



EUROPEAN CENTRAL BANK

EUROSYSTEM

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

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## 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**

# 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

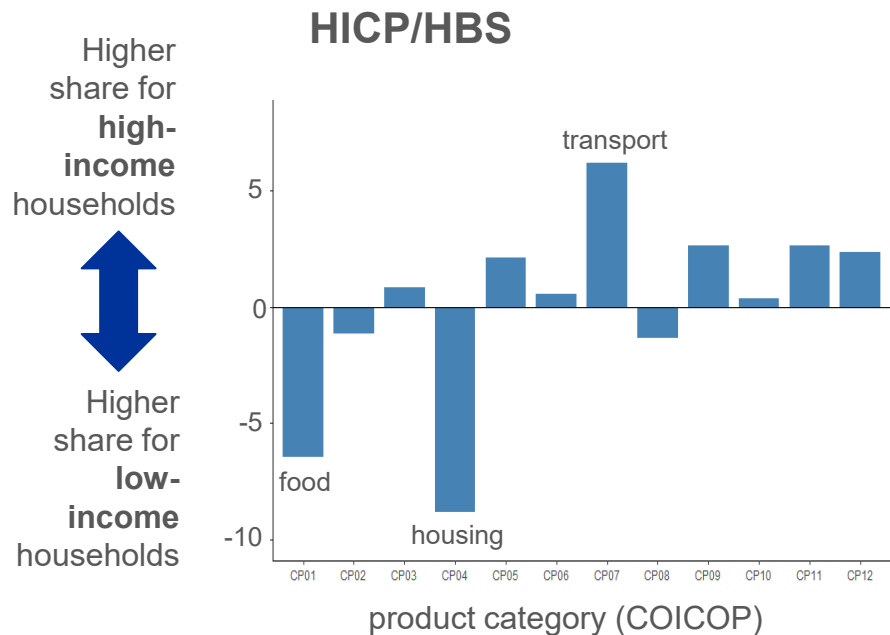
- seasonally adjusted (Banbura and Bobeica 2020)
- (same for all households)

- 
- 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)



## Micro price data: household panel

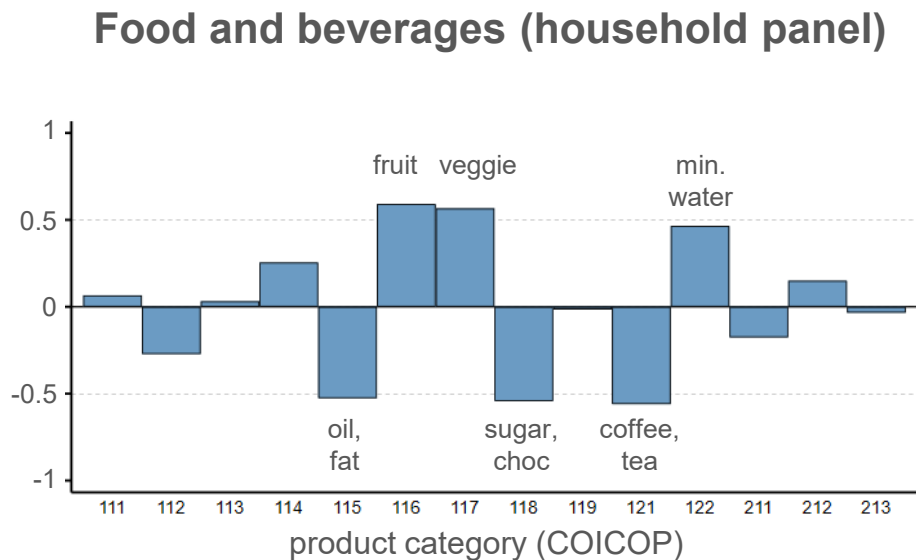
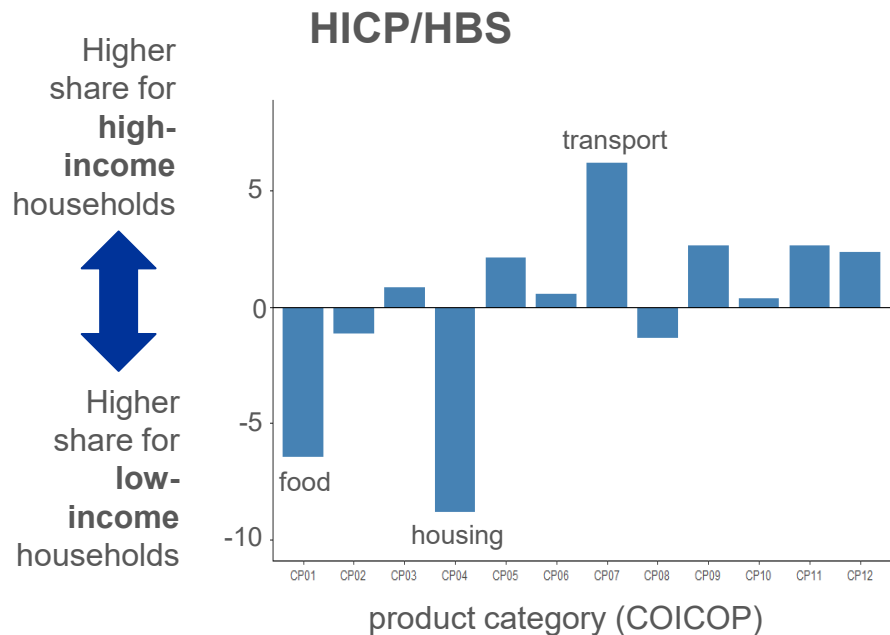
- Household panels of GfK and Kantar
- Information on purchases (transaction date, barcode, price, quantity purchased), plus socio-demographic information
- 2005 (BE, DE) / 2008 (FR, NL, ES) / 2011 (IT) – 2018
  
- High frequency tracking of i) differences in baskets and ii) prices paid by household
- 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 close to HICP analogue



# Expenditure share differences within FMCG smaller than between HICP categories

## Expenditure share difference between high- and low-income households

(by product category, percentage points)



## Inflation by income in 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

# 2

## Estimation methodology

# Estimation methodology

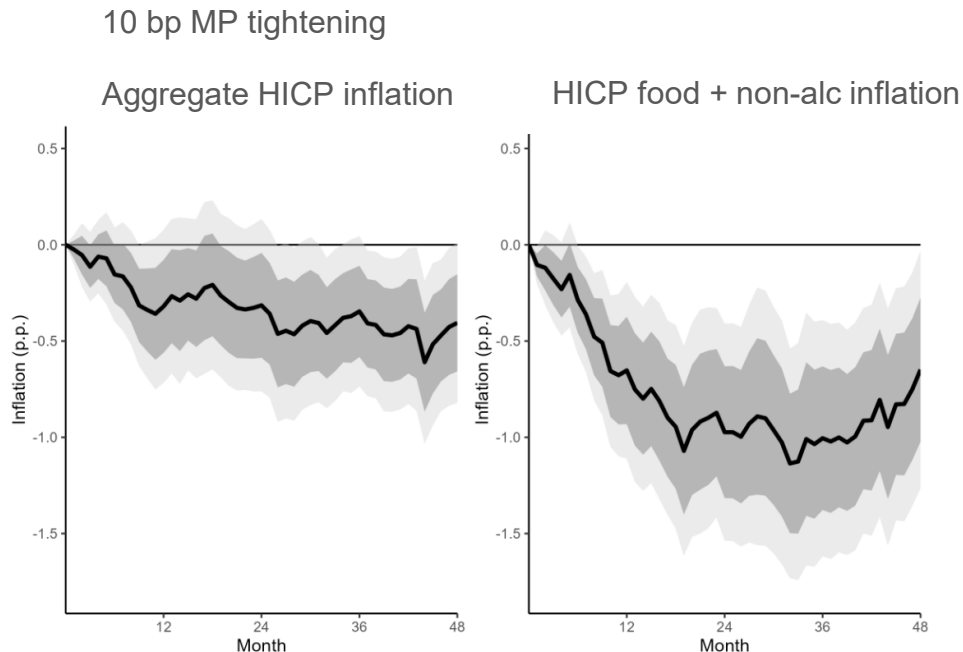
## Local projections (Jorda 2005)

- Response of cumulative inflation  $\pi_{t,t+h}$  to monetary policy shock  $\phi_t$  (Jarocinski and Karadi 2020)
- Panel setup (country fixed effects, 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



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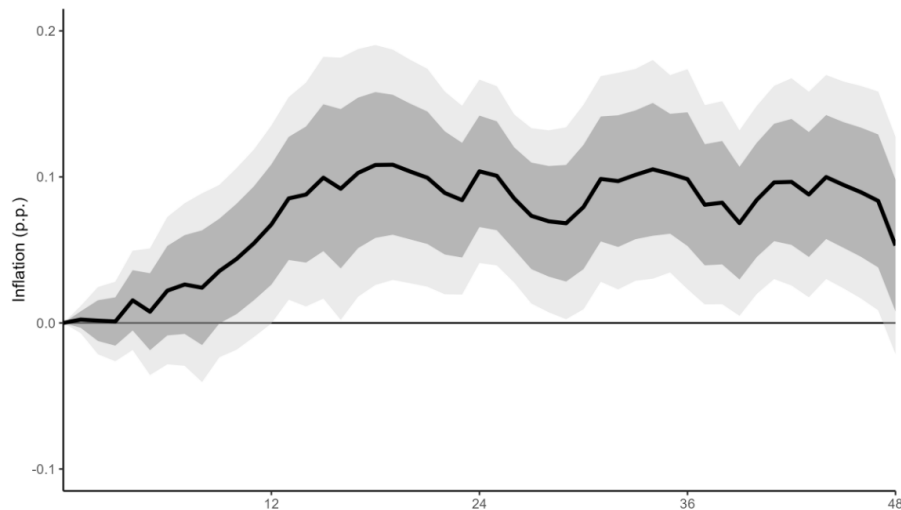
Results

# 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)

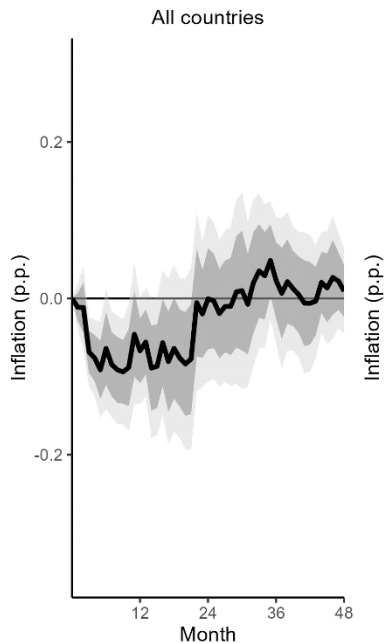


# Response of FMCG inflation differential (high-low income) before substitution

Food and beverages

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

(10 bp MP tightening, Laspeyres index)



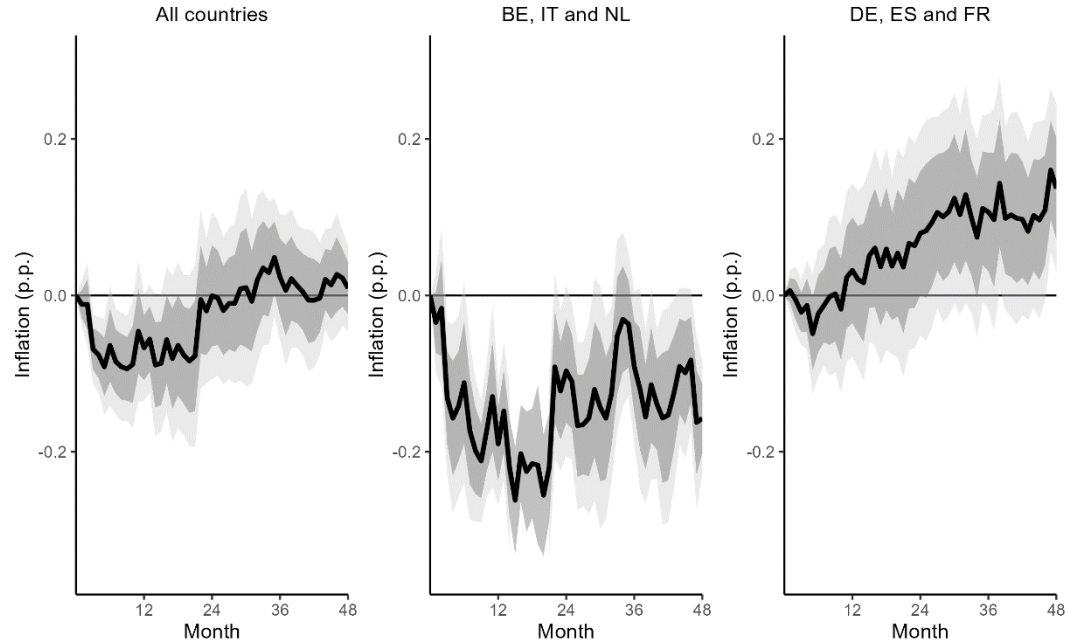


# Response of FMCG inflation differential (high-low income) before substitution

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)

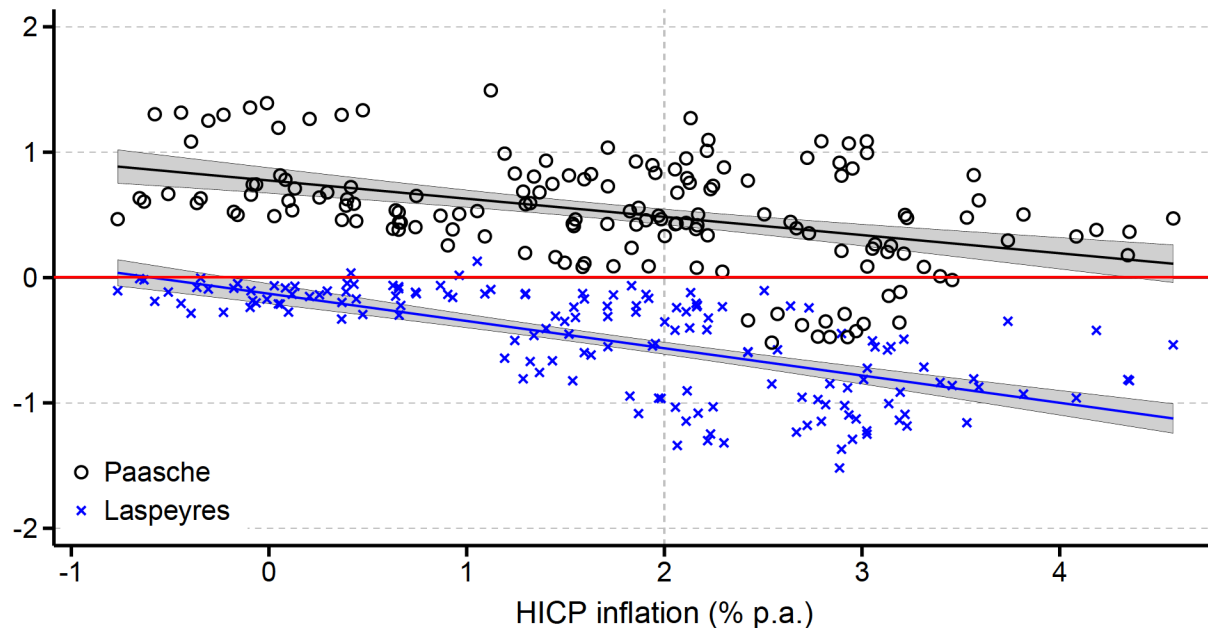


# Difference in shopping behaviour varies with level of aggregate inflation

Food and beverages

## FMCG inflation differential versus the level of HICP inflation

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



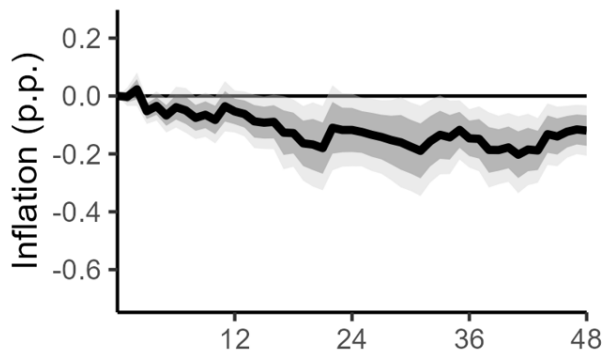
Data: household panel, COICOPs 1.1, 1.2, 2.1  
difference of six-country weighted avg.

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

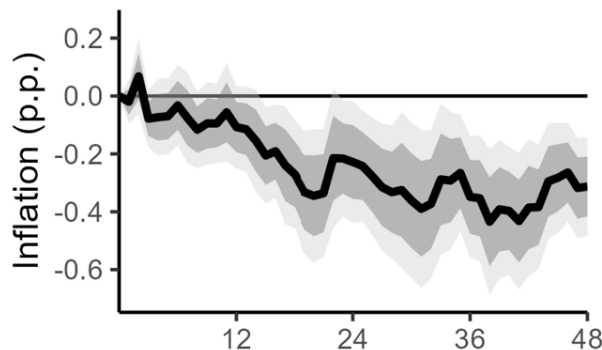
Food and beverages

(10 bp MP tightening, Paasche index)

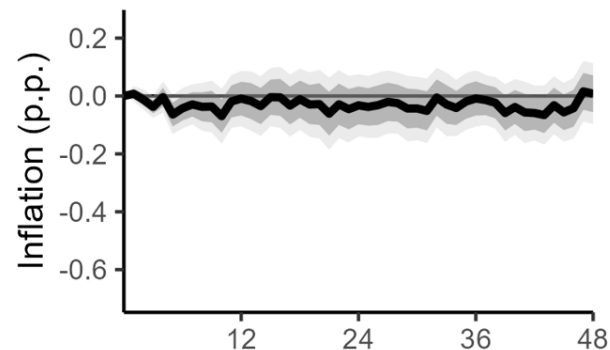
All countries



BE, IT and NL



DE, ES and FR



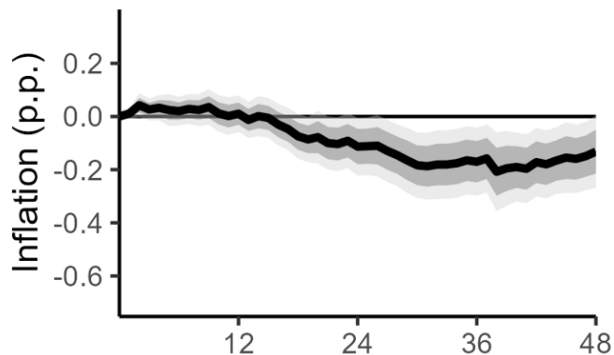
- High-income respond more than low-income households (similar to Laspeyres)
- Heterogeneity across countries

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

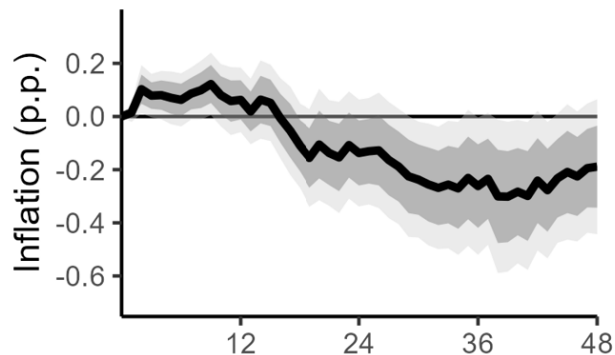
Food and beverages

(10 bp MP tightening, Paasche minus Laspeyres differential)

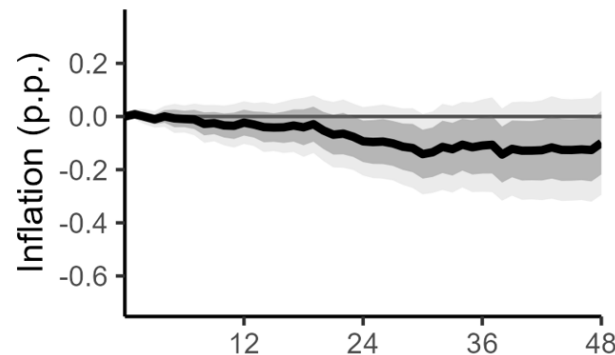
All countries



BE, IT and NL



DE, ES and FR



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

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

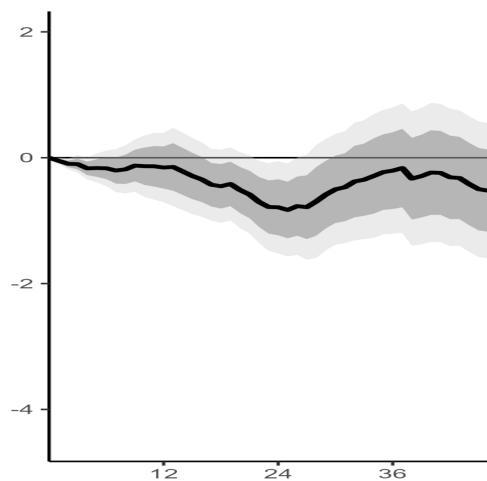
Food and beverages

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

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

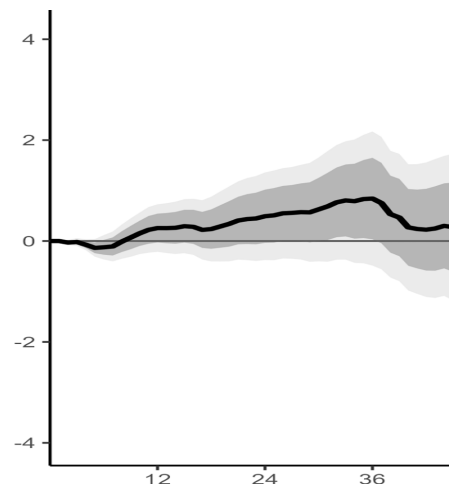
### Quantity of repurchased products

(percentage points p.a.)



### Number of shopping trips

(monthly trips, cumulative)



4

# Conclusion

# Monetary policy affects inflation differently along the income distribution

- Differences in top-level **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



# 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

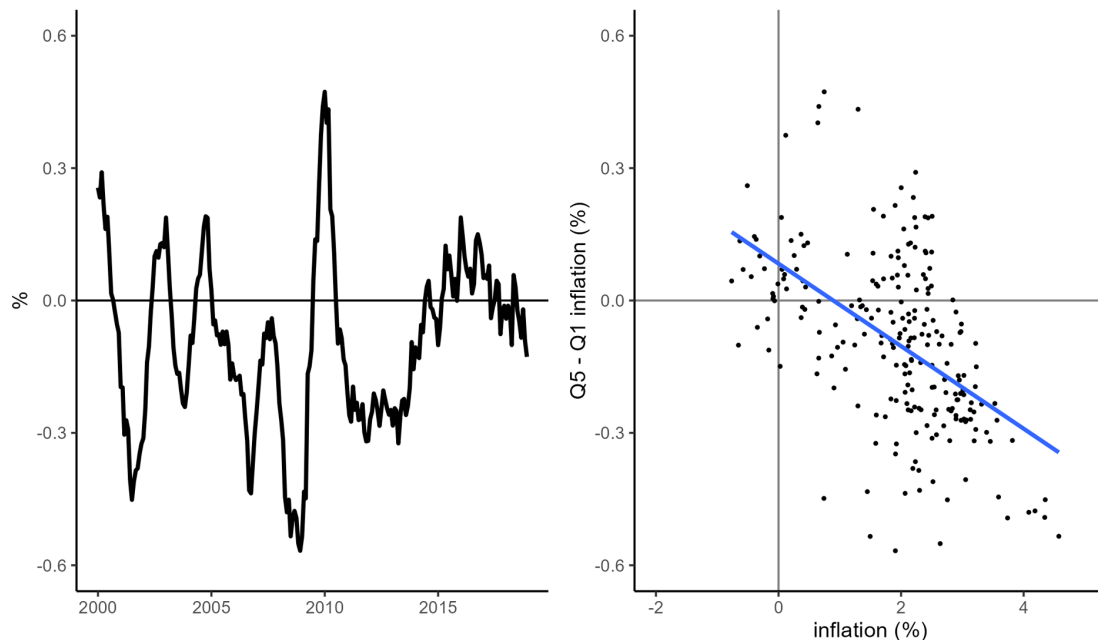
# Monetary policy shocks

- 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

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

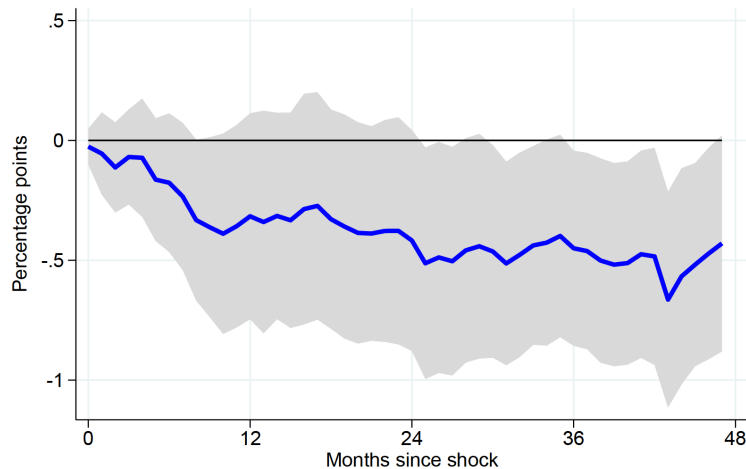
## Inflation differential between high- and low-income households

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

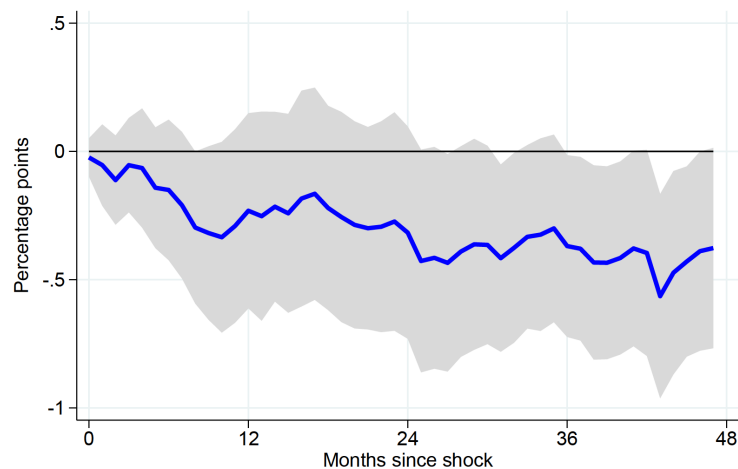


# Response of HICP inflation by income group (HBS)

## Low-income households



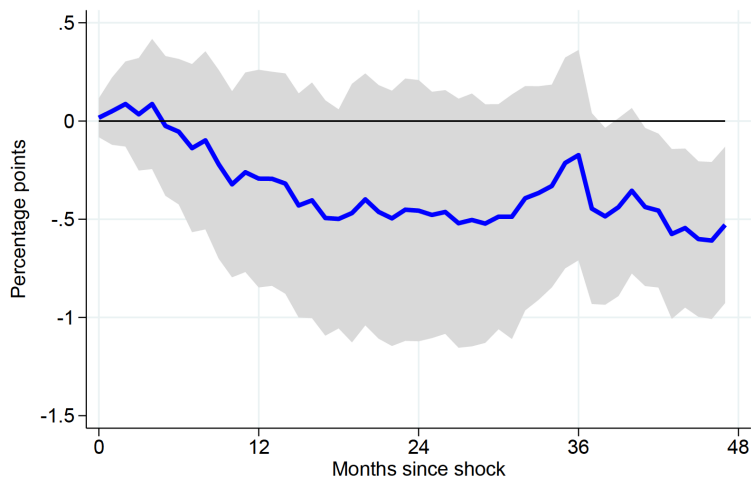
## High-income households



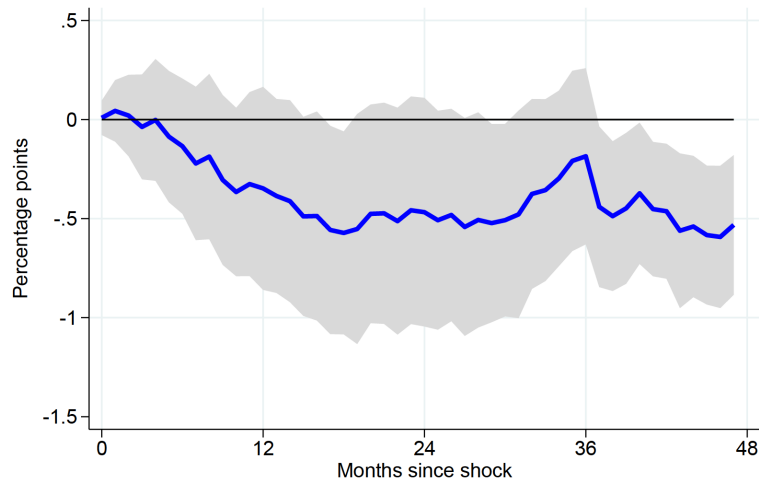
- 10 bp tightening ECB monetary policy shock
- Six euro area countries, sample period 2005-2018

# 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

# Response of shopping behaviour to monetary policy shocks

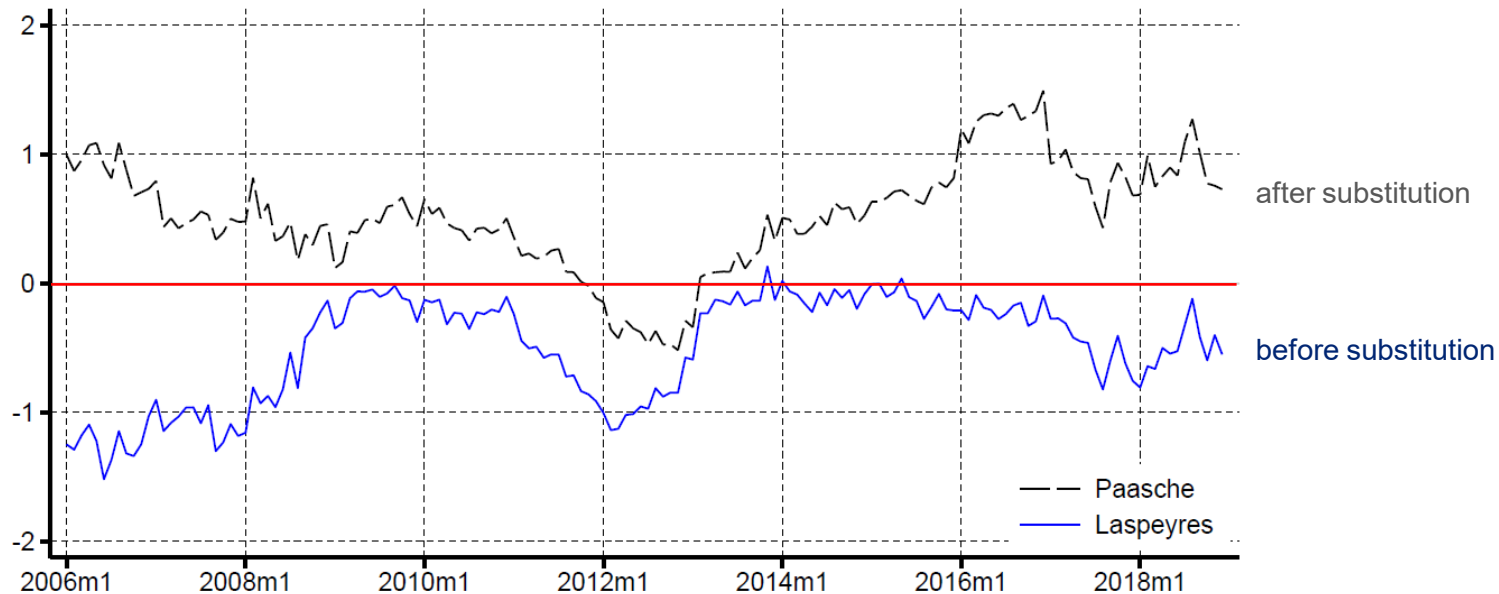
- Change in shopping behaviour, in product substitution? (Argente and Lee, 2021)
- Difference between income groups?
- Differences in **substitution**
  - Comparison of Paasche and Laspeyres indices
- Differences in **shopping behaviour**
  1. Changes in quantities purchased
  2. Number of shopping trips

# 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)



# Decomposition of Laspeyres inflation

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

$$1 + \pi_{t-1,t}^i = (1 + \varphi_{t-1,t}^i) / (1 + \Xi_{t-1,t}^i)$$

- Expenditure change component

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

- Quantity change component

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



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

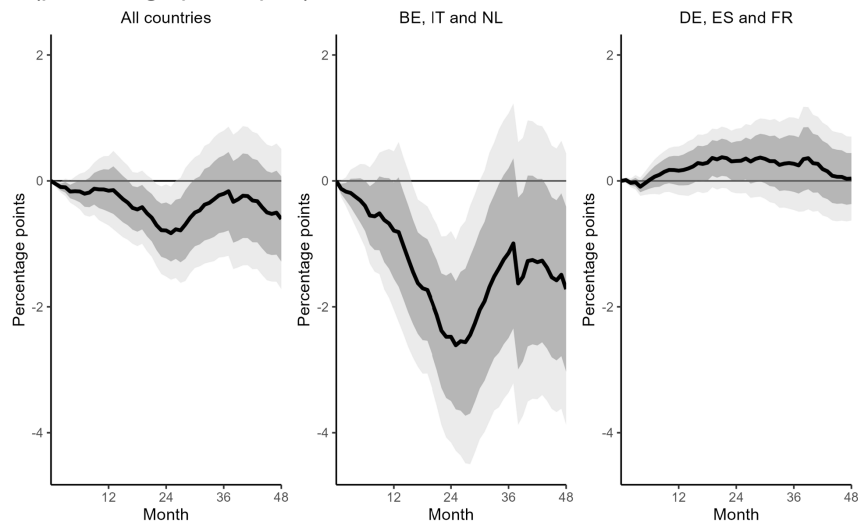
Food and beverages

## 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)

