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# Impact of inflation on household consumption structure. Evidence from EU cross-country panel data

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**Abstract**
The study examines how inflation is associated with the structure of household consumption expenditure across income quintiles in EU countries over the period 2000–2024. Its purpose is to identify whether the budget shares of major consumption categories respond differently to inflation in the lowest (Q1) and highest (Q5) income quintiles. The analysis uses Eurostat cross-country panel data and a fixed-effects baseline specification, in which budget shares are related to headline Harmonised Index of Consumer Prices (HICP) inflation. The dependent variable is an expenditure share. Therefore, the estimated coefficients are interpreted as changes in budget composition rather than as changes in physical consumption volumes. Diagnostic tests indicate serial correlation and groupwise heteroskedasticity, motivating robust inference. The baseline estimates show heterogeneous associations: for Q1, higher headline inflation is associated with a lower food and non-alcoholic beverages budget share, and a higher housing and utilities share; for Q5, negative correlations with inflation are more visible in transport, communications and education, while housing remains positively correlated with inflation. As headline HICP can conceal different relative-price shocks across COICOP components, this limitation is explicitly addressed, and the use of category-specific HICP indices is considered as an important direction for future research. The findings should be read as reduced-form evidence on budget-share reallocation, not as causal estimates of the impact on consumption volumes or welfare levels.
**Keywords:** EU countries, consumption expenditure, inflation, price sensitivity, distributional effects

## Wpływ inflacji na strukturę konsumpcji gospodarstw domowych. Analiza na podstawie danych panelowych z krajów UE

**Streszczenie**

Niniejsze badanie analizuje związek inflacji ze strukturą wydatków konsumpcyjnych gospodarstw domowych w różnych kwintylach dochodowych w krajach Unii Europejskiej w latach 2000–2024. Celem badania jest ustalenie, czy udziały budżetowe głównych kategorii konsumpcji reagują odmiennie na inflację w najniższym (Q1) i najwyższym (Q5) kwintylu dochodowym. W analizie wykorzystano dane panelowe Eurostatu oraz bazową specyfikację z efektami stałymi, w której udziały wydatków według kategorii są wiązane z inflacją mierzoną zharmonizowanym wskaźnikiem cen konsumpcyjnych (HICP). Zmienną zależną jest udział wydatków w budżecie, dlatego oszacowane współczynniki interpretuje się jako zmiany struktury budżetu, a nie jako zmiany fizycznego wolumenu konsumpcji.

Testy diagnostyczne wskazują na autokorelację oraz heteroskedastyczność między jednostkami, co uzasadnia stosowanie odpornych błędów standardowych. Wyniki bazowe wskazują na zróżnicowane zależności: w Q1 wyższa inflacja ogółem wiąże się z niższym udziałem wydatków na żywność i napoje bezalkoholowe oraz wyższym udziałem wydatków mieszkaniowych i na media; w Q5 ujemne zależności są bardziej widoczne w wydatkach na transport, łączność i edukację, natomiast udział wydatków mieszkaniowych pozostaje dodatnio związany z inflacją. Ponieważ inflacja HICP ogółem może ukrywać odmienne szoki cen względnych w poszczególnych kategoriach COICOP, ograniczenie to zostało wyraźnie wskazane, a wykorzystanie indeksów HICP dla poszczególnych kategorii uznano za ważny kierunek przyszłych badań. Wyniki należy zatem traktować jako zredukowane zależności dotyczące przesunięć udziałów budżetowych, a nie jako przyczynowe oszacowania zmian ilości konsumpcji lub poziomu dobrobytu.

**Słowa kluczowe:** państwa Unii Europejskiej, wydatki konsumpcyjne, inflacja, wrażliwość cenowa, efekty rozkładu dochodów

**Inflation** is defined as a persistent rise in the general price level of goods and services and affects nearly every aspect of economic life. Its influence is particularly visible in household consumption patterns, where changes in purchasing power force individuals and families to reconsider how their income is allocated. This reallocation can be especially pronounced in lower-income households, where essentials such as food, housing, and energy already account for a large share of the budget, leaving little room for discretionary spending.

While the relationship between inflation and consumption behaviour has been recognised in economic theory and empirical research, most studies have focused on aggregate consumption, individual countries, or household-specific inflation rates. Less attention has been given to a common cross-country empirical framework that compares how category budget shares covariate with inflation at opposite ends of the income distribution. Understanding these differences is essential, because a change in an expenditure share captures reallocation within the household budget and should not be conflated with a proportional change in the physical quantity consumed.

**The article's aim** is to fill this gap by comparing the lowest and highest household income quintiles across EU Member States over the period 2000–2024. The econometric sample is restricted to EU countries; neighbouring countries presented in the descriptive Eurostat figures are used only for contextual comparison. Focusing on Q1 and Q5 (first and fifth income quintiles) provides a transparent contrast between the two ends of the income distribution and is not intended to imply that intermediate quintiles are homogeneous.

The study addresses **three research questions**:

1) How is headline HICP inflation associated with the budget shares of major consumption categories?
2) Do these associations differ between the lowest (Q1) and highest (Q5) income quintiles?
3) Are the cross-quintile differences concentrated in categories commonly treated as necessities or discretionary expenditure?

Based on the theoretical arguments concerning Engel's Law, household budget constraints and differences in substitution possibilities across income groups, the study verifies the following **research hypotheses**:

**H1:** Headline HICP inflation is significantly associated with changes in the budget shares of major household consumption categories.

**H2:** The association between headline HICP inflation and household consumption budget shares differs between the lowest (Q1) and highest (Q5) income quintiles.

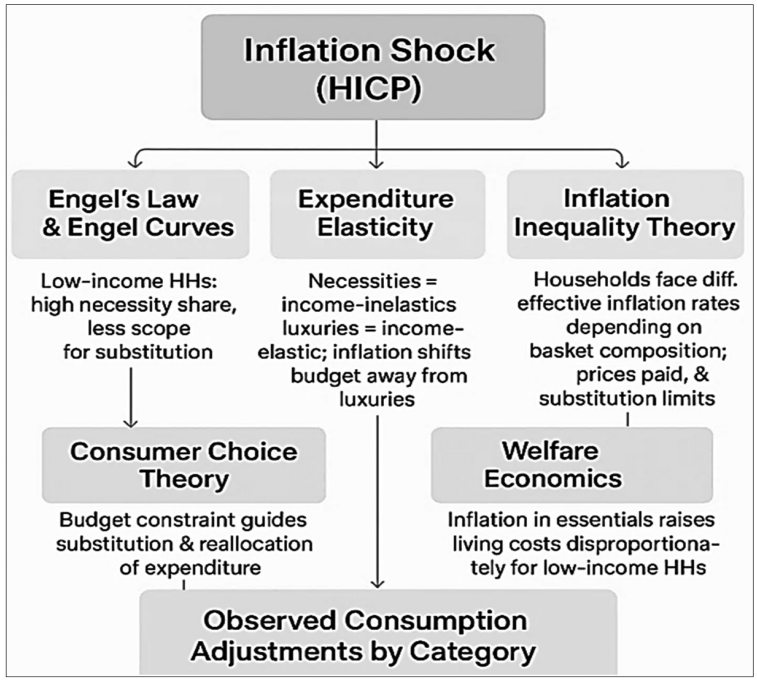
**H3:** Differences between Q1 and Q5 are more visible in consumption categories associated with necessities and discretionary expenditure, reflecting differences in budget constraints and substitution possibilities across income groups.

These hypotheses are tested within a panel-data framework for EU countries over the period 2000–2024. The estimated relationships are interpreted as reduced-form associations between inflation and the composition of household expenditure rather than as causal effects on physical consumption volumes. The contribution is primarily comparative and distributional: the same panel framework is applied across EU countries and to both ends of the income distribution, while the interpretation is explicitly limited to expenditure shares.

## Theoretical considerations

The unequal effects of inflation on household consumption patterns can be understood through several established economic theories (*Figure 1*).

**Figure 1: The mechanism of inflation's impact on household consumption.**




Source: the author's own elaboration.

Engel's Law posits that as household income rises, the proportion of income spent on necessities declines, even if absolute spending increases. The Engel curve illustrates this relationship across income levels. Under inflationary pressure, low-income households, whose budgets are already dominated by essential goods, have a sharper reduction in discretionary consumption, because the scope for substitution is minimal. High-income households, with a greater share of discretionary spending, face less severe welfare losses when essentials rise in price.

Goods are often classified as income-inelastic (necessities) or income-elastic (luxuries). The theory of expenditure elasticity predicts that inflation in necessities disproportionately impacts lower-income households, forcing cutbacks in luxuries. Conversely, inflation in discretionary goods primarily affects higher-income groups, whose consumption of these items is more sensitive to price changes.

According to microeconomic consumer choice theory, households reallocate expenditure in response to price changes, guided by utility maximisation under budget constraints. For low-income households, substitution possibilities for essentials are limited, so inflation leads to quantity or quality reductions rather than shifting consumption to cheaper alternatives. For high-income households, substitution among discretionary goods is more feasible, softening the welfare impact.

Kaplan and Schulhofer-Wohl in their research on inflation heterogeneity at the household level (Kaplan, Schulhofer-Wohl 2017) argue that households face different effective inflation rates due to variations in consumption baskets, purchasing locations, and price sensitivity. This heterogeneity means aggregate inflation measures can mask significant distributional disparities, with low-income households typically experiencing higher effective inflation rates. In welfare economics, inflation in essentials increases the cost of living disproportionately for households near subsistence levels, reducing real income and overall welfare (Moreira 2025). The compensating variation and equivalent variation measures from consumer theory can quantify these welfare losses, emphasising the regressive nature of essential goods inflation. Taken together, these frameworks explain why inflation can be associated with different budget-share adjustments across income groups. They do not, however, imply that a coefficient on an expenditure share identifies a change in physical consumption volume. This distinction guides the empirical interpretation below.

## Literature review

Previous studies have documented that inflation reduces real incomes and forces households to prioritise essential goods. Engel's Law posits that as income rises, the proportion of income spent on food decreases, which implies a larger share of food expenditure in low-income households. Studies by Deaton (1997), and more recently by Ravallion (2016), have explored how inflation can exacerbate poverty by increasing the cost of living. However, there remains a research gap in understanding the structural reallocation of household spending across economic strata and development levels.

Szwacka-Mokrzycka and Lemanowicz (2023) discuss the significant impact of inflation on Polish households, particularly after a prolonged period of deflation leading to rising consumer prices since 2017, culminating in double-digit inflation by 2022. The primary objective of the study is to explore the causes and societal consequences of this inflationary trend while proposing measures to mitigate its effects. The research utilises both primary and secondary data, analysing household income, expenditure, and consumption patterns from 2015 to 2022. The findings indicate a strong correlation between inflation levels and household consumption behaviour, highlighting that lower-income households experience greater difficulty in satisfying food needs due to increased income elasticity of demand. The paper emphasises the role of government monetary policies and the central bank's actions, noting the mixed nature of current inflation resulting from both supply and demand pressures. Recommendations are focused on strategies to control inflation, suggesting that interest rate adjustments and stimulating savings could help mitigate inflationary effects on vulnerable households, particularly those with limited financial resources. The research offers insights valuable to policymakers and marketers in shaping effective economic policies aimed at alleviating inflation's impact on households in Poland.

Kaplan and Schulhofer-Wohl (2017) in their research examine the variation in inflation rates experienced by individual households compared to aggregate measures.

They utilise detailed scanner data from the Kilts-Nielsen Consumer Panel, covering 500 million transactions of roughly 50,000 U.S. households between 2004 and 2013, to reveal significant disparities in inflation rates across households, with annual rates ranging from 6.2% to 9.0%. The primary drivers of this heterogeneity are variations in prices paid for identical goods rather than differences in the types of goods consumed. Notably, lower-income households tend to face higher inflation rates, highlighting increasing inequality in real versus nominal incomes. Despite the considerable variability, household inflation closely tracks overall aggregate inflation trends. The study also indicates that households demonstrate distinctive substitution patterns based on prices, leading to substantial cross-sectional variation in inflation rates, which display only slight serial correlation over time. Ultimately, the findings suggest that variations in personal price experiences contribute more significantly to household inflation rates than changes in aggregate inflation, making this research important for understanding the real economic impact on households stemming from monetary policy and inflation dynamics.

Schnorpfeil et al. (2024) explore how households respond to the wealth effects of unexpected inflation, particularly focusing on awareness and decision-making regarding nominal assets and debt. The authors combine administrative bank data with a randomised control trial (RCT) conducted among bank customers during a significant inflation period in Germany. The study reveals that while households generally understand how inflation affects nominal assets, they lack awareness of how it impacts nominal debt. When informed about the positive effects of nominal debt erosion, households reported higher estimates of their real net wealth, which influenced their consumption plans and actual spending behaviours. The findings suggest that enhanced awareness of inflation's redistributive effects can lead to increased consumption and a preference for higher debt financing in investments. The research underscores the importance of information dissemination during inflationary periods to shape economic behaviours, particularly for those with negative net nominal positions. Overall, the document highlights the mediating role of perceived real wealth on the sensitivity of household consumption in response to inflationary pressures once awareness is achieved.

Lael Brainard (2022) presents the analysis of the varying experiences of inflation among U.S. households of different income levels, highlighting that lower-income families disproportionately bear the burden of rising prices, particularly for essentials. It underscores the Federal Reserve's mandate to maintain price stability and maximise employment, noting that inflation affects purchasing power, especially for low- and moderate-income families who spend a larger share of their income on necessities. Research indicates that the inflation rates experienced by these households can differ significantly due to factors such as their unique consumption bundles, lesser ability to substitute goods, and access to discounted prices. The author emphasises the need for better data disaggregating inflation impacts by income demographic to inform policy effectively. High inflation rates, fuelled by pandemic-related supply issues and geopolitical events, pose significant challenges for both employment and economic growth. The document concludes with a call for the Federal Reserve to

tighten monetary policy to mitigate inflation while monitoring the evolving economic landscape.

Altig et al. (2024) examine the impact of inflation on American households, particularly in the context of the post-COVID price surge. The study emphasises the fiscal consequences of inflation, rather than purely financial effects, by analysing data from the 2019 Survey of Consumer Finances (SCF) through the Fiscal Analyzer (TFA). This tool assesses how inflation influences expected remaining lifetime spending, factoring in major federal and state fiscal programmes. The findings reveal that a permanent inflation increase to 10% would reduce median lifetime spending by 6.82%. The paper highlights the progressive nature of inflation's effects, noting that the wealthiest households suffer a median loss of 15.9%, while low-income households experience a significantly lower impact. Moreover, middle-aged households are more adversely affected due to their reliance on asset income, which is taxed heavily in inflationary contexts. The study ultimately underscores the sensitivity of household welfare distribution to ongoing inflation, revealing the significant disparities in spending changes across different income levels. This comprehensive analysis aims to enhance understanding of inflation's varied fiscal ramifications for households in America.

Levell and Skingle (2012) examine the differences between the *Consumer Prices Index* (CPI) and the *Retail Prices Index* (RPI) in measuring household inflation experiences. The study highlights a consultation initiated by the Office for National Statistics (ONS) on potential changes to the RPI methodology to align it more closely with the CPI. The authors, Peter Levell and Thomas Skingle, analyse whether CPI measures yield similar results to RPI measures regarding inflation variations across different household groups, particularly concerning income and pensioner status. The study reveals that, when housing costs are excluded, there are minimal differences in inflation experienced by various household demographics. Essentially, the 'formula effect' differing between the two indices does not disproportionately impact the consumption patterns of low-income households or pensioners compared to higher-income groups. This issue is important, because the CPI has increasingly replaced the RPI for various policy applications. The analysis spans 2001 to 2010, providing insights into spending patterns and inflation rates, thus contributing to important discussions about inflation measurement methodologies and their implications for different segments of the population.

The report published by DIW Econ (2022) addresses the burden on low-income households in Germany caused by rising inflation, which reached 7.9% in May 2022. These households are particularly struggling with sharp price increases, which threaten their consumption needs. The study demonstrates that lower-income deciles need to increase their net household income by up to 5.3% to cover the same consumption expenditure as in the previous year, compared to just 1.1% for high-income households. The support packages already introduced by the federal government are insufficient, because low-income households are unable to compensate for the increased spending through reserves or reduced savings. In light of these challenges, *Diakonie Deutschland e.V.* proposes a crisis measure that includes an additional monthly transfer payment

of €100 for six months for affected households. This measure could particularly help lower-income deciles and vulnerable groups to mitigate the burden of price increases. However, some households, such as low-income retirees, would not benefit from this proposal.

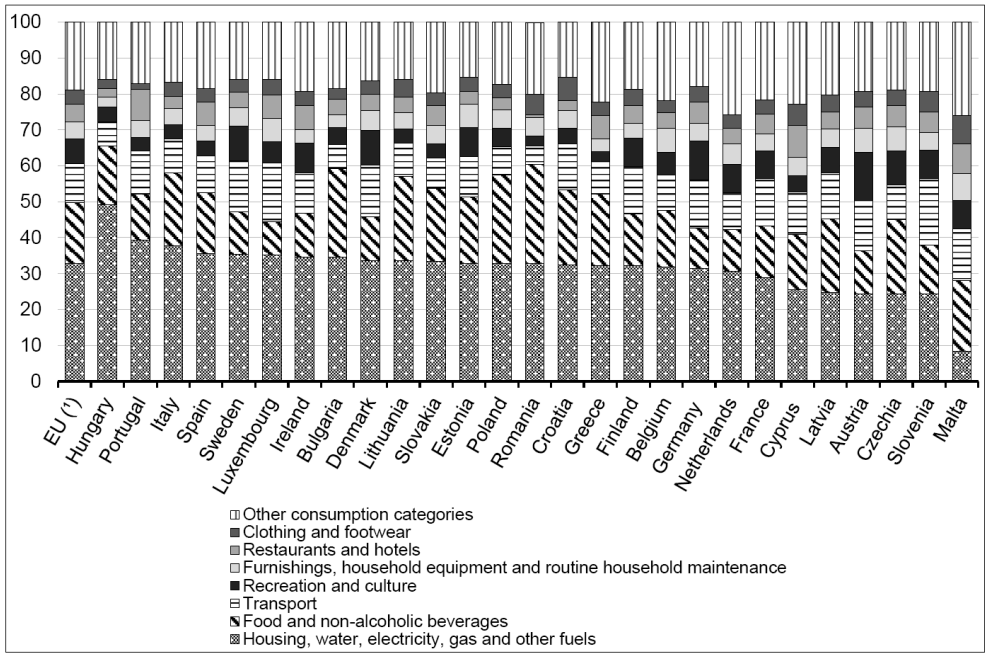
Recent euro-area evidence reinforces the importance of distinguishing headline inflation from the composition of price shocks. Bobasu, di Nino and Osbat (2023) demonstrate that distributional exposure is especially pronounced when food and energy prices rise relative to average inflation, because these items carry larger weights in lower-income consumption baskets. Their analysis uses COICOP expenditure weights and component-level price dynamics, illustrating the additional insights that category-specific price information can provide beyond headline HICP.

More recent studies extend this distributional perspective. Dausà i Noguera, Kocharkov and Kouvavas (2025) construct personal inflation rates using detailed household consumption data matched to HICP components and demonstrate that the inflation burden varies over time across income groups. Cicek et al. (2026), using microdata for 18 European economies, analyse the consumption-basket, income and wealth channels jointly and find that welfare effects depend on both household characteristics and the composition of inflation. These studies demonstrate the importance of inflation composition for distributional analysis and motivate category-specific relative-price analysis as a valuable extension to the present headline-HICP framework.

## Statistical data

In 2020, the share of household consumption expenditure across European countries demonstrated marked differences by category. The expenditure share for *Food and non-alcoholic beverages* displayed the widest variation, ranging from around 8% in high-income countries such as Ireland to approximately 26% in lower-income countries like Romania, a gap of about 18 percentage points. Housing, water, electricity, gas, and other fuels also varied substantially, from roughly 19% in Malta and Croatia to over 32% in Finland, reflecting a range of about 13 percentage points. Other consumption categories followed closely, indicating notable differences in discretionary spending. Spending on recreation and culture varied by around 8 percentage points, with Nordic countries such as Finland allocating the most, and Eastern European states the least. Expenditure on restaurants and hotels varied by roughly 7 percentage points, highest in tourism-oriented countries like Malta and lowest in Romania and Bulgaria. Transport expenditure demonstrated a smaller spread of about 6 percentage points, while furnishings and household equipment exhibited a narrower range of 3 percentage points, and clothing and footwear were the most uniform categories across countries, varying by only about 2 percentage points. Overall, the data indicate that basic necessities (such as food and housing) tend to drive the largest differences in spending patterns between countries, while categories such as clothing and household goods demonstrate far more consistent shares regardless of national context (*Figure 2*).

**Figure 2: Structure of consumption expenditure, 2020 (share of total expenditure by country in %).**




Source: Eurostat 2025.

However, *Figure 3* on the next page presents the mean consumption expenditure per adult equivalent in 2020 for the lowest and highest income quintile groups across EU Member States and selected neighboring countries. Expenditures are expressed in *Purchasing Power Standards* (PPS), a unit that adjusts for differences in price levels across countries, enabling direct comparison of real consumption levels. The blue bars represent the lowest income quintile (Q1), the yellow bars represent the highest income quintile (Q5), while the red markers indicate the ratio of Q5 to Q1 mean consumption expenditure, plotted against the secondary (right-hand) vertical axis.

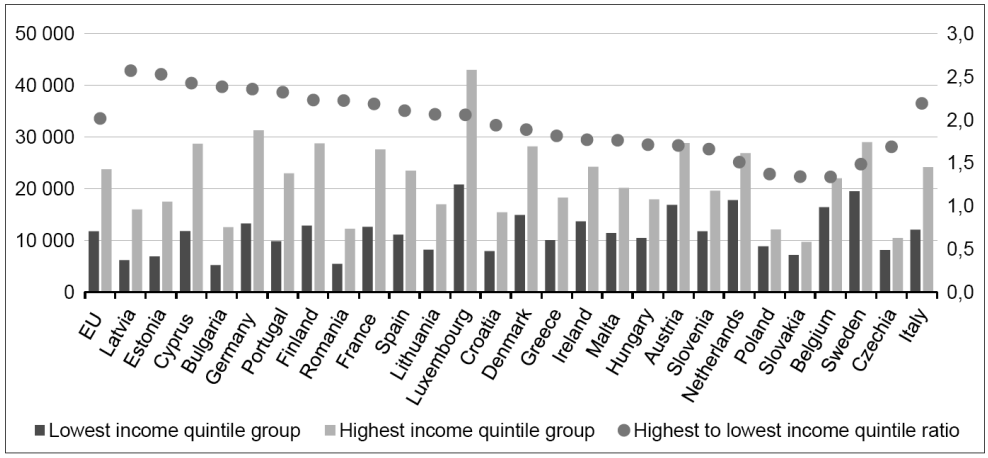
Across all observed countries, Q5 households have higher mean consumption expenditures than Q1 households, confirming the expected monotonic relationship between income position and consumption. Countries such as Luxembourg, Norway, and Austria report the highest absolute Q5 expenditures (often exceeding 35,000 PPS), while Serbia, Türkiye, and Montenegro occupy the lower end of the scale for both quintiles. The dispersion in Q1 consumption is substantial, ranging from over 20,000 PPS in Luxembourg to 10,000 PPS in parts of Eastern and Southeastern Europe.

The lowest ratios (≤2.0) are observed in Luxembourg, Finland, and Austria, indicating relatively narrow consumption gaps between top and bottom quintiles. The highest ratios (≥3.0) appear in Bulgaria, Romania, Latvia and Cyprus, pointing to pronounced consumption inequality. Notably, some high-income countries maintain low inequality

(e.g., Luxembourg), while some lower-income countries combine low Q1 levels with high ratios, exacerbating relative deprivation.

Northern and Western European countries generally combine higher absolute consumption levels with lower relative inequality, while several Southern and Eastern European countries demonstrate lower consumption levels and higher inequality ratios. This pattern aligns with differences in social protection systems, labour market structures, and redistributive fiscal policies.

**Figure 3: Mean consumption expenditure by income quintile per adult equivalent, 2020.**




Source: Eurostat 2025.

The data indicate that material living standards for the lowest income quintile vary dramatically across Europe, even after adjusting for price levels. In absolute terms, households in the lowest quintile in some countries consume at levels more than twice those in others. In relative terms, high Q5-to-Q1 ratios suggest larger consumption gaps, which can be translated into greater socio-economic polarisation and lower perceived equity. From a policy perspective, countries combining low Q1 consumption levels with high quintile ratios are particularly vulnerable to the social costs of inequality. In contrast, economies with high Q1 consumption and low ratios appear to achieve more inclusive material prosperity, potentially reflecting more effective redistribution and stronger wage floors.

## Methodology and empirical results

The econometric framework follows panel-data approaches used in applied demand analysis. The dependent variable is the budget share of consumption category ***c*** for income quintile ***q*** in country ***i*** and year ***t***. Accordingly, the model estimates how the composition of expenditure covariates with inflation; it does not directly estimate physical quantities consumed, real consumption volumes, or compensating variation.

The specification is motivated by Engel-curve and consumer-demand theory, in which budget shares depend on total expenditure and relative prices. The present study, however, does not aim to identify category-specific price effects or estimate a system of price elasticities. Its objective is to examine whether the overall inflationary environment, measured by headline HICP, is associated with the allocation of household expenditure across consumption categories and income groups. Headline HICP is therefore retained as the main explanatory variable. We recognise that this aggregate measure can conceal heterogeneous relative-price movements across food, energy, transport and services.

Category-specific COICOP price indices would address a related but distinct research question: how household budget shares respond to relative price changes within individual consumption categories. Incorporating such indices would shift the empirical focus towards a category-specific relative-price specification and would change the interpretation of the estimated coefficients. Category-specific HICP inflation is treated here as a valuable extension for future research rather than as part of the core specification of the present study (Bobasu et al. 2023; Dausà i Noguera et al. 2025).

Panel data exploit both cross-country and temporal variation while controlling for time-invariant country characteristics. Country fixed effects absorb persistent institutional, cultural and policy differences, and time fixed effects absorb common shocks. The Q1 and Q5 models are estimated separately to allow the inflation-budget-share association to differ across the income distribution.

At the beginning we consider a representative household in country $i$, income-quintile $q$, period $t$ choosing a consumption vector $x_{i,t} R^c$ with prices $p_{i,t}$:

$$\max_{x_{i,t}} \; u(x_{i,t}) \qquad \text{s.t.} \qquad p_{i,t}^{\top} x_{i,t} = Y_{i,q,t} \tag{1}$$

Define the **budget share** of category $c$ as:

$$s_{i,c,q,t} = \frac{p_{i,c,t}\; x_{i,c,t}}{p_{i,t}^{\top}\; x_{i,t}} \tag{2}$$

Engel-curve theory implies that, for a given price vector, budget shares are systematic functions of (real) total expenditure and, through Slutsky decomposition, of relative prices (price indices). This is the standard starting point in demand systems (AIDS/QUAIDS etc.).

Let $\pi_i$ denote inflation in country $i$ between $t-1$ and $t$:

$$\pi_{i,t} \approx \Delta \ln P_{i,t} \tag{3}$$

where $P_{i,t}$ is an aggregate consumer price index.

For small changes, a first-order approximation of the share of category $c$ gives:

$$\Delta s_{i,c,q,t} \approx \sum_{k=1}^{C} \frac{\partial s_{i,c,q,t-1}}{\partial \ln p_{i,k,t}} \Delta \ln p_{i,k,t} + \frac{\partial s_{i,c,q,t-1}}{\partial \ln Y_{i,q,t}} \Delta \ln Y_{i,q,t} \tag{4}$$

As headline inflation is a weighted average of component price changes, equation (6) is interpreted as a reduced-form model of budget-share reallocation under the overall inflationary environment. It is not intended to identify category-specific price effects. Headline HICP is retained as the core explanatory variable because this specification corresponds directly to the study's research question and to the available estimation output.

$$\sum_k \left(\partial s_c / \partial \ln p_k\right) \Delta \ln p_k \tag{5}$$

The baseline fixed-effects model reported in the current estimation output is:

$$s_{icqt} = \alpha_{cq} + \beta_{cq}\pi_{it} + \theta'_{cq} Z_{it} + \mu_i + \lambda_t + \varepsilon_{icqt} \tag{6}$$

where:

$s_{i,c,q,t}$ – share of total household consumption expenditure allocated to category c by quintile $q$ in country $i$ and period $t$,

$\pi_{i,t}$ – headline HICP inflation rate in country $i$ and period $t$,

$\beta_{c,q}$ – reduced-form association between headline inflation and the category budget share for quintile $q$,

$Z_{i,t}$ – vector of observed controls, where available,

$\mu_i$ – country fixed effect;

$\lambda_t$ – time fixed effect,

$\varepsilon_{i,c,q,t}$ – idiosyncratic error term.

A category-specific relative-price specification using COICOP HICP sub-indices would be a valuable extension for future research. It would allow direct analysis of how budget shares respond to relative price changes across consumption categories, but this would constitute a different empirical focus from the present study. Accordingly, equation (6) is retained as the core specification, and the current coefficients are interpreted as reduced-form associations with headline inflation.

The empirical panel covers 2000–2024 and uses Eurostat data. The analysis focuses on the two endpoints of the income distribution, Q1 and Q5, because the research question concerns the contrast between households with the tightest and the broadest budget margins. The dependent variable is modelled separately by consumption category and quintile. This design identifies differences in budget-share associations across Q1 and Q5 but does not by itself identify household-specific inflation rates.

Diagnostic testing is focused on residual dependence, heteroskedasticity and stationarity of explicitly defined macroeconomic series. Only diagnostic statistics that can be linked unambiguously to economically defined variables are retained in *Table 1*.

a) *Autocorrelation of residuals*. The Wooldridge test for first-order autocorrelation in panel data (see: Wooldridge 2010) was applied to the fixed-effects residuals ($H_0$: *no first-order autocorrelation*).
b) *Heteroskedasticity*. The Breusch-Pagan and groupwise Wald tests were used to assess whether residual variance is constant across the panel.
c) *Stationarity.* The available diagnostic output reports a Fisher-type panel ADF test for headline HICP inflation. Unit-root results for additional series are not reported unless the variables can be identified unambiguously by their economic names.

The Wooldridge test indicates first-order residual autocorrelation ($\rho = 0.508$, $t = 6.11$, $p < 0.001$). The Breusch-Pagan results (LM $p = 0.118$; F $p = 0.296$) do not indicate general heteroskedasticity, whereas the groupwise Wald test ($p = 0.018$) suggests that residual variance differs across entities. Robust inference is therefore required. The reported Fisher-type ADF result for headline HICP inflation ($p = 2.15 \times 10^{6}$) rejects a unit root in that series under the stated deterministic specification. *Table 1* summarises only diagnostics that can be interpreted unambiguously.

**Table 1: Diagnostic tests results.**

| Test | Statistic / Estimate | Interpretation |
|---|---|---|
| Wooldridge AR(1) | $\rho = 0.508$, $t = 6.11$ | Strong AR(1) autocorrelation |
| Breusch–Pagan LM | $p = 0.118$ | No strong evidence of heteroskedasticity |
| Breusch–Pagan F | $p = 0.296$ | No strong evidence of heteroskedasticity |
| Wald (groupwise heterosked.) | $p = 0.018$ | Variance differs between entities |
| Fisher ADF (HICP_y) | $p = 2.15 \times 10^{6}$ | Stationary (trend included) |
| Fisher ADF (x1) | $p = 2.22 \times 10^{16}$ | Stationary |
| Fisher ADF (x2) | $p = 3.11 \times 10^{5}$ | Stationary (trend included) |

Source: the author's own elaboration.

*Table 2* on the next page contains the baseline coefficients for Q1. Each coefficient $\beta$ describes the association between headline HICP inflation and the budget share of a consumption category. A negative coefficient means that the category accounts for a smaller share of the household budget when headline inflation is higher; it does not, by itself, imply a proportional decline in the physical quantity consumed.

For Q1, the strongest negative coefficient is observed for *Food and non-alcoholic beverages* ($\beta = -3.28$). In the present specification this indicates a lower food budget share during periods of higher headline inflation, not a directly measured contraction in real food consumption. Negative coefficients are also observed for *Clothing and footwear* ($\beta = -0.54$), *Alcoholic beverages, tobacco and narcotics* ($\beta = -0.23$), *Transport* ($\beta = -0.18$) and

*Recreation and culture* (β = -0.13). These estimates are consistent with reallocation of the expenditure basket, but the data do not separate price, quantity and quality adjustments within each category.

Positive Q1 coefficients are observed for *Housing, water, electricity, gas and other fuels* (β = 3.93), Health (β = 0.37) and *Miscellaneous goods and services* (β = 0.23). These coefficients indicate that the respective categories account for a larger budget share, when headline inflation is higher. In particular, the positive housing and utilities coefficient is consistent with the larger exposure of lower-income households to essential expenses, although the baseline model cannot determine whether the change is driven by category-specific prices, quantities or other simultaneous shocks.

Near-zero Q1 coefficients are observed for *Education* (β = 0.00), *Restaurants and hotels* (β = 0.03), *Communications* (β = -0.02) and *Furnishings and household equipment* (β = -0.05). Given the aggregate inflation regressor, these small coefficients should be interpreted descriptively rather than as evidence of price insensitivity.

Overall, the Q1 estimates indicate heterogeneous movements in expenditure shares during periods of higher headline inflation. The estimates do not establish causal effects on consumption volumes and should not be interpreted as category-specific price elasticities. Estimating such elasticities would require a separate specification based on category-specific COICOP price indices, which is beyond the scope of the present study and is identified as a direction for future research.

**Table 2: Baseline association between headline HICP inflation and consumption budget shares (Q1).**

| **Category** | β | **$R^2$** |
|---|---|---|
| Food and non-alcoholic beverages | -3.28 | 0.94 |
| Alcoholic beverages, tobacco and narcotics | -0.23 | 0.52 |
| Clothing and footwear | -0.54 | 0.75 |
| Housing, water, electricity, gas and other fuels | 3.93 | 0.78 |
| Furnishings, household equipment and routine household maintenance | -0.05 | 0.75 |
| Health | 0.37 | 0.79 |
| Transport | -0.18 | 0.77 |
| Communications | -0.02 | 0.62 |
| Recreation and culture | -0.13 | 0.93 |
| Education | 0.00 | 0.80 |
| Restaurants and hotels | 0.03 | 0.82 |
| Miscellaneous goods and services | 0.23 | 0.92 |

Source: the author's own elaboration.

*Table 3* reports the corresponding baseline coefficients for Q5 under the same interpretation. *Food and non-alcoholic beverages* have a negative coefficient (β = -2.29), as well as *Transport* (β = -0.66), *Communications* (β= -0.72), *Clothing and footwear* (β = -0.26), *Education* (β = -0.40), and *Restaurants and hotels* (β = -0.09). Positive coefficients are observed for *Housing, water, electricity, gas and other fuels* (β = 3.06), *Furnishings and household equipment* (β = 0.61), *Alcoholic beverages, tobacco and narcotics* (β = 0.33), and *Health* (β = 0.22). The coefficient for *Recreation and culture* is approximately zero, while for *Miscellaneous goods and services* is close to zero (β = 0.05). Relative to Q1, the Q5 results suggest a different pattern of budget-share reallocation, particularly in communications, transport, education and furnishings. These differences are descriptive associations with headline inflation and should not be interpreted as quantity responses or as category-specific price elasticities.

**Table 3: Baseline association between headline HICP inflation and consumption budget shares (Q5).**

| **Category** | β | **$R^2$** |
|---|---|---|
| Food and non-alcoholic beverages | -2.29 | 0.90 |
| Alcoholic beverages, tobacco and narcotics | 0.33 | 0.86 |
| Clothing and footwear | -0.26 | 0.70 |
| Housing, water, electricity, gas and other fuels | 3.06 | 0.68 |
| Furnishings, household equipment and routine household maintenance | 0.61 | 0.71 |
| Health | 0.22 | 0.75 |
| Transport | -0.66 | 0.64 |
| Communications | -0.72 | 0.91 |
| Recreation and culture | 0.00 | 0.82 |
| Education | -0.40 | 0.87 |
| Restaurants and hotels | -0.09 | 0.85 |
| Miscellaneous goods and services | 0.05 | 0.78 |

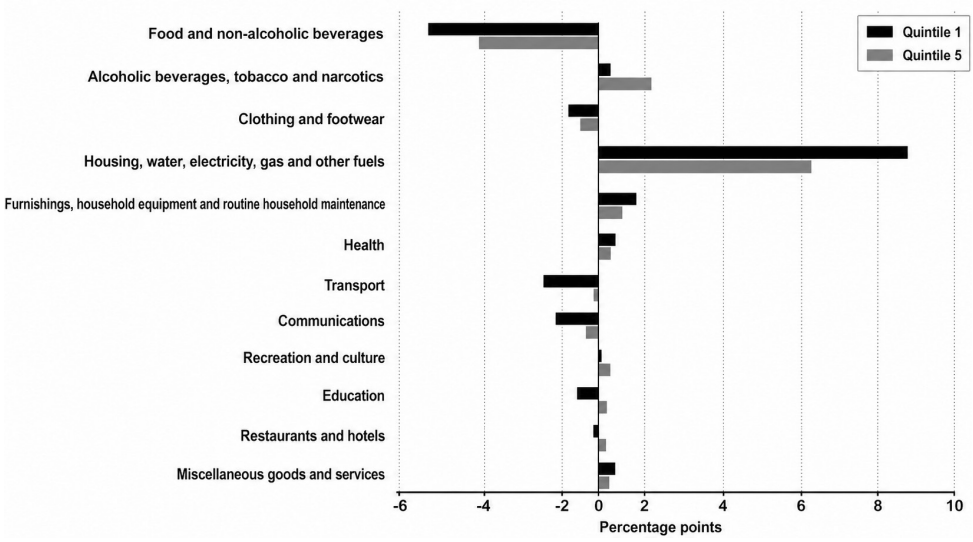
Source: the author's own elaboration.

Comparing Q1 and Q5 reveals meaningful differences in the direction and magnitude of budget-share associations: Q1 demonstrates a more negative food coefficient and a more positive housing and utilities coefficient than Q5; in turn, Q5 has more negative coefficients for transport, communications and education and a more positive furnishings coefficient. These contrasts are consistent with different budget constraints and substitution margins across the income distribution, but they do not identify household-specific effective inflation rates or physical consumption changes.

For higher-income households, the baseline pattern is more pronounced in several discretionary or adjustable categories, including communications, transport, education and furnishings. For lower-income households, the larger absolute coefficients for food and housing are consistent with the greater weight of necessities in the budget. The interpretation remains one of expenditure-share reallocation conditional on headline inflation.

Some categories demonstrate similar signs across quintiles, while others differ materially. The comparison is summarised in *Figure 4*. Because the baseline regressor is headline HICP, the figure should be read as a comparison of reduced-form coefficients rather than of structural price elasticities.

**Figure 4: Baseline budget-share associations with headline HICP inflation (Q1 vs Q5).**




Source: the author's own elaboration.

The cross-quintile differences are consistent with the broader literature suggesting that the welfare burden of inflation depends on consumption-basket composition and the relative prices of necessities (Kaplan, Schulhofer-Wohl 2017; Bobasu et al. 2023; Dausà i Noguera et al. 2025). The present model does not estimate welfare losses directly; policy implications are derived cautiously from the observed budget-share patterns and from the wider literature.

The findings are also relevant for monetary and fiscal policy because the composition of inflation can matter for distributional outcomes. Energy-led or food-led inflation may exert different pressure on household budgets than services-led inflation. The present analysis does not identify these component-specific effects; this compositional heterogeneity is treated as a limitation, and examining it with COICOP-specific HICP indices is an important extension for future research.

## Discussion

The baseline results indicate an asymmetry in how household budget shares covariate with headline inflation across Q1 and Q5. Lower-income households demonstrate larger absolute coefficients for food and housing, whereas higher-income households show stronger movements in several more adjustable categories. These patterns are consistent with Engel's Law and with differences in substitution margins, but the estimates do not identify changes in physical consumption quantities. Moreover, because headline HICP aggregates heterogeneous component-price shocks, the current coefficients are interpreted as descriptive reduced-form evidence of budget-share reallocation under the overall inflationary environment, rather than as estimates of category-specific price effects.

The $R^2$ values available in the archived estimation output are not used to support the substantive interpretation because the output does not identify whether they are within, between or overall $R^2$. For a fixed-effects model, re-estimation should report within $R^2$ and full inferential statistics. This avoids treating an ambiguous goodness-of-fit statistic as evidence of a strong relationship.

## Policy implications

Taken together with the wider distributional-inflation literature, the observed budget-share patterns suggest that macroeconomic stabilisation may need to be complemented by targeted measures, when inflation is concentrated in necessities. Temporary and well-targeted transfers or support for food and energy costs can be more closely aligned with the exposure of lower-income households than untargeted measures.

Central banks primarily pursue price stability, while distributional support is generally a fiscal responsibility. Nevertheless, identifying whether inflation is driven by necessities or by more discretionary components can improve the assessment of heterogeneous household exposure and the communication of policy trade-offs.

Statistical agencies can strengthen distributional analysis by linking household expenditure weights to detailed COICOP HICP components and by publishing timely measures across income groups. Such data would allow researchers to distinguish headline inflation from relative-price shocks and to test whether the associations documented here survive a richer demand specification.

## Conclusions

This study provides comparative evidence that category budget shares are associated differently with headline inflation across the lowest and highest income quintiles in the European Union. In the baseline estimates, Q1 exhibits larger movements in the food and housing shares, while Q5 demonstrates stronger changes in several adjustable categories, such as communications, transport, education and furnishings. These results

are related to the composition of expenditure; they do not directly measure physical consumption quantities or household welfare losses.

The findings are consistent with the view that the distributional consequences of inflation depend on household budget composition. A central empirical limitation is that headline HICP alone cannot distinguish an energy-led inflation shock from a services-led shock. This limitation is inherent in the chosen research design, which focuses on the association between the overall inflationary environment and household budget shares. Future research could extend the analysis by using COICOP-specific HICP sub-indices to examine relative-price effects across consumption categories. Conclusions about structural category-specific price effects are outside the scope of the present study.

## Limitations and future research

While this study provides comparative evidence on heterogeneous budget-share associations across income quintiles in the European Union, several limitations should be acknowledged.

Firstly, the analysis relies on aggregated quintile-level data, which may mask important intra-quintile differences in household size, demographic structure, location and access to substitution possibilities. The comparison between Q1 and Q5 is intentionally focused on distributional endpoints and should not be generalised to all intermediate quintiles without additional analysis.

Secondly, the panel covers the period 2000–2024 and spans markedly different inflation regimes, including the global financial crisis, low-inflation years, the COVID-19 shock and the recent energy-price surge. Country and time fixed effects absorb persistent and common factors, but structural breaks and time-varying behavioural responses may remain.

Thirdly, the econometric analysis focuses on EU Member States. Descriptive figures may include neighbouring countries, where Eurostat publishes comparable data, but these observations are not part of the core EU panel. The findings should therefore be interpreted within the institutional setting of European labour markets, welfare systems and consumer-price measurement.

Fourthly, the numerical estimates reported in *Tables 2 and 3* use headline HICP inflation. This choice reflects the main research question, which concerns the association between the overall inflationary environment and household budget allocation across income groups. At the same time, headline inflation can be generated by very different COICOP component shocks and, therefore, cannot identify category-specific price effects. This is an important limitation of the present reduced-form analysis. Future research could address it by incorporating category-specific HICP sub-indices in a broader relative-price specification.

Finally, the available model output does not identify the reported $R^2$ measure as within, between or overall $R^2$, and it does not provide a complete publication table with robust standard errors and significance levels. The analysis, therefore, avoids using $R^2$ to claim strong explanatory power. A final empirical revision should provide within $R^2$,

robust standard errors, p-values, the number of observations and an explicit description of country and time fixed effects. Future research could address these limitations by:

1) Employing household-level longitudinal data to capture more nuanced distributional effects and life-cycle dynamics.
2) Investigating the role of credit constraints, savings buffers, and debt burdens in mediating inflationary impacts.
3) Extending the analysis to non-EU countries to test the applicability of the findings across diverse economic and institutional contexts.
4) Exploring the impact of inflation and other macroeconomic shocks (such as unemployment spikes or interest rate increases) on consumption structures.
5) Incorporating survey-based or experimental approaches to better understand the behavioural mechanisms underpinning expenditure adjustments during inflationary episodes.

By pursuing these avenues, future studies can deepen the understanding of inflation's distributional consequences and support the design of policies that both stabilise prices and safeguard household welfare across the income spectrum.

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**Piotr Misztal** – prof. dr hab. nauk społecznych w dyscyplinie ekonomia i finanse. Dziekan Wydziału Ekonomii i Finansów Uniwersytetu Radomskiego im. Kazimierza Pułaskiego. Zainteresowania badawcze obejmują zagadnienia dotyczące głównych determinant wzrostu i rozwoju gospodarczego krajów o różnym poziomie rozwoju oraz czynników atrakcyjności inwestycyjnej krajów i regionów.

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