ECB monetary policy shock
- Six euro area countries, sample period 2005/2008/2011-2018

Decomposition of Laspeyres inflation

- Laspeyres inflation can be decomposed in expenditure change and quantity change

$$1+\pi^{i}_{t-1,t} = (1+\varphi^{i}_{t-1,t})/(1+\Xi^{i}_{t-1,t})$$

- Expenditure change component

$$1+\varphi^{i}_{t-1,t} = \frac{\sum_{b\in B(i,t-1)\cap B(i,t)} p^{i}_{b,t-1}\bar{x}^{i}_{b,t-1}}{\sum_{b\in B(i,t-1)} p^{i}_{b,t-1}\bar{x}^{i}_{b,t-1}} \times \frac{\sum_{b\in B(i,t-1)\cap B(i,t)} p^{i}_{b,t}\bar{x}^{i}_{b,t}}{\sum_{b\in B(i,t-1)\cap B(i,t)} p^{i}_{b,t-1}\bar{x}^{i}_{b,t-1}} \times \frac{\sum_{b\in B(i,t)} p^{i}_{b,t}\bar{x}^{i}_{bt}}{\sum_{b\in B(i,t-1)\cap B(i,t)} p^{i}_{b,t}\bar{x}^{i}_{b,t}}$$

- Quantity change component

$$1+\Xi^{i}_{t-1,t} = \frac{\sum_{b\in B(i,t-1)\cap B(i,t)} p^{i}_{b,t}\bar{x}^{i}_{b,t-1}}{\sum_{b\in B(i,t-1)} p^{i}_{b,t}\bar{x}^{i}_{b,t-1}} \times \frac{\sum_{b\in B(i,t-1)\cap B(i,t)} p^{i}_{b,t}\bar{x}^{i}_{b,t}}{\sum_{b\in B(i,t-1)\cap B(i,t)} p^{i}_{b,t}\bar{x}^{i}_{b,t-1}} \times \frac{\sum_{b\in B(i,t)} p^{i}_{b,t}\bar{x}^{i}_{b,t}}{\sum_{b\in B(i,t-1)\cap B(i,t)} p^{i}_{b,t}\bar{x}^{i}_{b,t}}$$