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Unequal burdens: Food price convergence, divergence, and inequality in the European Union

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ABSTRACT

In recent years, the European Union (EU) has experienced an unprecedented surge in food prices, driven by overlapping global shocks such as the COVID-19 pandemic, supply chain disruptions, and the Russia-Ukraine conflict. This paper examines how these shocks have translated into unequal burdens across EU member states, with a particular focus on their distributional consequences. Using monthly Harmonised Index of Consumer Prices (HICP) data disaggregated by food category (ECOICOP 4-digit level) from 2005 to 2025, we apply β- and σ-convergence frameworks to assess whether food price dynamics have aligned or diverged across countries. Over the two decades, EU food prices display significant β- and σ-convergence up to 2019, but this process reverses sharply during 2020-2025: cross-country dispersion widens to historically high levels and β turns from negative (catch-up) to positive (divergence). The reversal is most pronounced between euro-area and non-euro-area countries and between Eastern and Western Europe, and it disproportionately affects lower-income households and countries with smaller economic bases, amplifying pre-existing inequalities in purchasing power and food security. These findings underscore the regressive nature of food price inflation and the need for targeted fiscal and monetary policies to mitigate its unequal impact and support economic cohesion within the EU.

1. Introduction

In recent years, the European Union (EU) has experienced a sharp and persistent rise in consumer prices, with inflation peaking between 2022 and 2023 due to overlapping global shocks. These include the COVID-19 pandemic, supply chain disruptions, and, more recently, the Russia-Ukraine war. Price increases have been particularly pronounced in the food and energy sectors, intensifying existing socioeconomic disparities and raising serious concerns for vulnerable households (Benedetti et al., 2024).

While the recent surge in food prices did not result from a decline in global food production, it was exacerbated by volatility in agricultural trade, rising input costs, and geopolitical uncertainty, disproportionately affecting low- and middle-income households (EC, 2023a; Torero, 2020; Bai et al., 2022). Inflation has thus emerged as one of the most pressing economic issues in Europe. Recent evidence shows that these shocks have worsened living conditions in the euro area and widened inequalities across households, with monetary policy responses further influencing inflation heterogeneity along the income distribution (Ampudia et al., 2023; Pallotti et al., 2024).

Food plays a central role in this context as the second largest component of household spending. Low-income households are particularly exposed because of the substantial share of their budgets devoted to food (Menyhert, 2022). On average, food and non-

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alcoholic beverages account for 14.3% of household expenditure in the EU, but this share ranges from under 9% in the wealthiest Member States to 24.8% in Romania, reflecting broader differences in consumption patterns and income levels (Adam et al., 2022; Zhu et al., 2022). Rising prices for essential goods like food underscore disparities in household purchasing power and economic resilience across Member States (Faharuddin et al., 2022). According to the European Central Bank (European Central Bank ECB, 2024), inflation dispersion within the euro area reached record highs during 2022-2023, largely driven by energy and food prices. Moreover, recent analyses reveal notable differences between euro area and non-euro area countries (Martin & Nagy-Mohácsi, 2025).

The divergence in inflation outcomes reflects heterogeneity in monetary and fiscal policy responses, shaped by different institutional settings, exchange rate regimes, and levels of integration within the euro area.

In this setting, food price convergence becomes a critical dimension of economic cohesion. The EU's monetary and political union aims not only to ensure price stability but also to foster convergence among Member States. However, recent studies indicate divergent inflation trends between euro area and non-euro area countries, suggesting that price stability objectives are not uniformly achieved (EC, 2023b; Hałka & Leszczyńska-Paczesna, 2019).

These developments highlight the importance of monitoring inflation and price convergence, particularly in sectors such as food where volatility can have profound social implications. The EU, as one of the highest-income regions globally, offers an instructive case for studying food price dynamics given its complex economic integration and relatively low-income inequality (Ridao-Cano & Bodewig, 2018).

Because rising prices erode household purchasing power and increase poverty risks when incomes stagnate (Faharuddin et al., 2022), food price convergence plays a pivotal role in promoting economic stability and cohesion within the EU. From this perspective, cohesion policy seeks to reduce disparities in development levels among Member States, thereby improving living standards and strengthening economic, social, and territorial cohesion (EC, 2021). In practice, price convergence can be seen as both a consequence and a goal of economic integration, as the reduction of price level differences signals closer economic alignment (Hałka & Leszczyńska-Paczesna, 2019).

Against this background, this paper addresses a direct question: did food prices converge or diverge across EU Member States in recent years, and how did the 2020-2025 shocks reshape this process? To answer it, we use monthly HICP data disaggregated by food category (ECOICOP 4-digit level) for all 27 Member States over the two decades from 2005 to 2025, and apply σ- and β-convergence frameworks to assess both absolute and conditional convergence. Examining a twenty-year horizon, rather than reading the recent episode in isolation, lets us distinguish the long-run convergence dynamics of EU food prices from the abrupt adjustments triggered by the COVID-19 pandemic and the Russia-Ukraine conflict, and test whether the post-2020 divergence is a genuine structural break.

While convergence is typically studied over longer horizons (often exceeding two decades; Barro and Sala-i-Martin, 2003), we exploit the full two-decade span (2005-2025) precisely to set the rapid adjustments triggered by the COVID-19 pandemic and the Russia-Ukraine conflict against the longer-run convergence trend.

This paper makes three main contributions. First, it provides a detailed account of price trends across key food categories. Second, it analyses food price convergence at the country level, with attention to regional patterns. Third, it investigates whether convergence dynamics differ between euro area and non-euro area countries. Although prior research has examined price convergence in the EU using disaggregated indices (e.g., Brož & Kočenda, 2018; Hałka & Leszczyńska-Paczesna, 2019; Liu & Lee, 2021) or focused on retail food price dispersion (Romero et al., 2020), the question of food price convergence remains underexplored.

The remainder of the paper is structured as follows. Section 2 outlines the conceptual background and methodological approach. Section 3 describes the data and provides an overview of food price dynamics during the study period. Section 4 presents the empirical results of the β- and σ-convergence analyses, highlighting cross-country differences. Section 5 discusses the policy implications of our findings in light of the current economic and institutional context. Finally, Section 6 concludes by summarising the main insights and suggesting avenues for future research.

2. Background: inflation and price convergence in the EU

The sharp increase in food prices observed across the EU has revived longstanding debates around economic convergence (Garcia-Hiernaux et al., 2023; Hałka & Leszczyńska-Paczesna, 2019). Price convergence, often viewed as a natural outcome of economic integration, is essential for the functioning of a monetary union. When price levels across countries move towards a common trend, this suggests successful integration and enhanced economic cohesion.

Previous research focused heavily on the early stages of the EU and euro area integration, analysing whether price convergence accompanied institutional harmonisation. Early studies (e.g., Sosvilla-Rivero & Gil-Pareja, 2004; Rogers, 2001) found little convergence in non-tradable goods. Others, such as Faber and Stokman (2009), explored the experience of Central and Eastern European countries after their EU accession, often documenting convergence in tradables but mixed evidence for broader price indices.

Recent studies have highlighted how external shocks have exacerbated disparities within the EU, with vulnerable and smaller economies experiencing stronger and more persistent price pressures (Bruno et al., 2023). This complements earlier evidence on regional disparities, underscoring the need for coordinated policy responses to address structural vulnerabilities amplified by global disruptions.

Building on this literature, several contributions have suggested that price convergence within the EU may have stalled or even reversed in recent years, particularly among the newer Member States. For example, Szafranek (2017) documents episodes of deflation in Eastern Europe, while Hałka and Kotłowski (2017) attribute this pattern partly to the post-crisis slowdown in globalisation. More recent analyses have also begun to explore more nuanced dynamics, such as non-linear convergence paths (Guerreiro & Mignon, 2013) and relative price behaviour across income levels (Egert, 2011).

Despite this extensive research, food price convergence remains relatively underexplored, particularly for the period following the COVID-19 pandemic and the Russia-Ukraine conflict. Notable exceptions outside the EU include Woo et al. (2020) for Canada, Tasić (2007) for the Balkans, and Iğdeli (2024) for Turkey.

This paper addresses the gap by analysing the convergence of food prices in the EU from 2005 to 2025. By integrating cross-country comparisons and distinguishing between euro and non-euro area members, the study sheds light on the heterogeneity of inflation dynamics in the wake of global disruptions.

3. Data used and food prices analysis across EU member states

This section draws on monthly Harmonised Index of Consumer Prices (HICP) data for all 27 EU Member States between January 2005 and December 2025 (252 monthly observations per series). The HICP, developed by Eurostat in collaboration with national statistical institutes, provides a harmonised measure of inflation, facilitating direct comparability across countries (Eurostat, 2018). The classification adopted in this study follows the European Classification of Individual Consumption According to Purpose (ECOICOP), specifically at the 4-digit level, allowing for detailed analysis of consumption subcategories.

As shown in Fig. 1, the EU experienced a sharp acceleration in headline inflation starting in mid-2021, peaking at 10% in December 2023. Among all ECOICOP categories, food and non-alcoholic beverages (CP01) displayed a particularly persistent and steep increase. Inflation in this category exceeded 5% shortly after the outbreak of the Russia-Ukraine war (February 2022), reflecting the EU's exposure to agri-food supply chain disruptions. These developments were exacerbated by the fact that both Russia and Ukraine are major global suppliers of cereals, sunflower oil, and fertilisers (Bodnár & Schuler, 2022).

While broader inflation declined in late 2023 due to falling energy prices, food inflation remained elevated throughout 2024, suggesting a slower pass-through of global shocks in the food supply chain. This persistent inflation is particularly concerning from a social equity perspective, as food is a basic necessity, and its price volatility tends to hit low-income households the hardest.

In this regard, it is important to note that, according to Eurostat, food and non-alcoholic beverages account for an average of 14.3% of household spending across the EU, but this share is markedly higher in less affluent countries - over 24% in Romania, for instance. These disparities are critical for understanding the regressive impact of inflation and its link to food insecurity and material deprivation (Ampudia et al., 2023; Menyhert, 2022; Pallotti et al., 2024).

Fig. 2 presents monthly food inflation rates by ECOICOP 4-digit categories. Within the food groups, subcategories such as oils and fats, bread and cereals, meat and dairy product groups showed particularly sharp increases, driven by rising input costs and supply bottlenecks. These categories represent a substantial portion of household food budgets and are therefore critical for assessing welfare impacts.

Food accounts for a disproportionately large share of consumption among lower-income households - often exceeding 25% of total expenditure in the bottom income quintile, compared to 14 percent among the wealthiest (Menyhert, 2022). As such, sustained increases in food prices directly erode the purchasing power of the most vulnerable populations. Fig. 3 shows the share of food expenditure in total household consumption across EU-27 countries, revealing marked territorial disparities that align with the broader patterns of vulnerability discussed in the paper. Countries in Eastern and South-eastern Europe - including Romania, Bulgaria, and the Baltic States - display the highest shares, often exceeding 20% of total household spending. These elevated ratios signal a greater exposure of households in these regions to fluctuations in food prices, reinforcing the concern that food inflation has a disproportionately regressive effect.

The spatial distribution of food expenditure shares is closely correlated with income levels and economic resilience. In wealthier Member States such as Germany, the Netherlands, and the Nordic countries, food typically accounts for less than 12% of total consumption, allowing households to better absorb rising prices without severely compromising consumption volumes or quality. By contrast, in lower-income countries, where food constitutes a structurally higher share of the consumption basket, price surges translate more directly into affordability pressures and reductions in real welfare.

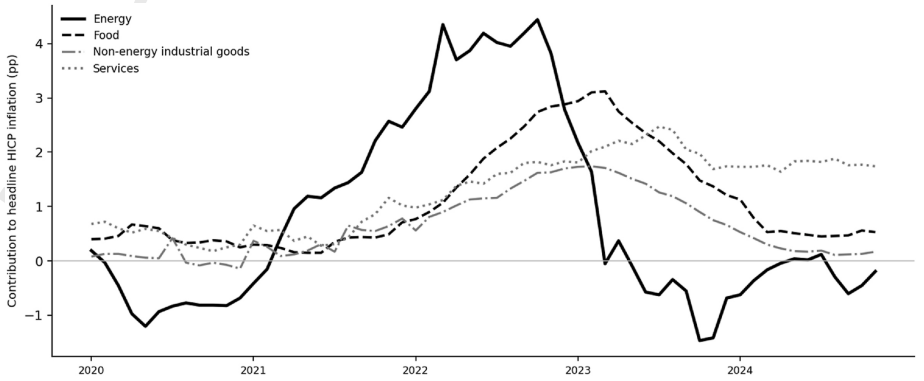

Fig. 1. Contribution to EU headline HICP inflation by main components, 2020-2024.
Source: Authors' elaboration from EUROSTAT data (prc_hicp_ctrb dataset)

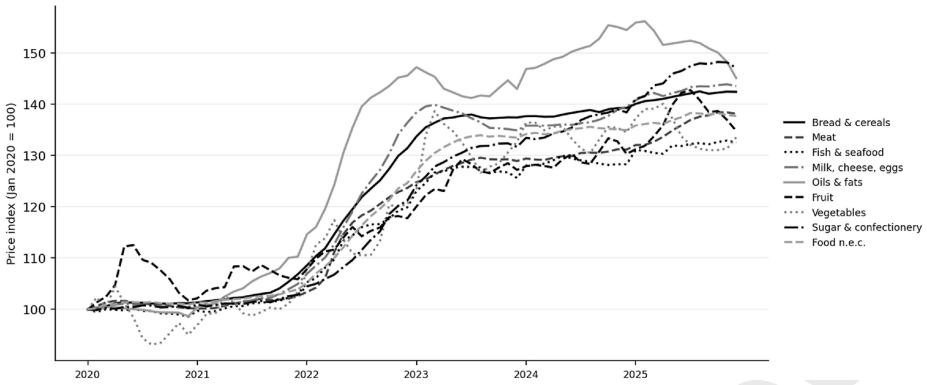

Fig. 2. EU-27 food prices by ECOICOP subcategory, 2020-2025 (Jan 2020 = 100).
Source: Authors' elaboration from EUROSTAT data (prc_hicp_ctrb dataset)

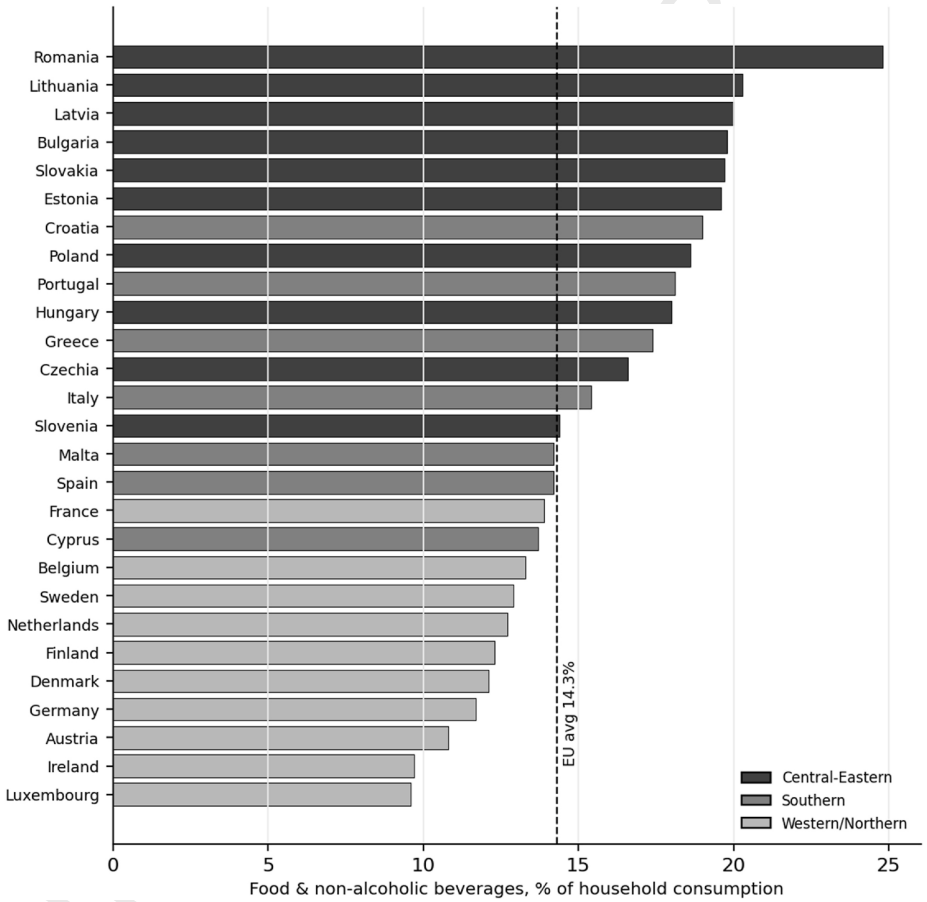

Fig. 3. Share of Food Expenditure in EU countries.
Source: *Authors' elaboration from EUROSTAT data*

As food prices rose, real household incomes stagnated or declined, eroding purchasing power and increasing the incidence of poverty and inequality. The data shown in Fig. 4 reveals that real food expenditure (chain-linked volume, 2020 = 100) decreased during the crisis period, indicating that many households were forced to reduce consumption or shift to lower-quality items, despite spending more in nominal terms. This reflects a deterioration in living standards, especially in lower-income Member States and among economically vulnerable groups.

While all countries experienced a marked decline in real food expenditure during the inflationary spike of 2022-2023, the extent of this contraction varied significantly across Member States. In particular, smaller and more open economies - such as the Baltic

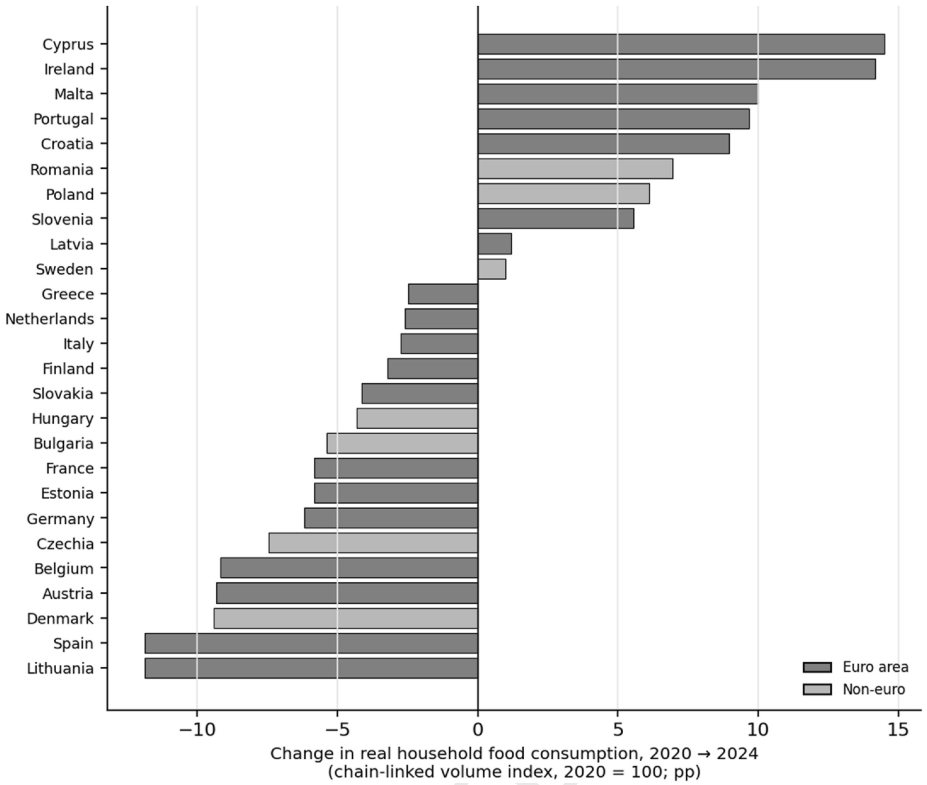

Fig. 4. Change in real household food consumption across EU Member States, 2020-2024 (chain-linked volume index, 2020 = 100; percentage-point change since 2020).
Source: Authors' elaboration from EUROSTAT data (nama_10_cp18 dataset). Luxembourg is not available in this Eurostat series.

States - recorded the steepest reductions, with real consumption falling by more than 15 percent in some cases. In contrast, larger and wealthier economies such as Germany, France, and the Netherlands observed more moderate declines, typically in the range of 4 to 6 percent. This asymmetry is consistent with earlier findings on the vulnerability of small economies to global price shocks, as their limited fiscal buffers and greater dependence on imported food and energy expose them to stronger inflationary pressures (Hałka & Leszczyńska-Paczesna, 2019; Pallotti et al., 2024).

Differences between euro-area and non-euro-area countries also appear to play a role. Countries with floating exchange rates - such as Poland, Hungary, and Romania - faced higher inflation peaks and sharper declines in real consumption compared to their euro-area counterparts. The combined effect of high food price inflation and high food budget shares places a heavier burden on vulnerable populations, especially in Member States with limited policy space to shield real incomes. While the flexibility of domestic monetary policy allowed for more rapid interest rate adjustments (European Central Bank ECB, 2023), this was partially offset by currency depreciation and pass-through effects on import prices, exacerbating domestic food inflation (Ampudia et al., 2023). Conversely, in euro-area countries, the uniform monetary policy stance of the ECB helped to anchor inflation expectations more effectively but was unable to fully mitigate national inflation differentials, due in part to heterogeneities in energy dependence and fiscal responses (Lane, 2022).

These outcomes underline the regressive nature of food inflation and its potential to exacerbate social and territorial inequalities across the Union.

The cross-country perspective shown in Fig. 5 reveals a marked divergence in food inflation dynamics across the EU. From 2020 to 2025, the interquartile range and the min-max spread in national food inflation rates widened significantly.[1] Countries such as Estonia, Latvia, and Czechia faced the most severe food inflation episodes, likely due to their greater exposure to global markets, limited monetary policy buffers, and smaller economic size. In contrast, countries such as Denmark and France maintained more moderate inflation paths. These differences mirror broader structural disparities - including income levels, policy frameworks, and welfare systems - across the Union.

Figs. 4 and 5 visually reinforce the argument that food price inflation is not only an economic phenomenon but also a social and territorial challenge. It contributes to diverging trajectories in living standards within the EU, undermining the Union's cohesion

[1] The shaded bands show the interquartile and min-max ranges across the 27 Member States and the solid line the median; the spread narrows toward 2015 and widens sharply after 2020, signalling rising dispersion (σ-divergence).

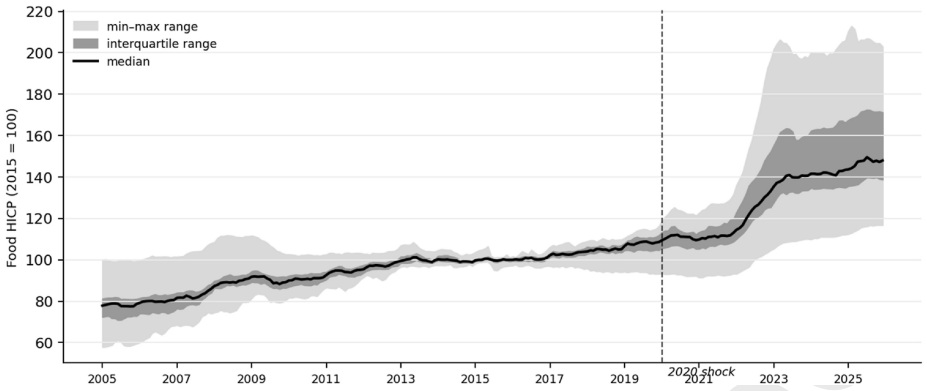

Fig. 5. Cross-country distribution of EU food price levels, 2005-2025 (HICP, 2015 = 100).
Source: authors' elaboration on Eurostat prc_hicp_midx.

objectives and highlighting widening disparities in real household welfare.

4. Understanding food price convergence in the EU

4.1. Motivation and conceptual framework

In the context of a monetary union like the European Union (EU), the convergence of inflation rates across member states is not only an indicator of economic alignment but a fundamental requirement for the effective functioning of the union itself. Price convergence ensures that the single monetary policy set by the European Central Bank (ECB) has uniform effects across countries, thereby supporting macroeconomic stability, fair competition, and social cohesion.

To assess price convergence across EU Member States, this study adopts the β- and σ-convergence frameworks widely employed in the empirical literature (Barro & Sala-i-Martin, 1992; Hałka & Leszczyńska-Paczesna, 2019). In particular, β-convergence tests whether countries with higher initial price levels experience slower subsequent price growth, indicative of a "catch-up" process. The methodology for β-convergence was initially derived from Baumol's 1986 study on real convergence among economies and initially employed graphical data analysis. The concept is then applied directly to the issue of food price convergence among European countries. Formally, the model regresses the average log-growth rate of prices on the log of the initial price level, following the log-log specification:

$$\frac{1}{T}\left[ln(y_{i,T}) - (y_{i,to})\right] = \beta_1 + \beta_2 \ln\left(y_{i,t_0}\right) + \varepsilon_t \tag{1}$$

where t_0 is the initial time period and T represents the end of time period, $y_{i,T}$ is the growth rate of HICP at the end of time period, y_{i,t_0} is the HICP rate at the beginning of time period, β_1 is the intercept, β_2 is the slope parameter, ε is statistical error term and i is index marking each country

In contrast to Baumol, Barro and Sala-i-Martin (1992) subsequently developed a regression-based approach within the theoretical framework of economic growth, introducing the concept of beta convergence for cross-country income levels. The concept is then applied directly to the issue of food price convergence in European countries:

$$(1/T)\ln\left(\frac{y_{it}}{y_{it-T}}\right) = \alpha + \alpha_1 \ln(y_{it-T}) + \sum_{k=1}^{k} \phi_k X_{k,it} + \varepsilon_{it} \tag{2}$$

Where: $(1/T)\ln\left(\frac{y_{it}}{y_{it-T}}\right)$ represents the rate of HICP growth, y_{it} is HICP of country i in period t, T is the number of months covered by one observation, $X_{k,it}$ for k = *1, …,K* is the set of control variables, and ε_{it} is random factor. $\ln(y_{it-T})$ measures the initial inflation level, so α_1 is used to draw conclusions about the existence and the rate of β convergence. The value of β coefficient that measures the rate of convergence can be calculated as (Barro and Sala-i-Martin, 2003):

$$\beta = \frac{1}{T}\ln(1 + \alpha_1 T)$$

If $\beta < 0$, there is conditional convergence; otherwise, there is conditional divergence. It indicates that it is difficult for commodity prices between regions to converge (Liu & Lee, 2021).

Having estimated the β parameter, we can also determine the speed of convergence: $\lambda = -\ln(1+\beta)$ and the half-life (which indicates the time needed to halve the distance from the mean): $HL = \frac{\ln(2)}{\lambda}$.

The assessment of convergence based exclusively on the velocity of mean reversion has been the subject of considerable criticism. Quah (1993) and Friedman (1992) argue that the negative parameter from regression (2) may not be connected to the convergence process itself but is instead a symptom of the mean reversion tendency of different samples from the same distribution (so-called Galton's fallacy; Bliss, 1999; Fazio & Piacentino, 2018). Furthermore, the mean reversion of relative price levels does not necessarily

imply a decrease in price dispersion across countries (Young et al., 2008). In the literature, it is often stated that beta convergence is a necessary but not sufficient condition for sigma convergence (Lichtenberg, 1994). A direct method of determining whether prices exhibit reduced dispersion across countries is to measure sigma convergence. Complementary to β-convergence, σ-convergence examines whether the cross-sectional dispersion of price levels (measured by the standard deviation or coefficient of variation) declines over time. This dimension is important because β-convergence is a necessary but not sufficient condition for overall convergence, as pointed out by Lichtenberg (1994).

Our approach closely aligns with Hałka and Leszczyńska-Paczesna (2019), who applied these methods to assess convergence of consumer prices within the EU over longer horizons. Like theirs, our analysis spans two decades (2005-2025); within this horizon we isolate the exceptional 2020-2025 shock period and compare it with the preceding fifteen years, testing whether it marks a temporary deviation or a lasting break in longer-run convergence.

While the convergence literature typically focuses on long-term horizons (often spanning 20 years or more; Barro and Sala-i-Martin, 2003), our analysis now covers two full decades (2005-2025) at monthly frequency, yielding 252 observations per country and food category. This long horizon aligns with that literature and lets us separate long-run convergence from the sharp, asymmetric adjustments triggered by the COVID-19 pandemic, the energy crisis, and the Russia-Ukraine conflict (Dreger et al., 2007; Guerreiro & Mignon, 2013). To isolate the role of the recent shocks, we additionally estimate the convergence parameters on sub-samples that include and exclude the 2020-2025 episode (notably 2005-2019 versus 2020-2025); the high frequency of the data further raises the power of the econometric tests and mitigates the small-sample concerns that affect short windows.

4.2. Analysis of convergence: results from EU countries

In this section we present the results of our convergence analysis. We first document the cross-country dispersion of food-price levels over the full 2005-2025 window (equation (1)), and then estimate panel β- and σ-convergence (equation (2)) for the EU-27 as a whole and separately for euro-area versus non-euro-area and Eastern versus Western Member States, distinguishing the pre-shock (2005-2019) and shock (2020-2025) sub-periods.

We estimate the β-convergence model of equation (2) on monthly food-price data for the full 2005-2025 window (252 months) and on the pre-shock (2005-2019) and shock (2020-2025) sub-samples, both for the EU-27 as a whole and separately for euro-area versus non-euro-area and Eastern versus Western Member States. The dependent variable is the average monthly log-growth of the HICP and the regressor is the log of the initial price level; conditional specifications add country-group dummies. Table 1 reports the absolute β-coefficients together with the corresponding σ-convergence statistics. A negative β denotes convergence (catch-up); a positive σ-trend (rising cross-country dispersion) denotes divergence. p-values in parentheses; full results by ECOICOP category are reported in the Appendix.

Over the full 2005-2025 window the estimated β-coefficient is negative and highly significant ($\beta = -0.0073$, $p < 0.001$), indicating that Member States with higher initial food-price levels experienced systematically slower subsequent growth - that is, long-run β-convergence. The catch-up is equally clear in the pre-shock sub-sample (2005-2019: $\beta = -0.0071$, $p < 0.001$). During the 2020-2025 shock, however, the sign reverses: β becomes positive and significant ($\beta = +0.017$, $p < 0.001$), signalling divergence. The reversal is robust across the 5-, 15- and 20-year pre-shock windows, indicating a genuine structural break rather than an artefact of a short sample. This resolves the weak, inconclusive result obtained when attention is restricted to the 2020-2025 window alone, and is consistent with Hałka and Leszczyńska-Paczesna (2019), who document significant long-run convergence of EU consumer prices.

The cross-country pattern mirrors this reversal. Over the pre-shock period (2005-2019) convergence is broad-based: β is negative and highly significant for every country group - euro-area ($\beta = -0.0071$, $p < 0.001$) and non-euro members ($\beta = -0.0065$, $p < 0.001$), Eastern ($\beta = -0.0059$, $p < 0.001$) and Western ($\beta = -0.0072$, $p < 0.001$) economies alike (Table 1). During the shock (2020-2025) the sign turns positive for all groups, but the magnitude is markedly uneven: the point estimates indicate the strongest divergence among non-euro ($\beta \approx +0.024$) and Eastern ($\beta \approx +0.021$) Member States and the weakest in the euro-area ($\beta \approx +0.015$) and Western ($\beta \approx +0.007$) core. Because the short shock window limits the power of group-by-group tests, we confirm this gradient

Table 1
Absolute β- and σ-convergence of EU food prices, by sample and country group[a] (Eurostat HICP, 2005-2025).

	EU-27	Euro area	Non-euro	East	West
β-convergence (β < 0 = convergence)					
2005-2025 (full)	−0.0073***	−0.0067***	−0.0078***	−0.0059***	−0.0058***
2005-2019 (pre-shock)	−0.0071***	−0.0071***	−0.0065***	−0.0059***	−0.0072***
2020-2025 (shock)	+0.0174***	+0.0152***	+0.0239*	+0.0211	+0.0068
σ-convergence trend (<0 = convergence)					
2005-2019 (pre-shock)	−0.0005***	−0.0005***	−0.0004***	−0.0004***	−0.0004***
2020-2025 (shock)	+0.0015***	+0.0012***	+0.0018***	+0.0012***	+0.0005***

Notes: monthly Eurostat HICP food index (2015 = 100), 27 EU Member States, 252 months. β = slope of average monthly log price growth on log initial level; σ-trend = slope of the cross-country coefficient of variation on time. ***p < 0.01, **p < 0.05, *p < 0.10.

[a] Throughout, the euro-area (EA20) versus non-euro and Eastern versus Western classifications follow Eurostat definitions. For descriptive purposes the geographic grouping is: Western (Belgium, Germany, France, Ireland, Luxembourg, the Netherlands, Austria); Nordic (Denmark, Finland, Sweden); Baltic (Estonia, Latvia, Lithuania); Southern (Greece, Spain, Italy, Cyprus, Malta, Portugal, Croatia); and Central-Eastern (Bulgaria, Czechia, Hungary, Poland, Romania, Slovenia, Slovakia).

Source: Author's elaboration from Eurostat HICP data

with a conditional specification: the Eastern dummy is positive and significant ($\beta = +0.0012$, $p < 0.05$ over 2020-2025, rising to $\beta = +0.0016$, $p < 0.001$ over 2015-2025), whereas euro-area membership is not significant once initial price levels are controlled. The cleavage is therefore primarily East-West rather than euro vs. non-euro per se, consistent with Hałka and Leszczyńska-Paczesna's (2019) evidence of regional heterogeneity in EU price dynamics.

For the pre-shock period the implied speed of convergence is slow but statistically robust; during the 2020-2025 window the positive β implies divergence, so a half-life is not defined. Consistent with the well-known distinction between β- and σ-convergence (Friedman, 1992; Quah, 1993), we therefore read these estimates together with the σ-measures reported below.

The σ-convergence evidence mirrors this pattern. The cross-country dispersion of food prices (coefficient of variation) declines over 2005-2019 - σ-convergence - and rises sharply over 2020-2025 - σ-divergence. Because a 2015-based index mechanically compresses dispersion around the base year, we also measure the base-independent dispersion of cumulative price growth within each window; it confirms that cross-country dispersion accumulated markedly faster during the shock than over the preceding fifteen years. Taken together, the β- and σ-evidence shows that the long-run convergence of EU food prices was interrupted and reversed by the 2020-2025 shocks, with the largest divergence among non-euro-area and Eastern Member States.

These results admit a clear economic interpretation that goes beyond the statistical pattern. The convergence observed up to 2019 is consistent with the deepening of the single market and the common monetary framework, which progressively aligned food-price levels as trade integration and competition eroded cross-country gaps. The post-2020 reversal, by contrast, reflects the asymmetric transmission of a sequence of common but unequally felt shocks. Because the pandemic, the energy crisis and the Russia-Ukraine war operated mainly through internationally traded commodity and energy inputs, their pass-through to retail food prices depended on national structural characteristics - import dependence, the energy intensity of the food chain, the exchange-rate regime and available fiscal space - that differ markedly across Member States. Where these buffers were weakest, prices rose fastest, widening rather than narrowing the cross-country distribution.

The group estimates make this mechanism explicit and address directly the role of countries' economic bases. In the conditional specification the Eastern dummy is positive and highly significant (about $+0.0016$, $p < 0.001$), confirming a robust east-west food-price gap that survives controlling for initial price levels, whereas the euro-area dummy is not significant once structure is accounted for. During the shock the divergence is largest for non-euro and Eastern members ($\beta = +0.024$ and $+ 0.021$, respectively) - economies that combine floating exchange rates, and hence stronger imported-inflation pass-through, with smaller fiscal buffers and structurally higher food budget shares. It is therefore not euro membership per se, but the underlying exposure and policy capacity of each economy, that shapes how a common shock maps into national food prices; this is the precise sense in which economic bases matter. The contrast also clarifies the limited but real stabilising role of the common monetary framework, which moderated - without eliminating - inflation differentials within the union. Finally, the coexistence of β-convergence in growth rates with widening dispersion in levels is a reminder that β-convergence is necessary but not sufficient for σ-convergence (Friedman, 1992; Quah, 1993); the welfare-relevant outcome is the dispersion of price levels, which unambiguously rose.

These results sit comfortably within, and extend, the existing convergence literature, which addresses the reviewers' call to benchmark our findings against standard practice. The long-run β- and σ-convergence we document for 2005-2019 echoes Hałka and Leszczyńska-Paczesna (2019), who find converging EU price levels over 1999-2016 with faster catch-up for lower-price countries; tellingly, they also detect a break - convergence up to 2008 followed by post-crisis divergence in several categories - that parallels the 2019/2020 break we identify around the pandemic. The subsequent divergence is consistent with Garcia-Hiernaux et al. (2023), whose "tale of convergence and divergence" documents a persistent lack of long-run price-level convergence and a "convergence cost" for lower-price members, and with Brož and Kočenda (2018), for whom EU inflation convergence is genuine but fragile and factor-dependent. Beyond the studies already cited, our evidence aligns closely with recent work outside the convergence literature: the European Central Bank (2024) reports that euro-area inflation differentials widened to historically high levels in 2022 - driven disproportionately by smaller and Baltic economies and by cross-country differences in energy intensity - and that food-price dispersion peaked later than energy dispersion before partly receding, exactly the pattern, drivers and timing our σ-measures capture. Table A2 summarises these comparisons. Our specific contribution is to quantify this break for food at the ECOICOP 4-digit level over a full two-decade horizon, placing the 2020-2025 episode within, rather than apart from, the long-run convergence record.

At the category level the same reversal holds across the board, with differing intensity (Appendix Table A1). In the pre-shock period every ECOICOP food group converges ($\beta < 0$, $p < 0.001$). During 2020-2025 every group diverges ($\beta > 0$), but the divergence is concentrated in commodity-, energy- and processing-intensive staples - bread and cereals ($\beta = +0.023$), sugar, jam and chocolate ($+0.018$), milk, cheese and eggs ($+0.017$) and processed food n.e.c. ($+0.017$) - and is weakest for oils and fats (about $+0.000$), vegetables ($+0.003$), fish and seafood ($+0.004$) and meat ($+0.005$); the σ-trend statistics in Table A1 confirm the same ordering. The pattern reflects the composition of each category's costs rather than perishability per se. Where local cost components (energy, labour, processing and distribution) dominate - bread, dairy, processed foods - national price responses to the common shock differed widely and dispersion rose. By contrast, oils and fats, the most internationally traded and commodity-priced item, shows almost no cross-country divergence: a common global price shock moved all Member States together, raising the level sharply while leaving the cross-country distribution broadly unchanged. Full category-level β- and σ-estimates are reported in the Appendix.

Fig. 6 plots each Member State's average monthly food-price growth (vertical axis) against its log initial price level (horizontal axis), separately for the pre-shock period (panel a) and the shock period (panel b). A downward-sloping fit indicates convergence - Member States starting from higher price levels growing more slowly - while an upward-sloping fit indicates divergence. The contrast is stark: the relationship is clearly negative over 2005-2019 but turns positive over 2020-2025, and the euro-area (filled circles) and non-euro (open triangles) groups separate most during the shock. This visual reversal corroborates the regression estimates in Table 1 and points to structural differences - monetary regimes, economic openness, and exposure to external shocks - as drivers of

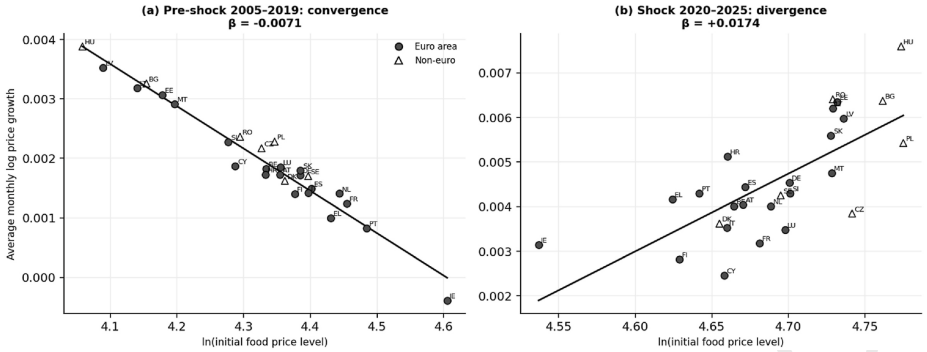

Fig. 6. β-convergence of EU food prices before and during the shock.
Each point is a Member State; the horizontal axis is the log initial food-price level and the vertical axis the average monthly price growth. The fitted line slopes downward in 2005-2019 (convergence) and upward in 2020-2025 (divergence); euro-area members are filled circles, non-euro members open triangles.
Source: authors' elaboration on Eurostat prc_hicp_midx.

the post-2020 heterogeneity.

These convergence dynamics are summarised graphically in Figs. 7 and 8, for the full 2005-2025 sample and for the shorter 2015-2025 robustness window, respectively.

Taken together, these results underscore that the broad-based convergence of EU food prices observed up to 2019 gave way, during 2020-2025, to a pattern of growing heterogeneity - most pronounced along the east-west divide and, more weakly, the euro vs. non-euro one. Convergence did not vanish uniformly: categories with shorter, more local supply chains (fish, meat, vegetables, oils and fats) resisted divergence far more than commodity- and processing-intensive staples (bread and cereals, dairy, sugar and processed foods). The euro-area core diverged less than non-euro and Eastern members, suggesting that the common monetary framework moderated inflation differentials within the union; once initial price levels are controlled, however, euro membership itself is no longer significant, indicating that it is the structural vulnerabilities and asymmetric exposure of each economy - rather than membership per se - that drove the widening dispersion, which the common framework dampened but could not offset.

5. Policy implication

The results point to a structural reversal in EU food-price convergence: a fifteen-year catch-up (2005-2019) gave way to sharp divergence during the 2020-2025 shocks, concentrated among non-euro and Eastern Member States - the economies with floating exchange rates, smaller fiscal buffers and higher food budget shares. Because these are precisely the groups our estimates identify as most exposed, the policy response should be targeted to them rather than uniform; the findings thus speak directly to how to mitigate the adverse distributional consequences of food-price inflation and strengthen resilience to future shocks.

Given the disproportionate burden borne by lower-income households and by smaller, more open economies, policies that can cushion vulnerable populations appear particularly warranted. Several EU countries have already implemented measures along these lines, which may serve as useful examples. For instance, temporary reductions or exemptions in VAT on essential food items have

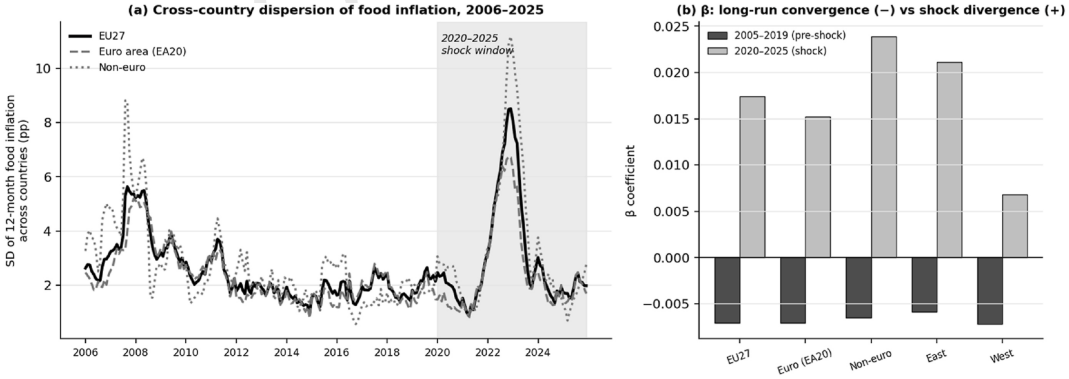

Fig. 7. Convergence and divergence of EU food prices, 2005-2025
Panel (a): the cross-country dispersion of 12-month food inflation (standard deviation across Member States) is low and stable until 2021, then spikes in 2022-23 - above the 2008 peak - before partly receding. Panel (b): the absolute β-coefficient is negative (convergence) over 2005-2019 for every country group and turns positive (divergence) over 2020-2025, the reversal being largest for non-euro and Eastern members.
Source: authors' elaboration on Eurostat prc_hicp_mid

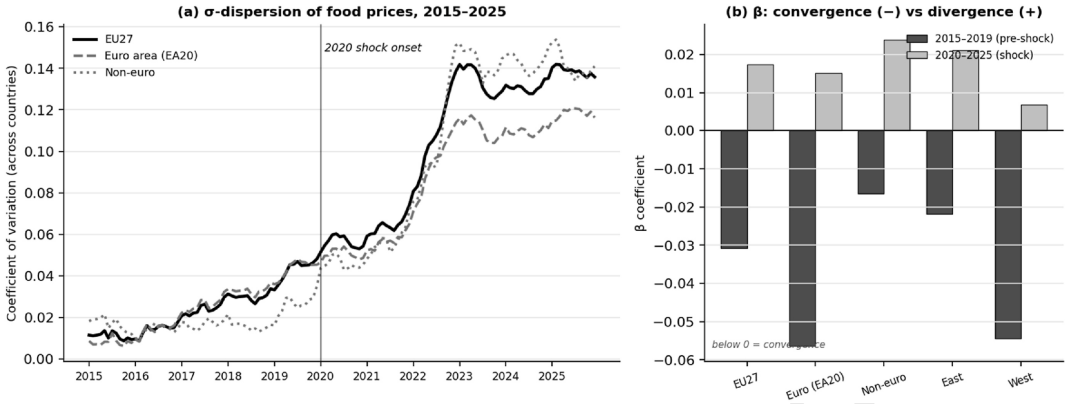

Fig. 8. Robustness over the 2015-2025 window
Panel (a): the cross-country coefficient of variation of food price levels rises sharply after 2020. Panel (b): the β-coefficient is negative (convergence) over 2015-2019 and positive (divergence) over 2020-2025 across all groups, confirming on the shorter sample the structural break documented for 2005-2025.
Source: authors' elaboration on Eurostat prc_hicp_midx.

been applied in Poland (2022-23) and Spain (2023), reducing the immediate impact of price surges on household budgets. Similarly, income-tested transfers - such as those implemented in the UK under the Energy Bills Support Scheme during the energy price crisis - have been proposed as a complementary tool to protect the purchasing power of low-income families. At the European level, the Fund for European Aid to the Most Deprived (FEAD) has supported the expansion of national food assistance programmes, which some Member States scaled up during the pandemic and inflationary peak.

These policy experiences suggest that well-calibrated and targeted fiscal measures, tailored to national contexts and fiscal space, can help alleviate the most acute effects of inflation on vulnerable households while maintaining incentives for efficient consumption and production. At the same time, strengthening the resilience of food supply chains - through diversification of import sources, investments in storage and distribution infrastructure, and fostering local production where feasible - may help to reduce exposure to external shocks in the longer term.

Furthermore, the findings also highlight the role of the euro area's shared monetary policy framework which, over the two decades examined here, is associated with a more moderate and more convergent inflation path in member states than outside the euro area (Fischer, 2012). Nevertheless, even within the euro area, differences in structural characteristics, such as energy dependence and the composition of consumption baskets, have led to asymmetric outcomes. Recent contributions to the literature on inflation heterogeneity (e.g., Ampudia et al., 2023; Känzig, 2023; Lauper & Mangiante, 2024; Pallotti et al., 2024) underline the importance of considering how monetary and fiscal policies interact with household heterogeneity and exposure to volatile goods like food and energy.

Two qualifications follow directly from this evidence and temper any strong monetary-policy reading. First, because monetary policy transmits to prices with long and variable lags, our high-frequency results characterise the short-run dispersion of food prices under common shocks rather than identify monetary transmission as such; we therefore draw measured implications, in line with the long-horizon evidence on inflation differentials within a monetary union (Lane, 2022) and on the heterogeneous, distributional effects of monetary policy across households (Ampudia et al., 2023; Pallotti et al., 2024). Second, the response should be calibrated to the groups our estimates identify as most exposed. Non-euro and Eastern Member States - with floating exchange rates, thinner fiscal buffers and higher food-budget shares - gained least from the common framework and benefit most from targeted fiscal support, such as income-tested transfers, temporary VAT relief on essentials and expanded food assistance; euro-area members rely instead on the ECB's anchoring of expectations complemented by national fiscal space (European Central Bank, 2024; Menyhert, 2022). Aligning the instrument to the source of exposure - exchange-rate pass-through, energy intensity, or the composition of the consumption basket - is what the cross-country evidence supports, rather than a uniform stance.

In summary, the evidence presented here reinforces the value of a balanced policy approach - one that combines targeted support for vulnerable households, investments in resilience-enhancing measures, and coordinated monetary and fiscal responses - while remaining attentive to the structural heterogeneity across Member States.

6. Conclusions

Over the two decades between January 2005 and December 2025 food-price inflation in the European Union evolved in ways that challenge the traditional view that monetary and market integration automatically foster price convergence. By exploiting a uniquely detailed monthly data set - the Harmonised Index of Consumer Prices (HICP) disaggregated to the 4-digit ECOICOP level - we traced the trajectories of food prices across all twenty-seven Member States and assessed convergence through the twin lenses of β- and σ-convergence.

Three findings stand out. First, EU food prices converged over the fifteen years before the pandemic but diverged sharply thereafter:

the cross-country σ-measure, having declined through 2019, rose steeply over 2022-23, precisely when households' real purchasing power was under greatest strain. The Baltic States, together with several other small and highly open economies, recorded cumulative price increases well above those of the large euro-area core, confirming that the recent divergence is a structural break from the preceding convergence trend rather than ordinary volatility.

Second, the picture is more nuanced at the category level. Before the pandemic every food group converged, but during 2020-2025 all of them diverged, and the divergence was far from uniform: it was concentrated in commodity-, energy- and processing-intensive staples - bread and cereals, dairy, sugar and processed foods - while the most internationally traded item, oils and fats, together with several perishables (fish, meat and vegetables), diverged least. These mixed results underscore that convergence is not a single, economy-wide phenomenon but varies with the nature of the good and the structure of its supply chain, reflecting exposure to global commodity and energy markets rather than catch-up dynamics or perishability per se.

Third, the data reveal a distinct divide between monetary regimes. Countries within the euro area, which share a single monetary policy and are shielded from exchange-rate fluctuations, generally avoided the extreme inflation spikes observed in their non-euro neighbours, such as Hungary, Poland, and Romania. In these non-euro countries, currency depreciation and a stronger pass-through of global price shocks amplified domestic inflation, despite efforts by national central banks to tighten monetary policy.

This episode illustrates both the stabilising benefits and the limitations of the euro's common framework: while inflation expectations were more firmly anchored within the currency union, structural differences - such as varying degrees of energy dependence and fiscal capacity - continued to produce substantial national inflation differentials.

These findings carry immediate policy implications. Because food accounts for a disproportionate share of spending in the lowest income quintiles (Menyhert, 2022) the observed price divergence risks deepening inequality and fuelling material deprivation, especially in Eastern and Baltic Member States. Targeted fiscal tools - income-tested transfers, temporary reductions in VAT on essentials, expanded food-assistance schemes - can cushion vulnerable households. At the same time, medium-term resilience requires investment that diversifies grain and fertiliser supply chains and strengthens logistics infrastructure, thereby reducing exposure to external shocks. Co-ordinated action at EU level, blending national fiscal efforts with the ECB's price-stability mandate, is essential if inflation heterogeneity is not to undermine the Union's cohesion objectives.

This study is not without limitations. While the twenty-year horizon places the recent episode firmly within the long-run convergence record, the 2020-2025 shock window is itself recent, so whether the divergence proves transitory or marks a lasting structural break can be confirmed only as more post-shock data accumulate. Econometrically, the estimates for the short shock sub-sample should be read with the usual caution about reduced statistical power and small-sample bias; and, because β-convergence is necessary but not sufficient for σ-convergence (Galton's fallacy; Quah, 1993; Friedman, 1992), we rely on the β- and σ-measures jointly rather than on either alone. Finally, national aggregates do not reveal the urban-rural and income-class disparities that matter most for welfare. Future research could test whether the post-2020 divergence is a temporary deviation or a structural break, for instance through club-convergence methods.

Research involving human participants and/or animals:

This article does not contain any studies with human participants or animals performed by the author.

Declaration of competing interest

The authors declare that they have **no conflicts of interest** relevant to the content of this article. No financial or personal relationships with other people or organisations influenced the research, authorship, or publication of this work.

Appendix

Table A1
Convergence of EU food prices by ECOICOP category, EU-27, pre-shock (2005-2019) versus shock (2020-2025).

Food category	β 2005-2019	β 2020-2025	σ-trend 2005-2019	σ-trend 2020-2025
Food (total)	−0.0071***	+0.0174***	−0.00051***	+0.00150***
Bread & cereals	−0.0070***	+0.0226***	−0.00062***	+0.00204***
Meat	−0.0068***	+0.0049*	−0.00048***	+0.00092***
Fish & seafood	−0.0060***	+0.0045	−0.00071***	+0.00132***
Milk, cheese, eggs	−0.0070***	+0.0174***	−0.00046***	+0.00161***
Oils & fats	−0.0064***	+0.0000	−0.00049***	+0.00076***
Fruit	−0.0063***	+0.0131**	−0.00057***	+0.00152***
Vegetables	−0.0073***	+0.0029	−0.00058***	+0.00130***
Sugar, jam, honey, choc.	−0.0064***	+0.0177***	−0.00045***	+0.00166***
Food n.e.c.	−0.0071***	+0.0172***	−0.00055***	+0.00202***
Non-alcoholic bev.	−0.0061***	+0.0067	−0.00054***	+0.00131***

Notes: EU-27, monthly Eurostat HICP by ECOICOP 4-digit category (2015 = 100). β = slope of average monthly log price growth on log initial level (β < 0 = convergence); σ-trend = slope of the cross-country coefficient of variation on time (<0 = convergence). ***p < 0.01, **p < 0.05, *p < 0.10.

Table A2
The present study in the context of the price-convergence literature (EU and euro area).

Study	Coverage & period	Prices/method	Main finding
Hałka and Leszczyńska-Paczesna (2019)	EU, 1999-2016	Disaggregated price levels; β/σ	Catch-up convergence up to 2008; divergence in several categories after the global financial crisis.
Garcia-Hiernaux et al. (2023)	EMU, 2001-2011	Price indices; relative-price test	No long-run price-level convergence for most countries; persistent "convergence cost".
Brož and Kočenda (2018)	EU, 1999-2015	Inflation rates; β/σ + factors	EU inflation convergence present but fragile and factor-dependent.
Faber and Stokman (2009)	Europe, long run	Price levels; β/σ	Convergence in tradables; mixed evidence for broad price indices.
European Central Bank (2024)	Euro area, 2021-2024	HICP inflation; dispersion accounting	Differentials at historic highs in 2022 (energy, Baltic States); food dispersion peaked late, then partly reversed.
This paper	**EU-27, 2005–2025**	**HICP food, ECOICOP 4-digit; β/σ, subsamples & groups**	**Long-run β/σ-convergence (2005–2019) reverses to divergence (2020–2025); largest for non-euro & Eastern members.**

Data availability

The data used in this study are available to the public under a Creative Commons license from Eurostat at https://ec.europa.eu/eurostat.

Specifically, the analysis draws on the Harmonised Index of Consumer Prices (HICP) dataset (prc_hicp_midx), covering January 2005 to December 2025 - note that prc_hicp_midx has since been superseded by the equivalent Eurostat series prc_hicp_minr - with DOI: https://doi.org/10.2908/PRC_HICP_MIDX and national accounts data (nama_10_cp18) with DOI: https://doi.org/10.2908/NAMA_10_CP18. These data can be accessed and downloaded free of charge from the Eurostat online database.

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