STUDY

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Monetary Dialogue, November 2022

European Parliament

Inflation differentials: consequences for monetary policy

Compilation of papers

Policy Department for Economic, Scientific and Quality of Life Policies
Directorate-General for Internal Policies
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Abstract

According to its price stability mandate, the European Central Bank (ECB) conducts a single monetary policy by targeting the aggregate euro area inflation rate. Even though monetary policy is not geared towards addressing inflation dispersion between Member States, wide inflation differentials have implications for monetary policy. At the moment of extreme volatility and high energy prices, Member States experience very high levels of headline and core inflation dispersion, affecting monetary policy transmission. Notable differences can also be viewed in inflation expectations and wage-price dynamics, with all these factors putting constraints on the ECB to deliver on its price stability mandate effectively.

Three papers were prepared by the ECON Committee's Monetary Expert Panel, analysing inflation dispersion in the euro area and the policy implications arising from wide inflation differentials.

This publication was provided by the Policy Department for Economic, Scientific and Quality of Life Policies at the request of the committee on Economic and Monetary Affairs (ECON) ahead of the Monetary Dialogue with the ECB President on 28 of November.

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Inflation divergence in the euro area: nature and implications
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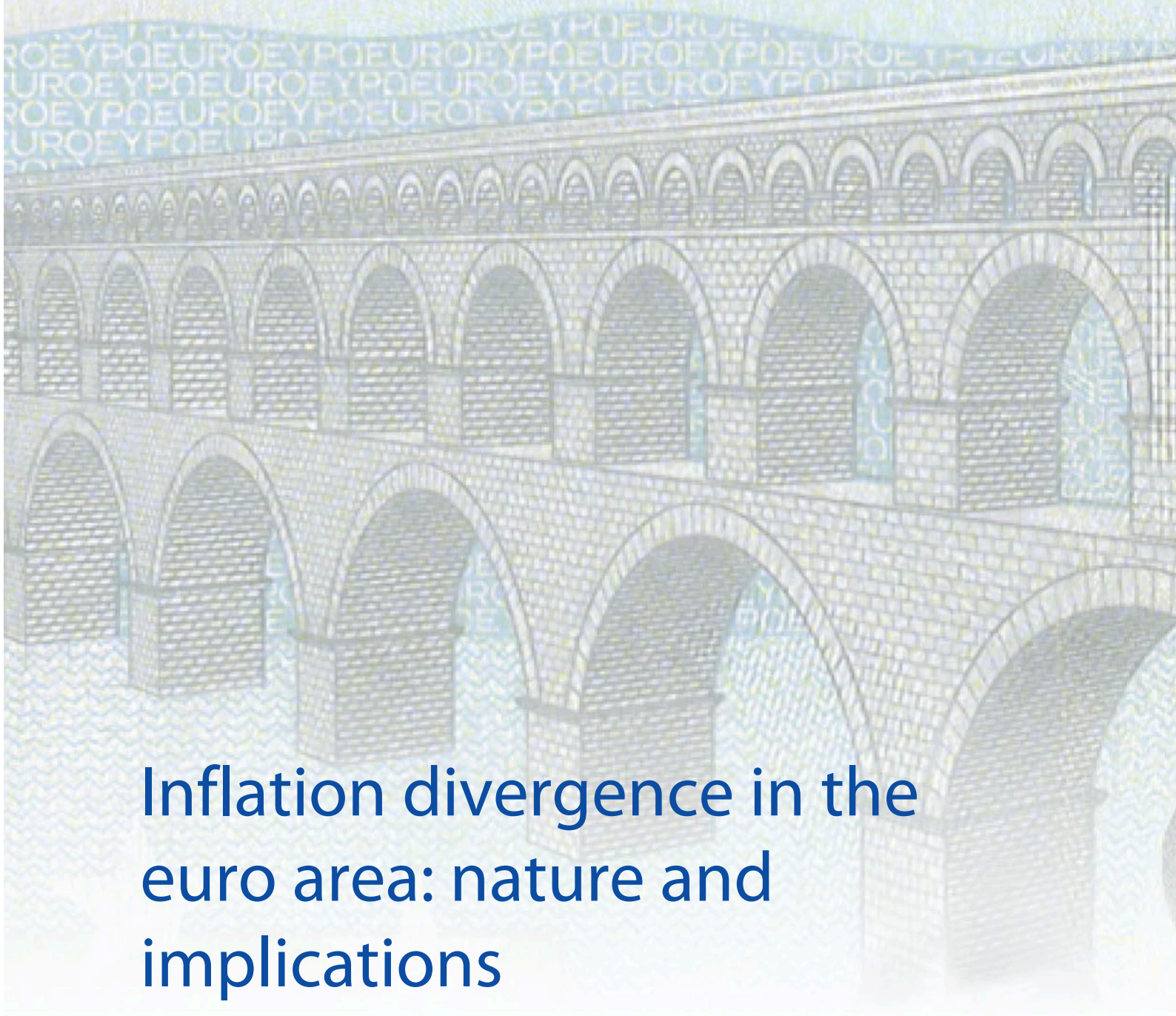
CONTENTS



Inflation divergence in the euro area: nature and implications

Klaus-Jürgen GERN, Nils SONNENBERG,
Ulrich STOLZENBURG

Abstract

Not only has inflation in the euro area accelerated to historical levels in 2022, but also the dispersion of inflation across Member States has risen strongly. We investigate the nature of this dispersion and find that it is driven by energy and food prices, whereas differences in core inflation are not unusually high, except for the Baltic countries. While large differences in inflation can lead to an undesirable divergence in growth trajectories, this cannot be addressed by the common monetary policy which should strictly focus on price stability in the euro area as a whole.

This paper was provided by the Policy Department for Economic, Scientific and Quality of Life Policies at the request of the Committee on Economic and Monetary Affairs (ECON) ahead of the Monetary Dialogue with the ECB President on 28 November 2022.

CONTENTS

LIST OF ABBREVIATIONS

ECB	European Central Bank
EU	European Union
GDP	Gross domestic product
HICP	Harmonised index of consumer prices
TPI	Transmission Protection Instrument

LIST OF BOXES

LIST OF FIGURES

EXECUTIVE SUMMARY

- **Headline inflation differentials among euro area Member States are currently at the highest level ever since the start of the monetary union, mostly driven by energy price increases.** Energy subcomponents like fuels, gas and electricity also diverge strongly due to differences in the energy mix but also the characteristics of household utility contracts and regulations, including government interventions to dampen price increases at the consumer level. Hence the historic energy crisis affects Member States differently. The different energy price dynamics also feed into diverging food price inflation.
- **Core inflation, by contrast, does not yet signal a concerning level of divergence, with the exception of the Baltic countries.** While measures of dispersion of core inflation are also historically high among all Member States, the level of dispersion is not unusually elevated when the Baltics are excluded. This finding is confirmed by the analysis of price developments of around 100 HICP subindices, as only the Baltics show a significant shift of the distribution of sub-group inflation rates.
- **Inflation divergences under a single monetary policy can be problematic.** Increased inflation dispersion can inhibit the smooth functioning of the currency union if inflation differentials are significant and persistent. Relatively high inflation may lead to the perception of relatively low real interest rates, potentially fuelling a spiral of rising prices, wages and activity, whereas conversely in low inflation parts of the currency union higher real interest rates can endanger fiscal sustainability and potentially depress the economy. At the current juncture, it is too early to say that the recent inflation dispersion will lead to similar self-reinforcing growth differentials in the euro area as have been experienced before and after the Financial Crisis.
- **The ECB must safeguard price stability for the euro area as a whole, not for every single Member State.** It is not the task of the single monetary policy to fine-tune the business cycle in each Member State. The ECB does not have the tools to create identical real interest rates and financing conditions, or to prevent real exchange rate imbalances from building up. The focus of a single monetary policy must be the euro area aggregate.
- **Diverging trends in inflation have to be kept in check by national policymakers and market forces.** It is the responsibility of national economic policy to counteract potentially harmful macroeconomic developments at the country level, e.g. by discouraging a domestic credit-financed boom by means of regulation or fiscal policy. And if divergent inflationary dynamics persist, the resulting real exchange rate developments will eventually activate market forces that contribute to resolving these imbalances.

1. INTRODUCTION

Inflation rates in all euro area countries increased steadily since early 2021 and are currently extremely high by historical standards. The highest inflation rates are currently recorded in the three Baltic countries at over 20%, followed by rates of around 15% in the Netherlands and Slovakia (Figure 1). Elsewhere in the euro area, headline inflation is generally close to 10%, only Finland, France and Malta have registered significantly lower inflation over recent months, but still significantly above the inflation target.

The inflation surge has different origins, but the effects have accumulated since early 2021. During the first phase of the post-pandemic reopening of the economy, supply-chain problems and material shortages stood in the spotlight of public discussion. The rapid recovery of demand for goods combined with supply-side problems eventually led to surging prices along the supply chain. European gas prices already increased strongly in the second half of 2021 reflecting concerns about supplies amid unusually flows from Russia during the summer, while oil prices also contributed to inflation. Energy inflation depends on the energy mix of the respective countries, on introduced price regulations and the institutional setting of household utility contracts.[1] Another factor behind the surge in inflation is the creation of purchasing power through the fiscal-monetary policy mix applied during the pandemic. In contrast to previous periods, the fiscal deficits during the pandemic were larger and totally absorbed by central bank asset purchases. Monetary aggregates increased heavily and are closely related to the extra savings, which accumulated during the pandemic. The coincidence of purchasing power on the one hand and negative supply shocks on the other hand, which led to lower production capabilities, constitutes another reason for the – worldwide – surge of inflation (Kooths, 2022).

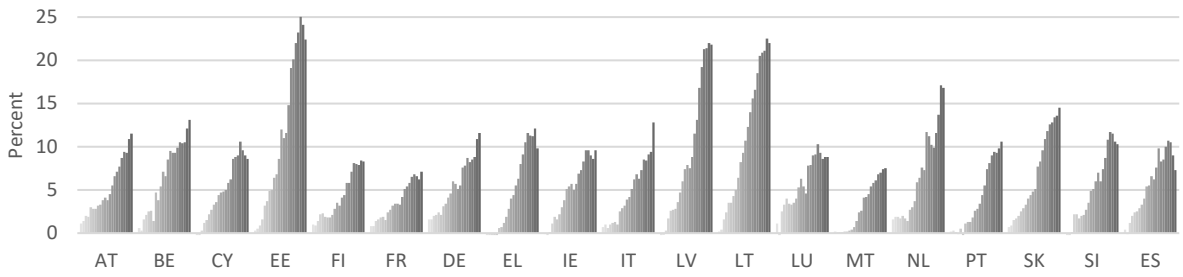
Inflation differentials across euro area Member States are at record levels. A large part of the dispersion of core inflation, i.e. inflation excluding energy, food, tobacco and alcohol, however, seem to be mostly driven by the three Baltic countries and Slovakia (Figure 1), where core rates are above 8%. For the rest of the euro area, core rates are considerably lower at approximately 4%. While recently the Netherlands, Greece, Cyprus, Portugal, Slovenia, Malta and Slovakia hit the 6% threshold. While there is huge divergence among the core rates of euro area countries they all reached a historic level and are way above the inflation target of the ECB.

The consequences of wider inflation differentials are unclear. Differences in inflation can to some extent be justified by catching-up processes. If there are larger deviations, however, and if these deviations accumulate, this can lead to excessive changes in real exchange rates within the currency union and lead to more asynchronous business cycles between Member States, thus complicating the conduct of monetary policy. The recent wave of inflation and inflation differentials is closely linked to the surge in energy prices and may be short-lived (or even reversed) if energy prices stabilise (or decline to more moderate levels). In any case, the question arises: what is the nature of recent inflation differentials, whether they will persist, and if there is need for the ECB to respond to them.

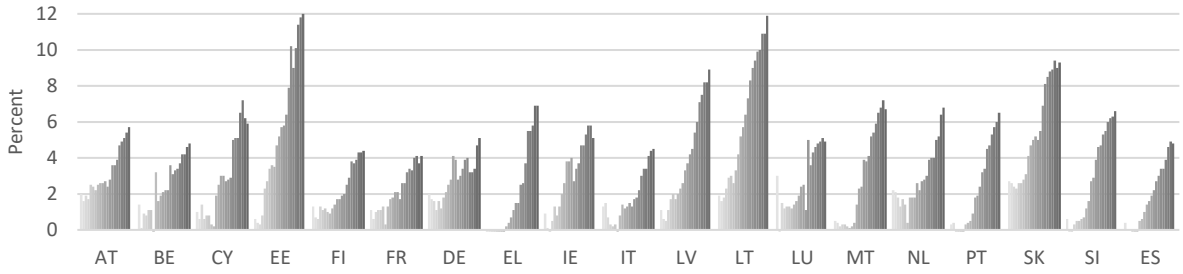
[1] The German council of economic experts has compiled a list of the interventions in European countries, although their degree and intensity is hard to measure (Sachverständigenrat, 2022, p.127).

Figure 1: Inflation rates in the euro area from January 2021 to October 2022

a) Headline Inflation



b) Core Inflation



Source: Refinitiv, Eurostat.

Notes: Monthly headline and core inflation rates from January 2021 to October 2022. Core rate here is defined as overall inflation excluding energy, food, tobacco and alcohol. October data for core rates was available for Belgium, Cyprus, Finland, France, Germany, Greece, Italy, Malta Netherlands and Slovakia.

This paper is organised as follows: Section 2 analyses descriptively the sources of inflation divergences in the euro area, digging into harmonised index of consumer prices (HICP) subcategories and comparing different groups of Member States. Section 3 explains how inflation divergences can inhibit a smooth functioning of the euro area economy. Section 4 concludes with a discussion of the possible consequences for monetary policy and national economic policies.

2. CURRENT INFLATION DIVERGENCES IN PERSPECTIVE

This chapter puts the current inflation divergences into perspective using different levels of disaggregation. The first part investigates differences in price developments at the level of headline, core, food and energy inflation as well as the categories services and non-energy industrial goods. Energy is further disaggregated into fuels, gas and electricity price inflation. The second part of the analysis is based on around 100 comparable price series focusing on the shifts in the distribution of sub-group inflation rates in the euro area countries.

For the analyses two statistical measures are reported. The first measure is the standard deviation of the 19 year-over-year inflation rates for every month since the beginning of the currency union. This measure gives the average percentage point deviation around the average inflation rate of the 19 countries (*#19*). The average inflation rate can be seen as a common trend among the 19 countries. The more dispersed the inflation rates are, the higher will be the standard deviation. A high degree of dispersion of inflation rates can constitute a problem for a single monetary policy, which only applies its policy instruments (esp. interest rates) to the whole euro area targeting aggregate euro area inflation. This measure is also calculated for two other country aggregates: one consisting of 16 countries, where the three Baltic countries (Estonia, Lithuania, Latvia) are excluded (*#16*), which currently stand out in terms of inflation, and one with only the 12 initial countries of the currency area (*#12*)[2]. The second measure is the average percentage point absolute deviation from the underlying euro area inflation. In comparison to the first measure, the country size is taken into account, as the 19 countries receive corresponding weights in the calculation of the euro area inflation aggregate. Hence, the reference is not an equally-weighted average inflation rate of the 19 Member States, but the weighted average of the 19 inflation rates using Eurostat country weights. This measure is also calculated for the other two country aggregates (*#16*, *#12*). Differences over time of the two statistical measures are limited, so the corresponding figures of the second measure are only reported in the appendix.

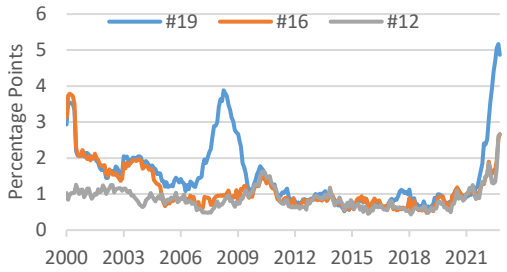
2.1. Inflation dispersion based on major product categories

Currently the dispersion in headline inflation rates stands at its highest ever level since the start of the monetary union. The headline inflation differentials are more pronounced for the 19-Member States than for the other two country aggregates (#16, #12), reflecting the fact that the three Baltic states are recently inflating considerably more than any other country (Figure 1, Figure 2a). This occurred in similar fashion before the great financial crisis (Figure 2a). Although significantly lower, inflation dispersion is also at record levels for the 12 country and the 16 country aggregates. Currently, the difference between the two country aggregates is small, whereas the dispersion in the 16 country aggregate was substantially larger than in the initial-12 in the early years of the currency union, when the four countries were outside the euro and even outside the European Union (EU).

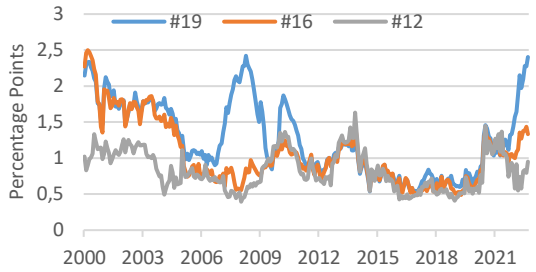
[2] 11 initial Member States from 1999: Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal and Spain, plus Greece which joined in 2001 before the currency was introduced. The following countries joined the currency area in a later stage: Cyprus (2008), Estonia (2011), Latvia (2014), Lithuania (2015), Malta (2008), Slovakia (2009) and Slovenia (2007).

Figure 2: Dispersion in headline and core inflation rates

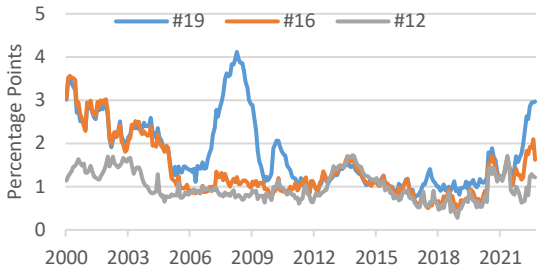
a) Headline Inflation: Standard Deviation



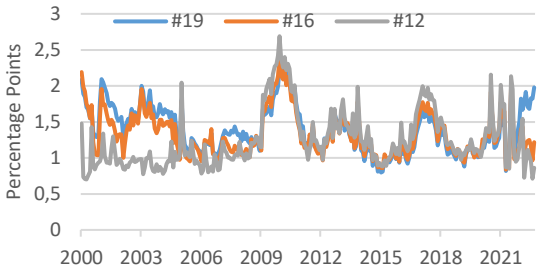
b) Core Inflation: Standard Deviation



c) Service Inflation: Standard Deviation



d) Goods Inflation (NEIG): Standard Deviation



Source: Refinitiv, Eurostat.

Notes: Standard deviation of 19, 16 and 12 inflation rates respectively. Country aggregate #19 based on all countries of the euro area. Country aggregate #16 excludes the three Baltic countries. Country aggregate #12 is based on 12 initial euro area countries. Core rate is overall inflation excluding energy, food, tobacco and alcohol.

Core inflation dispersion is not exceptionally high for the majority of Member States of the currency area. The overall dispersion measure (#19) has spiked in recent months and is currently close to the peak experienced in the runup to the Great Recession. Again, the dispersion level is clearly driven by the three Baltic countries, which experience way higher core inflation rates than the rest of the euro area countries. The #12 aggregate shows that core inflation differentials in the initial Member States of the euro area are currently even within the normal range experienced over the past 20 years (Figure 2b, Figure 1b).

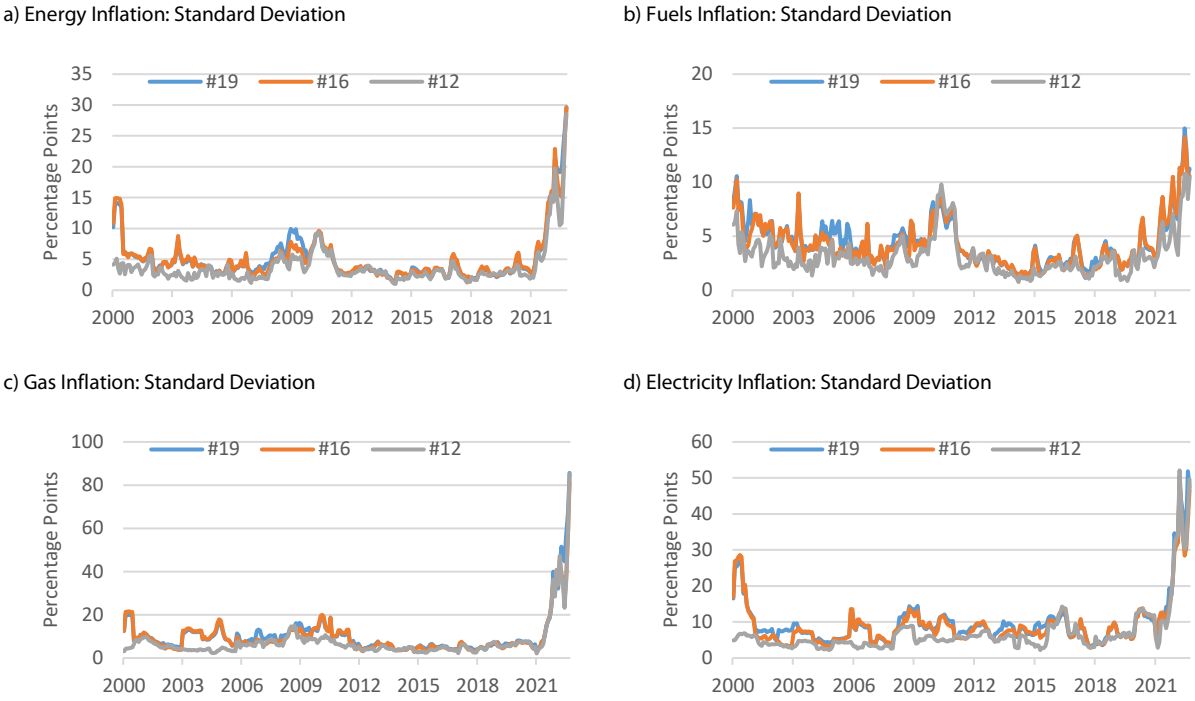
The divergence in core rates seems to be particularly driven by differences in services inflation. Dissecting the inflationary developments further, we look at dispersion in services inflation, which is at an elevated level with respect to its historical behaviour (Figure 2c, Figure 9 appendix). Again, services inflation is higher in the newer Members of the currency union and particularly in the Baltic countries, while for the 12 country aggregate the dispersion is less pronounced. Note that before and after the Great Recession, these countries have already shown large swings in services price inflation. Differences in services inflation can, in part, be caused by indirect effects of energy prices (pass-through), but wage dynamics should be particularly important as labour costs represent a large share of services production costs. Different wage dynamics will thus also be a prominent driver of core inflation divergences going forward.

Inflation differentials for non-energy industrial goods are overall relatively high, but only due to high inflation in the Baltics and still in line with former peaks. Non-energy industrial goods inflation has also risen for the 19-country group, but so far it is not higher than in previous phases of rising inflation. Strikingly, the increase of dispersion is entirely due to inflation in the Baltic countries as the

standard deviation is even comparatively low by historical standards for the 16- and 12- country aggregates (Figure 2d, Figure 9 appendix).

The biggest driver of headline inflation divergences is the energy component. Never before have there been energy price differentials of this magnitude in the euro area (Figure 3a, Figure 10 appendix). This holds true for all country aggregates, i.e. there are huge differences in energy inflation also among the initial Member States. These huge differences can be explained mostly by the gas and electricity components, but even fuel prices diverge strongly and at a level never seen before. Apart from transportation costs, fuel price increases should be relatively homogeneous among the Member States in a single market, but regulations and differences in the petrol-diesel usage might be drivers of this heterogeneity.

Figure 3: Dispersion in energy inflation



Source: Refinitiv, Eurostat.

Notes: Standard deviation of 19, 16 and 12 inflation rates respectively. Country aggregate #19 based on all countries of the euro area. Country aggregate #16 excludes the three Baltic countries. Country aggregate #12 includes 12 initial euro area countries.

Institutional settings, the energy and heating mix and different intensity of price regulations lie at the heart of the differences in the evolution of electricity and gas prices. In Germany, a high prevalence of long-term contracts of households and small firms for gas and electricity and a relatively large market share of risk-averse utility companies, which hedge their procurement costs on the futures market, have led to subdued price increases (Sonnenberg, 2022). By contrast, in the Netherlands and Greece, gas prices increased dramatically recently and are pushing headline inflation figures upwards[3]. Regarding electricity, there were recently also huge increases in the Netherlands and Italy[4].

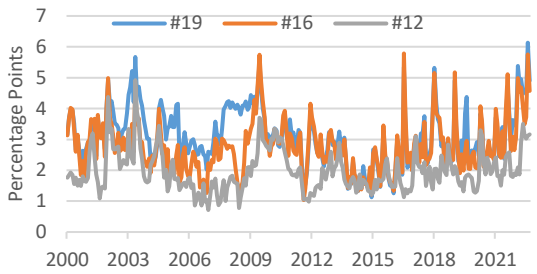
[3] In October 2022, the year-on-year increase of the gas component in the HICP is 229% in the Netherlands and 294% in Greece.

[4] The increase of the electricity component in October is 188% in the Netherlands and 103% in Italy.

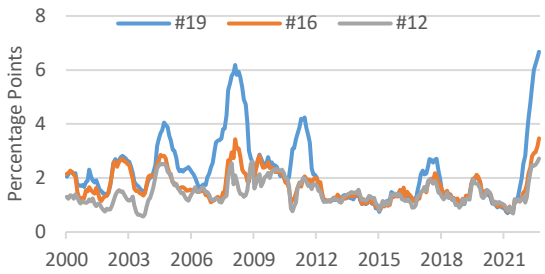
Once energy prices have stabilised, these drivers of dispersion should vanish. In some countries, the pass-through from higher electricity and gas prices is faster, while e.g. in Germany prices are increasing rather slowly. Nevertheless, in the end all countries face comparable costs regarding their energy inputs. The energy mix and the specific merit order to meet the demand then determines the cost increases. An energy mix where gas plants are needed relatively often to meet electricity demand will consequently end up with higher retail prices for households and companies. Future market prices decreased since their peaks in August, but are still relatively high compared to their 2005-2020 average values. For Germany, these futures prices still suggest a tenfold increase (Jannsen and Sonnenberg, 2022), which has so far been only partly passed on to retail customers. Eventually, in countries where the energy mix is heavily dependent on gas, the terms of trade effect and related loss in prosperity will probably be higher.

Figure 4: Dispersion in food inflation

a) Unprocessed Food Inflation: Standard Deviation



b) Processed Food Inflation: Standard Deviation



Source: Refinitiv, Eurostat.

Notes: Standard deviation of 19, 16 and 12 inflation rates respectively. Country aggregate #19 based on all countries of the euro area. Country aggregate #16 excludes the three Baltic countries. Country aggregate #12 includes 12 initial euro area countries.

Food price inflation differentials are currently also at a record level. Inflation differentials are high for both food subcategories (unprocessed food and processed food), but the dispersion is higher for processed food (Figure 4, Figure 11 appendix). This is probably related to the amount of energy used in the production process. The standard deviation at the level of 19 countries is once again visibly influenced by the dynamics in the Baltic countries, but the level for the other two country aggregates is also historically high (Figure 4). This effect might also be temporary in the sense that energy prices will be passed-through fully to consumers in all countries at some point.

2.2. Inflation divergences based on disaggregated approach

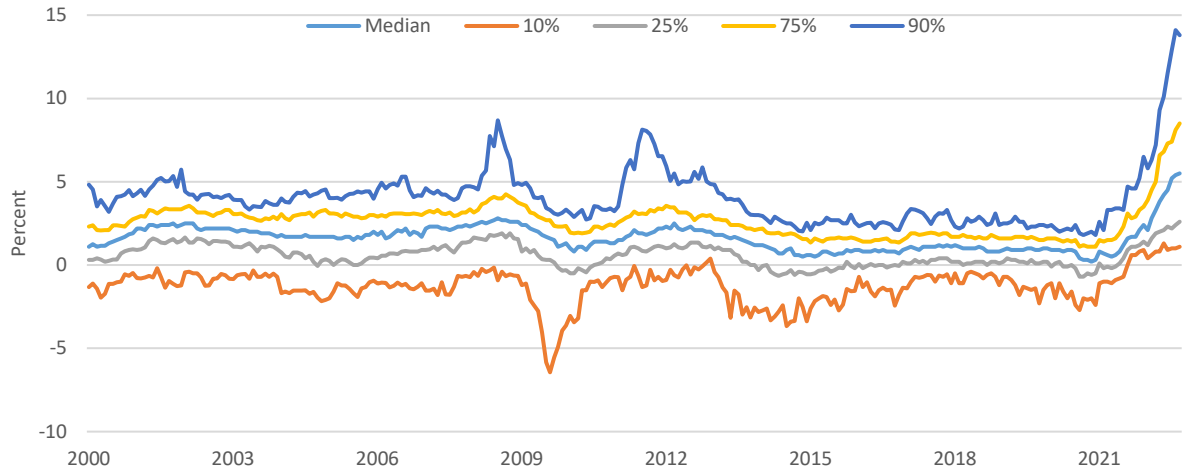
The disaggregated approach is based on some 100 subcomponents of the HICP and gives an insight into the broadness of price increases. For about 100 HICP price subindices distributional statistical measures provide information about the broadness of inflation. In contrast to the overall HICP and its categories – like services inflation or core inflation – the individual category time series are not aggregated using a weighting scheme, but are simply ranked by their monthly price increase. Then the 10, 25, 50, 75 and 90% quantiles are calculated[5]. The 50% quantile (median) indicates the inflation

[5] With 100 subindices, the 10% quantile is the price increase at the 10th rank, i.e. only 9 categories have lower price increases than this product group in the respective month, and approx. 90 categories experience higher price increases than this product group.

rate of the category that parts the 100 prices increases into two halves. The median rate like core rates can be seen as a gauge of the underlying inflation dynamics[6] (Sonnenberg and Stolzenburg, 2022).

Since 2021, the distribution of sub-group inflation rates for the euro area has shifted upwards, and the inflation process is becoming more and more broad based. All distributional summary measures lie currently at record levels (Figure 5). The 90% quantile is influenced heavily by energy prices, but also the other measures are unusually high. For example, since the beginning of the currency union the 10% quantile (almost) always had a negative value, i.e. there was a sufficient number of categories with falling prices – today this quantile stands at a positive value of 1.1%. The 25% quantile currently stands at 2.6% and hence above the inflation target of the ECB.

Figure 5: Distribution of sub-group inflation rates in the euro area



Source: Refinitiv, Eurostat.

Note: The graph shows quantiles of the distribution of sub-group inflation rates of CPI components at the 4-digit level (101 subindices).

In the past, big swings usually where shaped by the dynamics of crude oil prices. These big swings in a few oil-dependent subcategories can be seen by looking at the 10% and 90% quantile in the period around the Great Financial Crisis. With the booming world economy before the Great Recession, the oil price surged, reaching US dollar (USD) 140 per barrel of Brent in July 2008. A year before, it stood at USD 80 per barrel. In January 2009, the oil price stood at USD 40 per barrel. For fuel prices and heating oil the direct connection to crude oil prices is evident, but indirectly these dynamics spread to more categories.

The distribution of sub-group inflation rates was fairly stable until 2007, but shifted downwards after the Great Recession and the subsequent European sovereign debt crisis. Before 2007, the corridor between the 10% and 90% quantiles lay on average between -1% and 4%. The tails of the distribution experienced large swings after 2007 and during the Great Recession related to the volatility of oil prices. From 2015 to 2019 the corridor lay much lower, between -1% and 2.6% on average. Thus, particularly the higher quantiles (90%, 75%, 50%, 25%) shifted downwards. This effect also becomes

[6] A trimmed mean is another way, which is often used to measure the underlying inflation dynamic. For the trimmed mean the extreme price increases, i.e. especially high or low price increases, are not considered in the mean calculation. It is often having a similar trajectory as the median of all price increases (Sonnenberg and Stolzenburg, 2022).

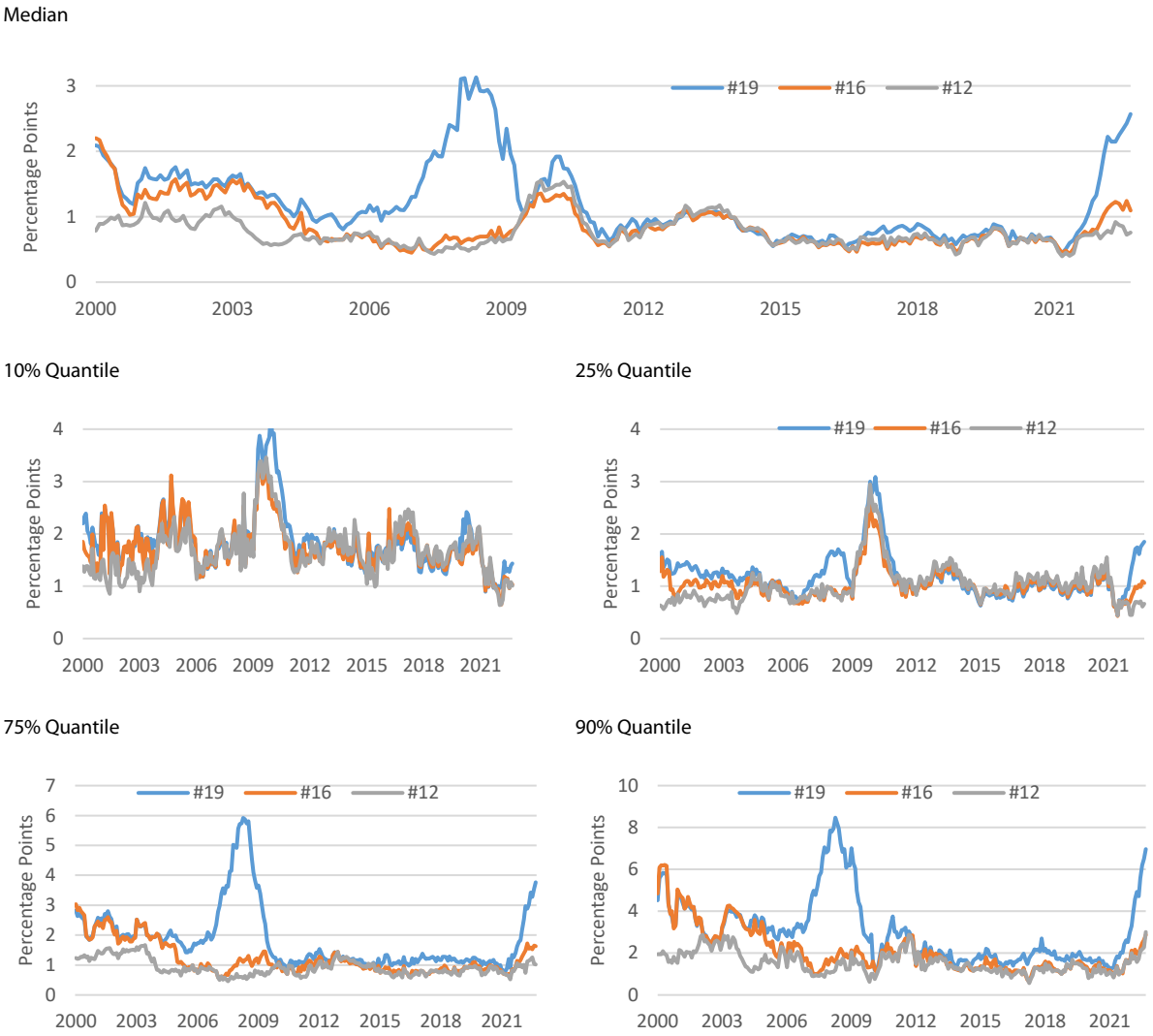
obvious from inspecting the inflation corridors for the single countries of the euro area (Figure 12 appendix).

The distributions of sub-group inflation rates in Italy, Spain, Greece and Portugal shifted visibly downwards in the aftermath of the euro sovereign debt crisis. This crisis, where sovereign bond yields escalated and growth rates decreased, had a lasting effect on the price dynamics in these countries (Figure 12 appendix). The shift in these countries also influenced the distribution of sub-group inflation rates of the euro area as a whole (Figure 5) as the share of these countries in the calculation of the euro area HICP is significant at about one third, according to the weights used by Eurostat.

The divergence in the quantiles of the distribution of sub-group inflation rates are currently at a high level. In line with the analysis above (chapter 2.1.), statistical measures like the standard deviation to describe the dispersion among the euro area countries can be calculated for all quantiles. Currently, the dispersion for a country aggregate including the Baltics is higher on all levels (quantiles). This is also indicated by the inflation corridors for the Baltics as they are the only ones that need a different vertical scale (Figure 13 appendix).

The median as an indicator for the underlying inflation dynamics also signals elevated price pressure in the Baltic countries. In line with the discussion of the behaviour of the core rates above (chapter 2.1.), the Baltic countries experience a much higher underlying inflation, so that the dispersion statistic for the country group including the Baltics stands out. But this is also true for the 75% and 90% quantiles (Figure 6, Figure 13 appendix). The dispersion for the 10% quantile is relatively low in historic comparison and there is also no big difference between the country aggregates (#19, #16, #12).

Figure 6: Dispersion in the distributional statistics of sub-group inflation rates



Source: Refinitiv, Eurostat.

Notes: Standard deviation of the summary distributional measures for the respective 19, 16 and 12 countries. Country aggregate #19 based on all countries of the euro area. Country aggregate #16 excludes the three Baltic countries. Country aggregate #12 is based on 12 initial euro area countries.

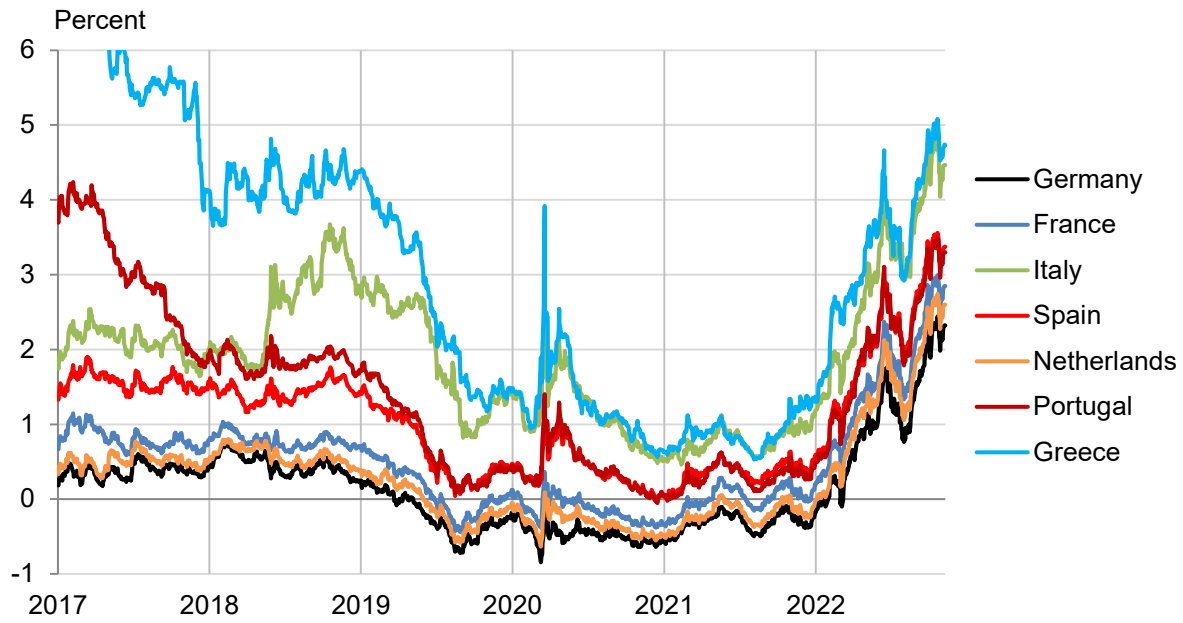
Overall, the effect from the Baltic countries on the distribution of sub-group inflation rates for the euro area as a whole is limited. The country weight of the Baltic countries sums up to about 1%, hence the effect is limited. The distribution of sub-group inflation rates for the initial 12 euro area countries is very similar to the euro area aggregate (Figure 5, Figure 12 appendix). A significantly higher distribution of subgroup inflation rates can only be observed in Slovakia and the Baltics. However, they have experienced a higher upward and downward price flexibility also in the past, hence these elevated inflation dynamics may prove to be temporary. But going forward there might result a bigger trade-off, if eventually wage dynamics based on past inflation surges set in or inflation expectations de-anchor contributing to a persistent divergence of price and wage setting behaviour in the Member States.

3. POTENTIAL PROBLEMS WITH INFLATION DIFFERENTIALS

Inflation divergences under a single currency with a one-size-fits-all monetary policy can be problematic. Deviations in price developments between Member States are not a big concern if they are rather small and temporary. However, as soon as inflation differentials become relatively large and persistent, there is a case for counteracting potentially detrimental effects to the statics and the smooth functioning of the currency union. In this chapter, we present issues that may arise with deviations in price developments across countries – concerning an uneven transmission of monetary policy, concerning public debt sustainability and real exchange-rate misalignments.

With substantial differences in nominal interest rates or domestic inflation, an even transmission of monetary policy to individual Member States is hard to achieve. Economic actors take investment and consumption decisions based on their expectations of real interest rates. If these differ to a large extent, either due to differences in nominal interest rates or in expected inflation, monetary policy instruments affect economic activity differently within the currency union. Inflation differentials can even be self-reinforcing, when high inflation in a Member State leads economic actors to build above-average inflation expectations, so that perceived real interest rates are lower than in the euro area average. As a result, investment and consumption is stimulated additionally, raising domestic demand even further and fuelling inflation. Conversely, below-average inflation dynamics can also be self-reinforcing, when perceived real interest rates are relatively high, and domestic demand is hampered, thereby putting further downward pressure on prices. As a result, inflation differentials could potentially increase heterogeneity of the cyclical situation between Member States making it more likely that the common monetary policy is inappropriate for individual countries.

Figure 7: Government bond yields (10-year)



Source: Refinitiv.

Notes: Daily data.

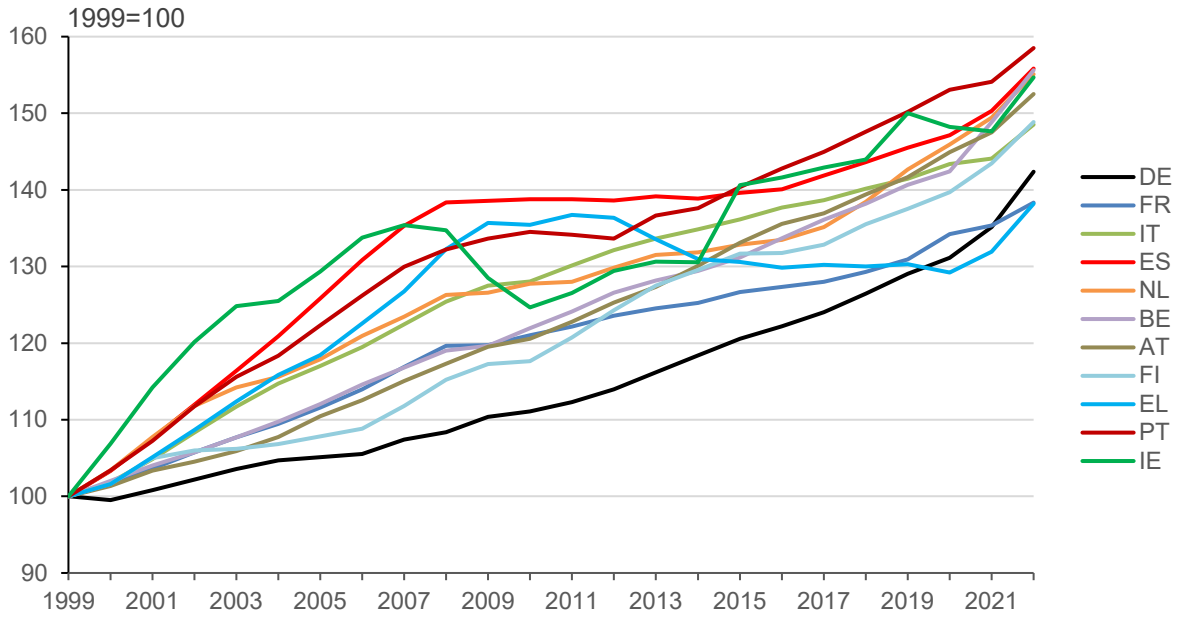
Differences in nominal interest rates for government bonds have temporarily receded since the peak of the euro area debt crisis, but they are still there. Compared to 2021, the respective risk spreads of highly-indebted countries have re-increased to alarming levels raising the spectre of another sovereign debt crisis (Figure 7). This "fragmentation risk" urged the ECB to introduce a new instrument, the "Transmission Protection Instrument" (TPI), to counteract tendencies that refinancing costs between Member States drift further apart. Large interest rate differentials for government bonds may translate to different financing conditions for the private sector, because government bonds serve as benchmark assets for domestic financial markets.

The gross domestic product (GDP) deflator has also shown remarkable differences within the currency union. Consumer prices are subject to major changes in import prices, while the GDP deflator basically indicates at what rate the price of domestic value added increases. Therefore, a closer look at this domestic component of inflation is warranted. For example, at the onset of the currency union, the GDP deflator increased at a much faster rate in Spain – at about 4% on average between 1999 and 2008 – in contrast to Germany, where the increase was merely 1% on average. This differential may have fuelled the domestic boom and housing bubble in Spain, where the single monetary policy was probably too lax at that time, whereas an ailing German economy likely needed a less restrictive monetary policy stance. After the global financial crisis, these trends partially reversed. GDP deflator growth in Spain fell to a level close to zero until approximately 2017, whereas it increased steadily at about 1.5-2% on average for Germany. Lately, in 2022, the GDP deflator increased markedly in Germany and the Netherlands at about 5-6%. In Spain, the GDP deflator increased by about 4%, and in France and Italy, the increase was merely 2% in the first half of 2022.

For the sustainability of public finances and government debt, the interest-inflation differential matters. Public debt sustainability depends not only on nominal interest rates, but also on growth of nominal GDP, which is the combination of real GDP growth and the increase of the GDP deflator. A country that faces low interest rates, high rates of economic growth and large increases in the GDP deflator is in a much more comfortable position with respect to debt sustainability than a country at the other side of the spectrum. In the latter case, low domestic inflation can be problematic, in particular if the average inflation rate of the euro area, which determines the monetary policy stance, is higher than the domestic one. The case of Italy could be particularly challenging, as the risk spread on benchmark government bond yields is relatively high, the potential growth rate is notoriously low, and the Italian GDP deflator has increased by considerably less (about 2% y-o-y) than the euro area average (4.3%) up to the second quarter of 2022. Overall, from the perspective of public debt service, below-average domestic inflation dynamics can be problematic. At the same time, however, if above-average inflation dynamics accumulate in a currency union, firms from the respective country can run into competitiveness problems.

Permanent inflation differentials can result in a build-up of real exchange rate misalignments. The early years of the currency union where characterised by a substantial decline in interest rates for many countries, which fuelled a credit-financed boom and pushed inflation up in some of the periphery countries like Spain and Ireland. Inflation differentials kept on building up in the domestic price levels, as indicated by the scissor-shaped deviation in the level of the GDP deflator between Germany (black line below) and some of the periphery countries (Figure 8). A similar picture can be drawn with the development of unit labour costs within the currency union, that led to current account imbalances between surplus countries (Germany, Netherlands) and deficit countries (Greece, Italy, Ireland, Portugal, Spain). Since then, domestic inflation as indicated by the GDP deflator was subdued in most of the periphery countries, contributing to a narrowing of the previous imbalances.

Figure 8: GDP deflator in selected Member States



Source: European Commission, AMECO database (Spring 2022 forecast); Own Calculations.

Notes: Yearly data.

So far, the recent inflation divergences are too short-lived to cause self-reinforcing cyclical variations within the euro area or a pronounced deterioration in competitiveness for some countries. It remains to be seen whether these divergences prevail once the major first shock has passed and energy prices stabilise on a somewhat more moderate level in a few quarters or years. Moreover, at least among the bigger Member States this far, countries with above-average inflation dynamics as indicated by the GDP deflator are not at risk of running into competitiveness issues immediately.

Central and eastern European countries like the Baltics have recorded persistently higher increases in the GDP deflator for many years, though this may also reflect a rather benign catching-up process towards advanced economies. The Baltic countries, among others, which are not included in Figure 8 above, would end up beyond the vertical scale at 250 to 300 in 2022. While they entered the currency union only in the 2010s, their former currencies were pegged to the euro before, so that, given the absence of a nominal devaluation, the persistent and large differential of prices for domestic value added led to a pronounced real appreciation with respect to the other euro area Member States . However, this inflation differential appears not to be a major problem for exporting firms in these newer, less developed Member States. It may rather reflect a benign catching-up process that results in higher wage dynamics and inflation rates that are in line with fundamentals (see Box 1 below). Nevertheless, local policymakers should carefully monitor their economies for potential signs of overheating, excessive wage growth and loss of competitiveness, to avoid undesirable consequences.

Box 1: The Balassa-Samuelson theorem: benign inflation differentials?

The **Balassa-Samuelson Theorem** (Balassa, 1964 and Samuelson, 1964) describes the catch-up process regarding income and price levels of less developed economies vis-a-vis more developed countries. Usually, the productivity level in the industry (relevant for goods trade) is lower in less developed economies, and through capital accumulation and assumption of technological progress, a higher productivity growth results in comparison to already developed countries. Hence, the real wages in the traded goods sector can increase in line with productivity without a loss in competitiveness. The increasing wages in the traded goods sector also trigger wage increases in the domestic service sector. The degree to which wage increases spill over to services hinges on the level of labour mobility. As the productivity level is assumed to be constant in the services sector, the wage increases also lead to an upward pressure on the general price level. **Thus, in comparison to advanced economies, less developed countries experience higher inflation** while catching up, along with an appreciation of the real exchange rate under fixed exchange rates (or nominal appreciation under flexible exchange rates).

There are **critical assumptions** though involved to generate this effect:

1. The productivity level of services is constant. – *In reality, also an increase in productivity in the service sector is likely, while the increase in productivity will probably be slower for services compared to industrial goods production.*

2. Services are not tradable. *In reality, some services are indeed tradable (e.g. IT services, consulting activities), but the macroeconomic aggregate of domestically produced services is to a considerably larger extent consumed domestically compared to industrial output.*

3. Demand mix for trade goods and services is constant. *In reality, with rising incomes also the consumption of services usually increases relative to goods.*

4. There is no international labour mobility. *In reality there is some cross-border migration.*

Additional finding regarding capital inflows: Capital inflows can lead to a **"pseudo"-Balassa-Samuelson effect**, where real wages increase beyond the productivity equilibrium path on a credit-driven demand boom (Belke et al, 2018).

4. CONCLUSION AND POLICY IMPLICATIONS

Historically high headline inflation differentials among euro area Member States are mainly due to differences in the evolution of the energy component, suggesting that underlying inflation dynamics is less of a concern. Energy price inflation strongly differs across countries due to differences in the energy mix, but also the characteristics of household utility contracts and regulation, including government interventions to dampen price increases at the consumer level. Different energy price dynamics are also a major factor behind the increased dispersion of food price inflation. Thus, at the moment the historic energy crisis seems to affect inflation in the Member States differently. Over time, however, with adjustments to the energy crisis progressing on both the demand and the supply side and temporary government programmes being wound down, we would expect differences in price levels for energy in general and gas in particular to recede again. With respect to core inflation, the level of divergence is currently not particularly high among the 12 initial euro area Member States. While exceptionally high core inflation in the Baltic Member States is leading to an elevated level of inflation dispersion in the total euro area, the size of the Baltic economies is small. In addition, experience with similar episodes in the past suggests that price flexibility in the Baltic countries is sufficiently high to correct any excessive real revaluation that may result from the current price dynamics in a relatively short period of time.

A more co-ordinated response of European governments to the energy crisis would help to reduce potential tensions arising from its different impact on inflation at the country level. National governments in the EU followed different approaches in their response to escalating energy prices. While some governments concentrated on measures to assist households in particular in coping with higher energy bills, e.g. by extra transfers often targeted to vulnerable groups, others intervened heavily to limit the increase in prices. For example, in France price increases for gas and electricity have been capped at 15% for the year 2023, following the cap of 4% for electricity and a gas price freeze in 2022. In Malta, gas and electricity prices did not increase at all since April 2021, according to Eurostat HCPI data. Substantial differences in the extent to which price intervention measures are taken tend to distort the common internal market. In addition, subsidised prices inhibit the role relative prices play for demand adjustment and will lead to higher energy demand, driving prices still higher for consumers in other countries. Monitoring and guiding national policies to support the proper functioning of the internal market would be an important role for institutions at the European level. In addition, a common European medium-term energy strategy, including elements such as long-term contracts with potential suppliers of energy and the closure of gaps in the energy infrastructure, could stabilise expectations both on the supply and the demand side with potentially significant positive effects for all countries involved.

Persistent inflation differentials in a monetary union can lead to self-reinforcing differences in the effects of the common monetary policy and a build-up of macroeconomic imbalances. Differences in the cyclical position of member countries and asymmetric shocks inhibit the efficient transmission of monetary policy across Member States of a monetary union, which, in the euro area, is complicated by the low level of coordination of national fiscal policies. Inflation dispersion could mean that the common monetary policy, which is set by the ECB with a view at the euro area level, is too loose for high inflation countries and at the same time too tight for countries with relatively low inflation rates, leading to diverging economic trajectories. In the early years of the currency union persistent differences in inflation and, hence, real interest rates, fuelled a credit-financed boom in some countries and eventually led to a (painful) correction of economic structures and relative price levels. It is too early to say that the recent inflation divergences will lead to similar self-reinforcing growth

differentials in the euro area. The behaviour of underlying inflation in the euro area countries, with the exception of the Baltic states, rather suggests that the risk of running into competitiveness issues is currently limited.

The primary objective of the ECB is to safeguard price stability for the euro area as a whole, not for every single Member State. It is important to note that the single monetary policy has to be conducted according to the requirements of the euro area aggregate. It is not the task of the ECB to fine-tune the business cycle in each Member State at any point in time, let alone provide a tailor-made monetary policy stance for the Baltics which represent less than a percentage point of euro area GDP. The ECB does not have the tools to provide identical real interest rates and harmonised financing conditions in every Member State, or to prevent real exchange rate imbalances from building up. The focus of attention of the ECB must be on the euro area as a whole.

The risk of fragmentation has increased amid monetary tightening and could result in the ECB being soft on inflation. Given the strong inflationary pressure, the ECB is called to tighten monetary policy aggressively. Substantially higher nominal interest rates could result in a painful increase of real interest rates particularly in countries with a relatively low growth of nominal GDP and a legacy of high government debt. In this situation, familiar questions about debt sustainability and fragmentation risk re-appear (Gern et al., 2022). To alleviate concerns about a negative spiral in sovereign debt markets, the ECB has launched the TPI. It is nevertheless possible that in the pursuit to avoid fragmentation risk, the ECB could be tempted to lean towards tightening monetary policy too slowly at the cost of persistent deviations from the inflation target.

Temporary inflation divergences will have to be kept in check by market forces and by policies in the Member States. Growth in high inflation countries will finally lose momentum when the domestic economy is increasingly priced out of the markets, and financial exposure has to be reduced. Such adjustments can, however, come with a serious recession. It is the responsibility of national economic policy to counteract harmful developments at the country level, e.g. by discouraging a domestic credit-financed boom by appropriate regulation (e.g. institutional setup for wage formation, housing market, macroprudential policy) or fiscal policy (e.g. taxation). In the context of macroeconomic surveillance ("Macroeconomic Imbalances Procedure"), the European Commission extensively reports on possibly undesirable developments in EU Member States. Countries receive in-depth analyses and economic policy recommendations from Brussels in order to counteract the build-up of vulnerabilities and macroeconomic imbalances. This is complemented by national institutions – central bank, ministries, research institutes, systemic risk board, fiscal council, think tanks – which analyse these issues and provide recommendations to national policymakers. If policy fails to arrest increasing imbalances, unsustainable economic trends will eventually be checked by market forces.

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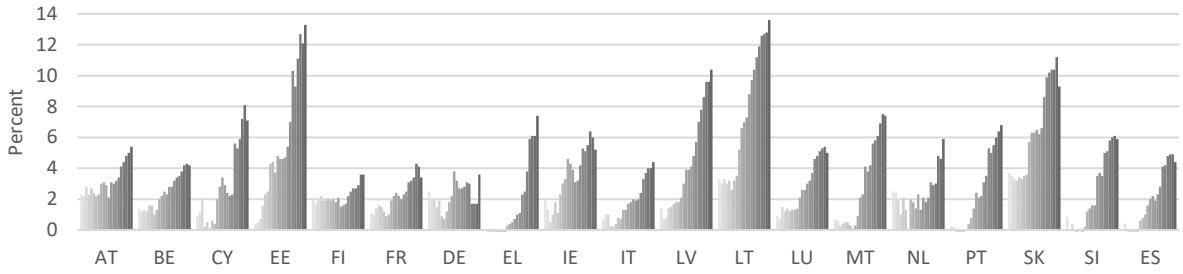
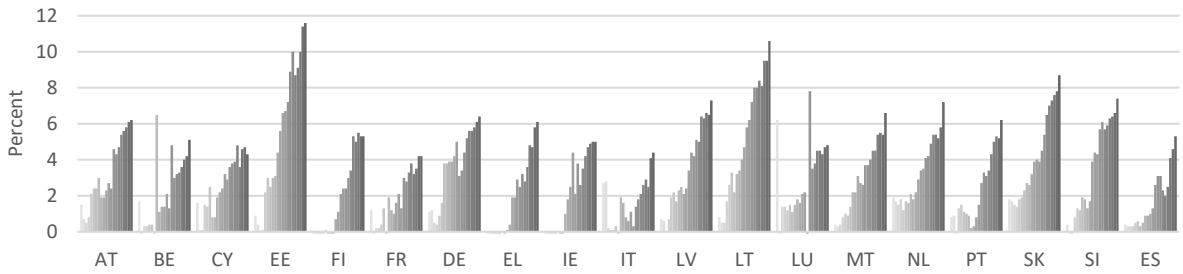
ANNEX

Figure 9: Service and goods inflation in the euro area

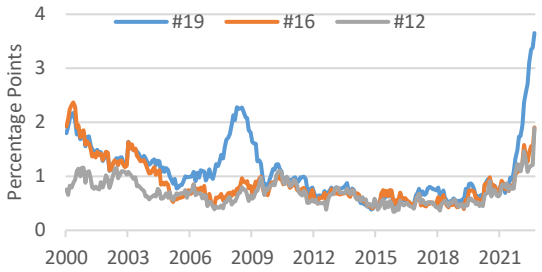
Service Inflation from January 2021 to September 2022



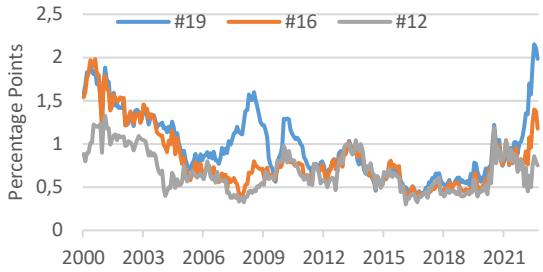
Goods Inflation from January 2021 to September 2022



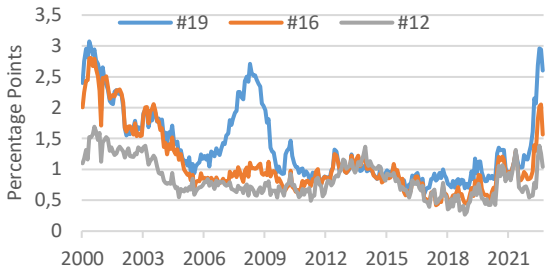
Headline Inflation: Mean of abs. difference from euro area rate



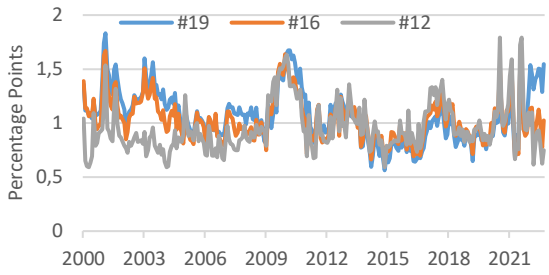
Core Inflation: Mean of abs. difference from euro area rate



Service Inflation: Mean of abs. difference from euro area rate



Goods Inflation (NEIG): Mean of abs. diff. from euro area rate

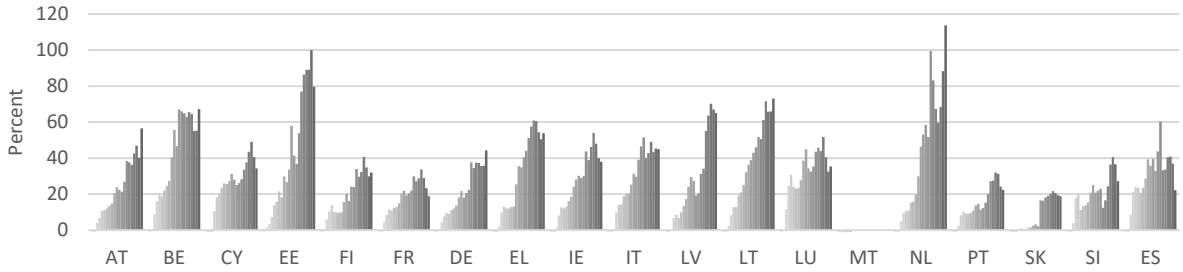


Source: Refinitiv, Eurostat.

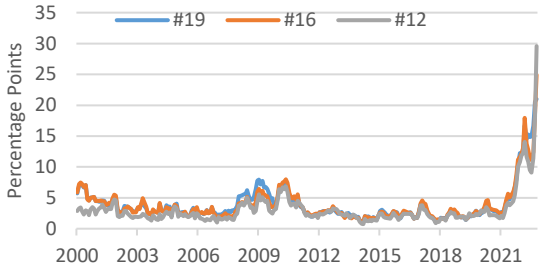
Notes: Mean of the absolute difference from corresponding euro area rate for 19, 16 and 12 countries respectively. Country aggregate #19 based on all countries of the euro area. Country aggregate #16 excludes the three Baltic countries. Country aggregate #12 is based on 12 initial euro area countries.

Figure 10: Energy inflation

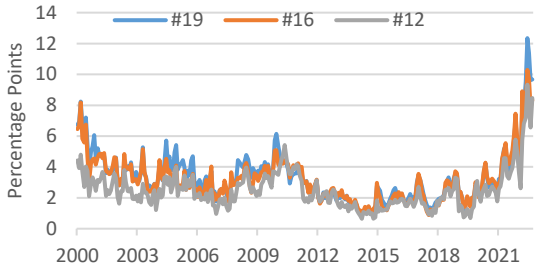
Energy Inflation from January 2021 to September 2022



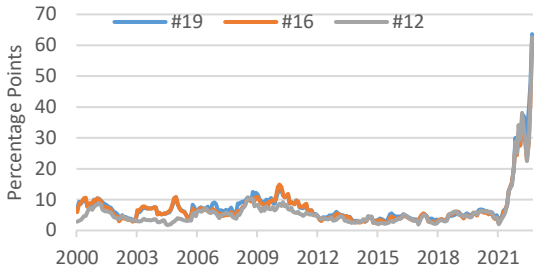
Energy Inflation: Mean of abs. difference from euro area rate



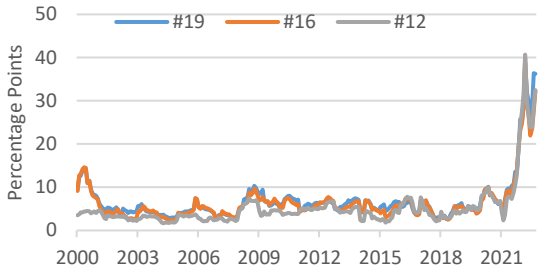
Fuels Inflation: Mean of abs. difference from euro area rate



Gas Inflation: Mean of abs. difference from euro area rate



Electricity Inflation: Mean of abs. difference from euro area rate

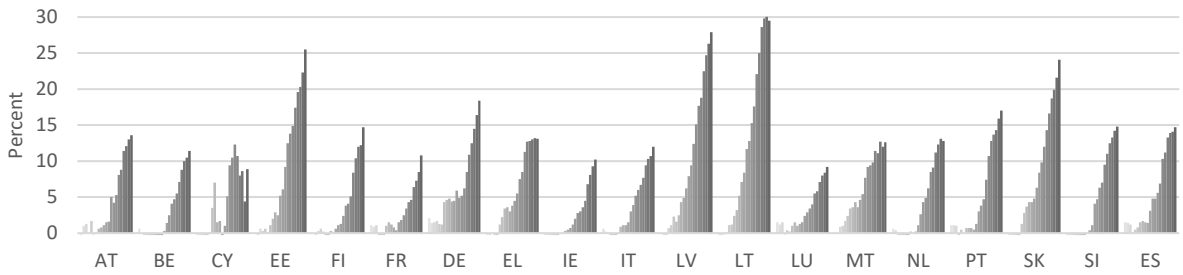


Source: Refinitiv, Eurostat.

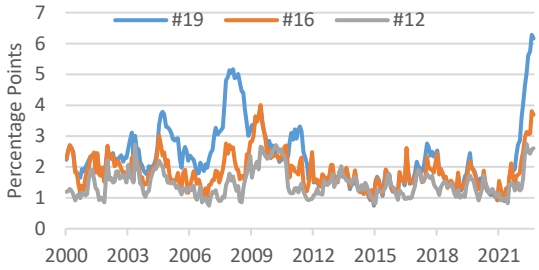
Notes: Mean of the absolute difference from corresponding euro area rate for 19, 16 and 12 countries respectively. Country aggregate #19 based on all countries of the euro area. Country aggregate #16 excludes the three Baltic countries. Country aggregate #12 is based on 12 initial euro area countries.

Figure 11: Food inflation

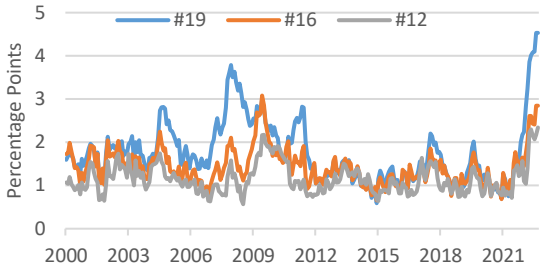
Food Inflation from January 2021 to September 2022



Food Inflation: Standard Deviation



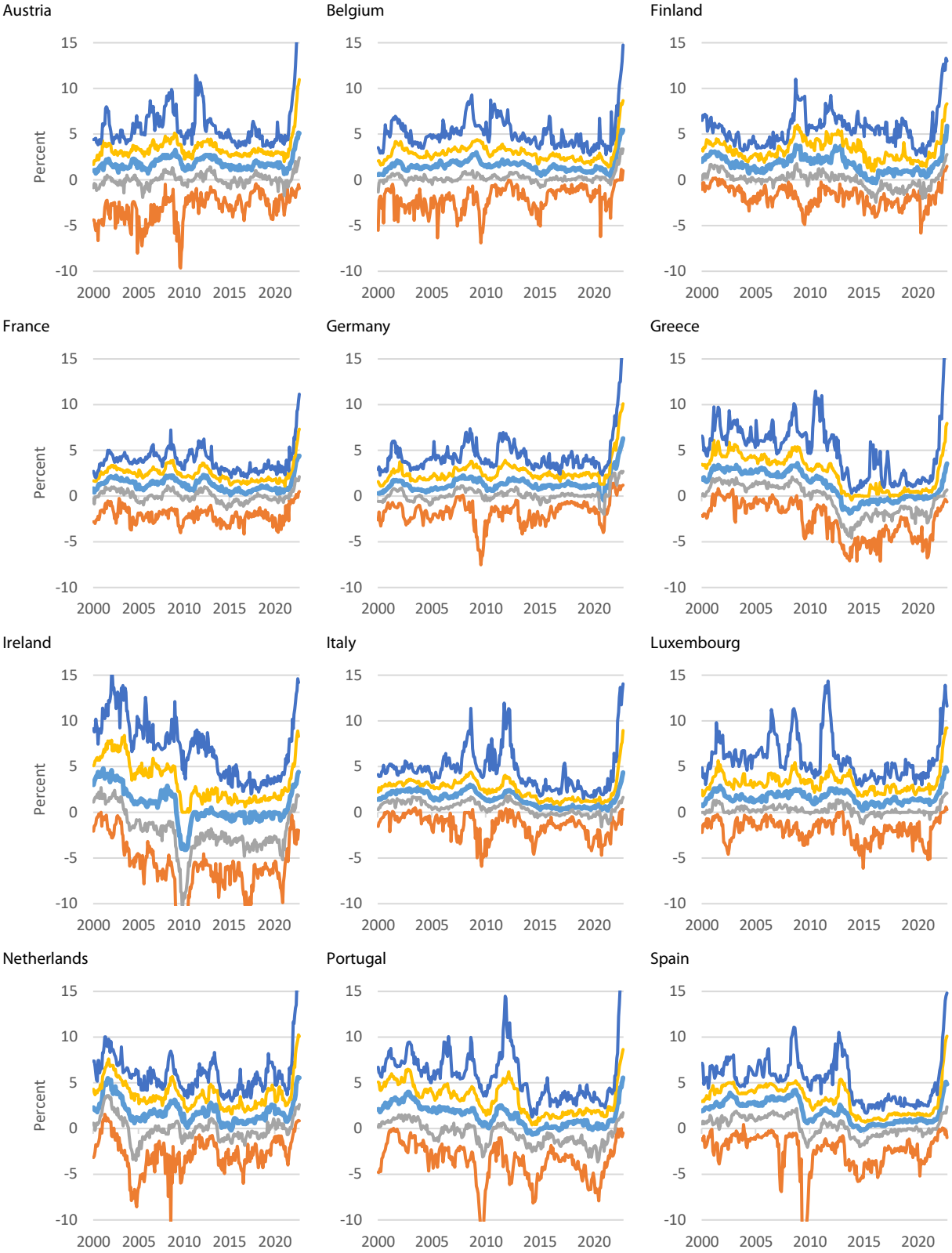
Food Inflation: Mean abs. difference from euro area rate



Source: Refinitiv, Eurostat.

Notes: Standard deviation of 19, 16 and 12 inflation rates respectively. Mean of the absolute difference from corresponding euro area rate for 19, 16 and 12 countries respectively. Country aggregate #19 based on all countries of the euro area. Country aggregate #16 excludes the three Baltic countries. Country aggregate #12 is based on 12 initial euro area countries.

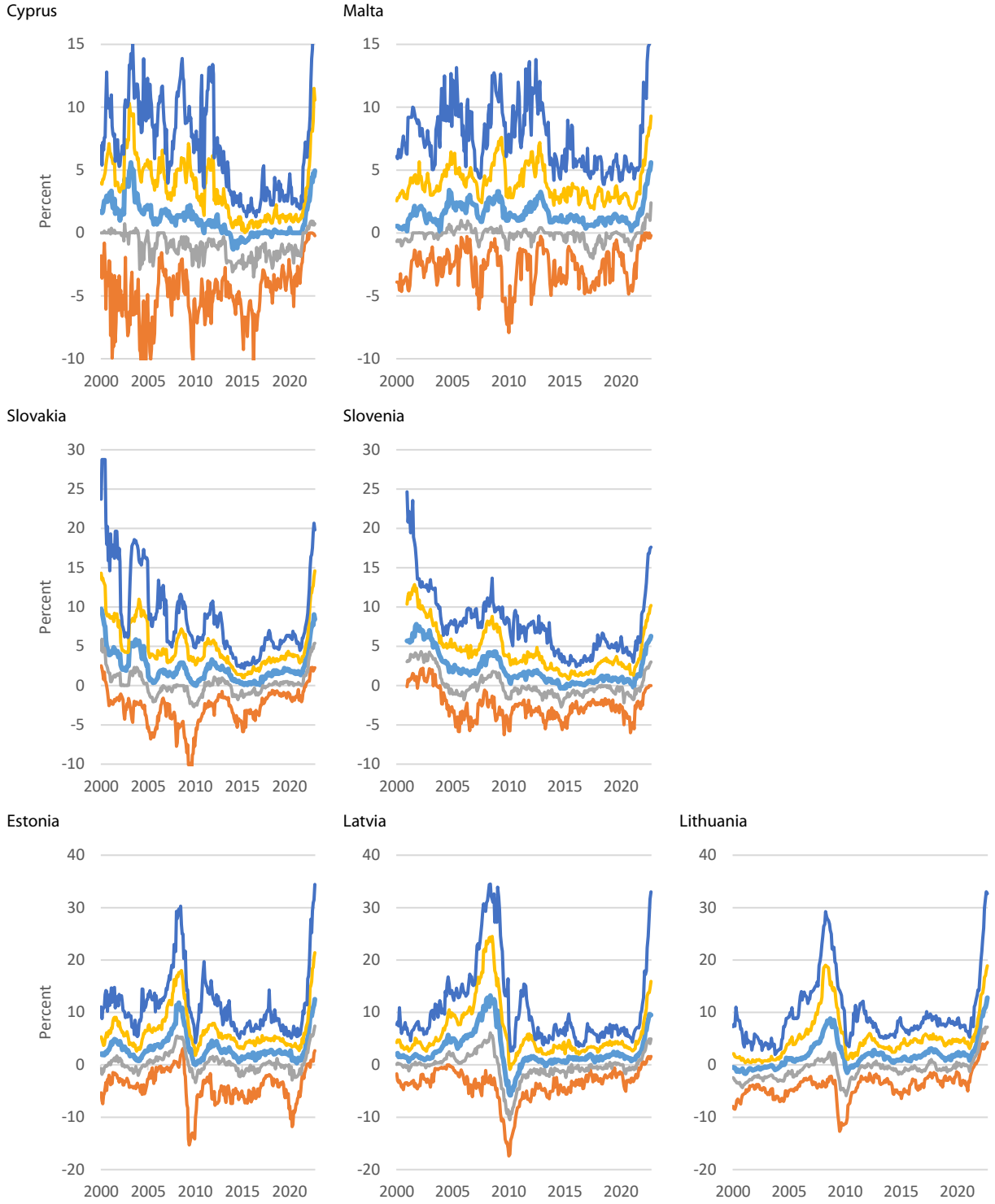
Figure 12: Distribution of sub-group inflation rates for 12 initial euro area countries



Source: Refinitiv, Eurostat.

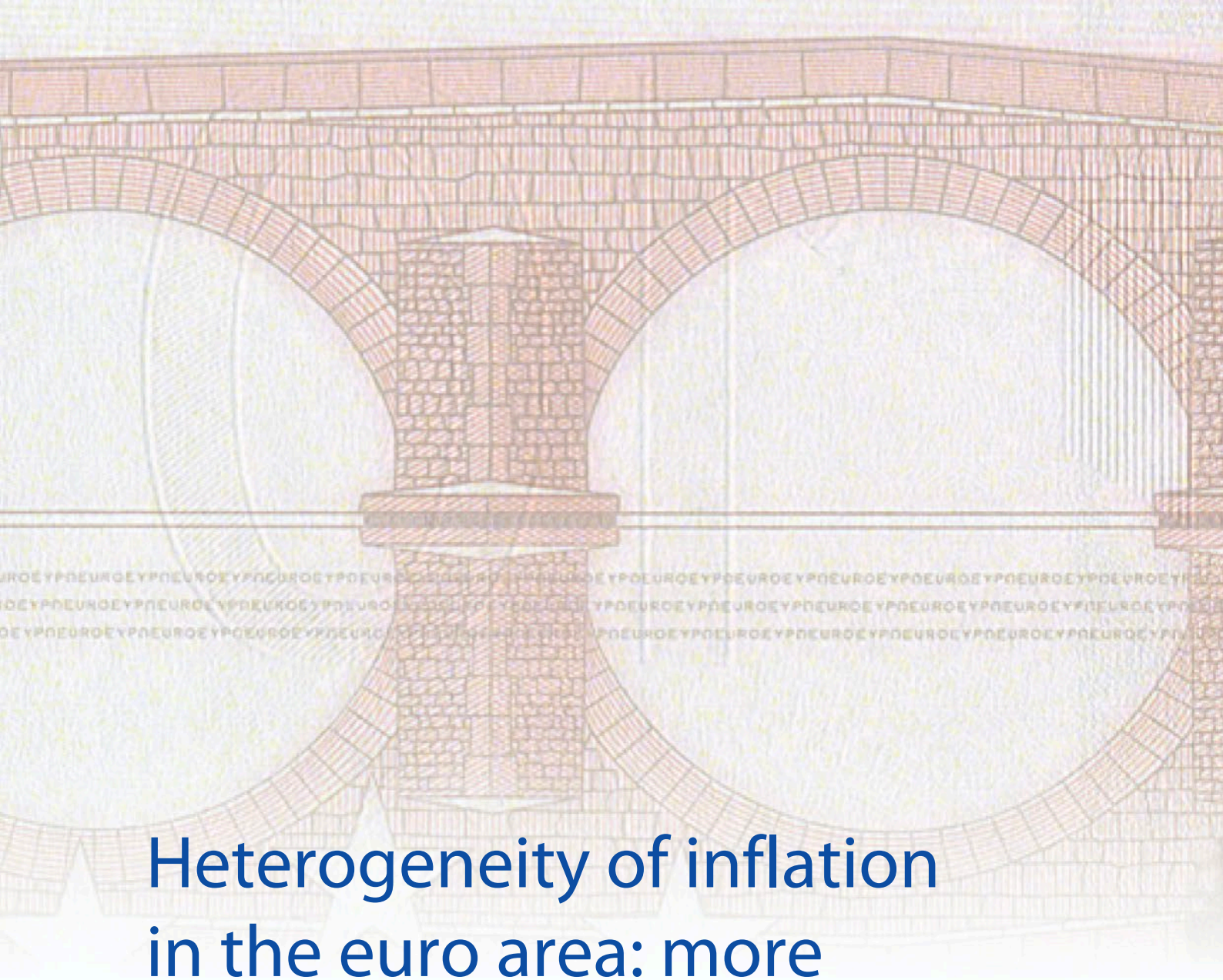
Notes: The graph shows quantiles of the distribution of sub-group inflation rates of CPI components at the 4-digit level (approx. 101 subindices).

Figure 13: Distribution of sub-group inflation rates for newer euro area countries



Source: Refinitiv, Eurostat.

Notes: The graph shows quantiles of the distribution of sub-group inflation rates of CPI components at the 4-digit level (101 subindices). For Cyprus and Malta the same scale as for the 12 initial euro area member is used. For Slovakia and Slovenia, the scale is adjusted upwards. For the Baltic countries the scale had to be adjusted further upwards.



Heterogeneity of inflation in the euro area: more complicated than it seems

Christophe BLOT, Jérôme CREEL, François GEEROLF, Sandrine LEVASSEUR

Abstract

We document different measures of inflation heterogeneity in the euro area. We ask what mostly drives this heterogeneity and whether there is cause for concern. Heterogeneity in headline inflation has increased substantially, and way more than heterogeneity in core inflation. We argue that core inflation dispersion is largely driven by small countries, where inflation reversion is the most likely. We then discuss about monetary policy as a limiting or aggravating factor of inflation heterogeneity.

This paper was provided by the Policy Department for Economic, Scientific and Quality of Life Policies at the request of the Committee on Economic and Monetary Affairs (ECON) ahead of the Monetary Dialogue with the ECB President on 28 November 2022.

CONTENTS

LIST OF ABBREVIATIONS

CEECs	Central and Eastern European countries
COICOP	Classification of individual consumption by purpose
CPI	Consumer price index
ECB	European Central Bank
EMU	Economic and Monetary Union
EU	European Union
GDP	Gross domestic product
HICP	Harmonised index of consumer prices
IQR	Interquartile range
PPI	Producer price index
PPPGDP	Purchasing power parity gross domestic product

LIST OF BOXES

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

- **Headline consumer inflation heterogeneity is at a historically high level in the euro area, but core inflation heterogeneity (excluding energy and food) is not.** This is true according to most measures of inflation dispersion: weighted standard deviation, or weighted interquartile range (IQR).
- **Nominal wage inflation and minimum wage inflation are positively correlated to headline consumer inflation, but not one-for-one.** This indicates no sign of a price-wage spiral in the euro area, at least so far. In fact, workers have been experiencing slower real wage growth where inflation is higher, suggesting that workers do not manage to bargain for wage increases to maintain the purchasing power of their wages, neither ex-ante (through inflation expectations) nor even ex-post, at least so far.
- **After we weight inflation dispersion across euro area countries for their relative size, inflation dispersion appears more limited and therefore mostly driven by small countries**.
- **We recall that in these small countries and, in particular in the Baltic countries, inflation upsurges have been followed by deflationary trends in the past**. This is a clear indication that monetary tightening by the ECB should have to be limited: Baltic countries only account for a small share of the euro area and they show fast mean-reversion in inflation rates after crises come to an end.
- **In theory, even in the best possible conditions, monetary policy would not necessarily be well suited to address underlying inflation heterogeneity.**
- **Monetary policy also likely has heterogeneous effects across different countries, and there is no a priori reason to expect a divine coincidence between the amount of needed tightening and the effectiveness of monetary policy across countries.** We show that empirically, aside from the Baltic countries, which have a higher share of floating rate loans as well as higher inflation, the share of floating rate loans is not systematically related to the inflation rate. Again, this suggests that monetary policy is not well suited to address inflation heterogeneity in the euro area.

1. INTRODUCTION

Inflation as measured by the harmonized index of consumer prices (HICP) has increased sharply in the euro area up to 10.6% annually in October 2022. In any case, inflation has increasingly exceeded the European Central Bank's (ECB's) 2% target since May 2021. This increase in inflation was largely unexpected and has caught the ECB by surprise, especially after the trough at the end of 2020 (with -0.3% annual HICP inflation). The ECB had been worried about too low inflation and even deflation risks. In this context, the ECB Governing Council has recently decided on a third interest rate increase in a row (by 75 basis points) on 27 October 2022, after two interest rate increases on 8 September and 21 July.

The sharp increase in consumer price inflation has qualitatively been observed for all euro area countries, but there have also been very large discrepancies across Member States: in October, the inflation rate stood at 7.1% in France, and it was above 20% in the Baltic countries. These examples are not isolated and inflation rates are very heterogeneous across the euro area. Inflation heterogeneity is a special focus of this analysis.

What is the extent of inflation heterogeneity? Has it increased, decreased, or stayed constant? Does it matter whether we look at weighted or unweighted measures, headline or core inflation, or whether we look at consumer price or wage inflation[1]? What are the causes of such inflation heterogeneity, and should we worry? How does inflation heterogeneity relate to real wage heterogeneity? Should we worry about heterogeneous second-round effects coming from differential wage-price spirals? These are the questions we attempt to answer in this analysis.

[1] In Blot et al. (2022), we also discuss heterogeneity in production price index (PPI) inflation, which is less related to the practice of monetary policy, but feeds heterogeneity in consumer price index (CPI) inflation (see Benecka, 2022; Koester et al., 2021). Blot et al. (2022) report that the heterogeneity in PPI inflation tends to increase in the context of a crisis. All industries considered, the current increase of heterogeneity in PPI inflation does not appear to be disproportionate compared to that observed during the 2008-2009 crisis. The correlation between heterogeneity in PPI consumer goods and CPI industrial goods is unstable, however.

2. INFLATION HETEROGENEITY IN THE EURO AREA

"Inflation" has many different definitions in economics, and therefore takes many different forms. "Inflation" often refers to consumer price inflation, in which case there is a relative consensus as to what it means. This is, for example, the implicit definition used by the ECB, alongside all central banks around the world which equate "inflation" to "consumer price inflation", although the precise meaning of this is still subject to some degree of controversy[2] (see Box 1). There are, however, other potential definitions of inflation such as wage or producer price inflation.

Box 1: What do we mean by "inflation"?

According to the July 2021 outcome of the ECB's strategy review, the Governing Council considers HICP as "the appropriate measure for assessing the achievement of the price stability objective", and so we shall mostly focus on that indicator. However, we also believe that is far from being the only relevant indicator for the proper conduct of monetary policy. In the following, we complement the analysis of headline HICP inflation with that of core inflation, as well as with other potential definitions of inflation, such as nominal wage inflation, real wage inflation, or production prices.

2.1. Headline and core inflation heterogeneity

In this section, we analyse in some depth consumer price inflation heterogeneity using different measures of dispersion. We first measure heterogeneity using the standard deviation, and then investigate the robustness of our findings to other commonly-used measures of heterogeneity.

2.1.1. Heterogeneity as measured by the standard deviation

The most standard way to assess cross-country heterogeneity for a given economic variable is to compute the standard deviation of this variable, as it captures the dispersion: the higher the standard deviation, the larger is the dispersion around the mean.

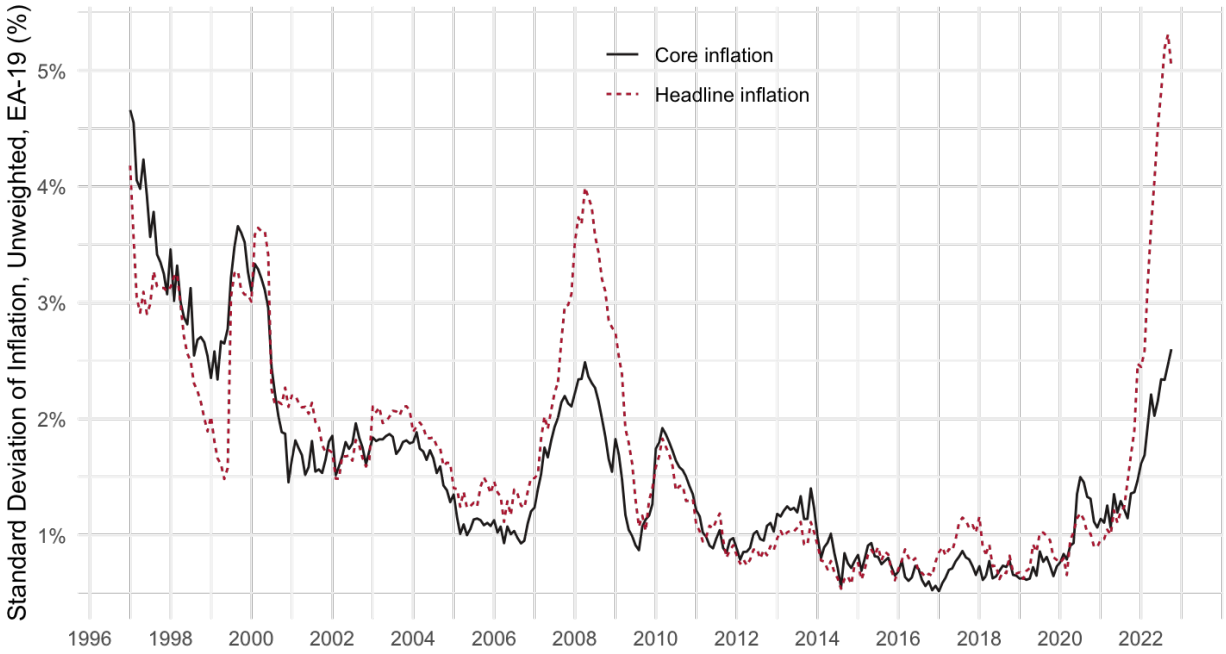
Figure 1 plots headline inflation ("All-items HICP" according to the classification of individual consumption by purpose (COICOP) classification, in black) as well as core inflation ("Overall index excluding energy, food, alcohol and tobacco", according to the COICOP classification in dashed red line) using unweighted standard deviations.

Unweighted standard deviations imply that Germany and France carry as much weight in the computation of the standard deviation as, for instance, Malta and Cyprus. Weighted standard deviations (Figure 2), on the contrary, assign a weight of 28.3% to Germany, 20.5% to France but only 0.2% to Cyprus and 0.1% to Malta in 2022, which is the weight that these countries have in Eurostat's computation of the overall HICP price index at the euro area level. As one can see, using unweighted standard deviations leads to higher estimates of the extent of inflation heterogeneity, as well as of its variation over time. One can also see that unweighted standard deviation of headline inflation is currently at a historical high in the euro area, while core inflation is at a high level but one which is actually comparable to the heights that were reached during the previous energy price increases in 2008.

[2] There may be slight differences on the precise indicator targeted by central banks. For instance, in the United States, the Federal Reserve focuses on the price consumer expenditure deflator.

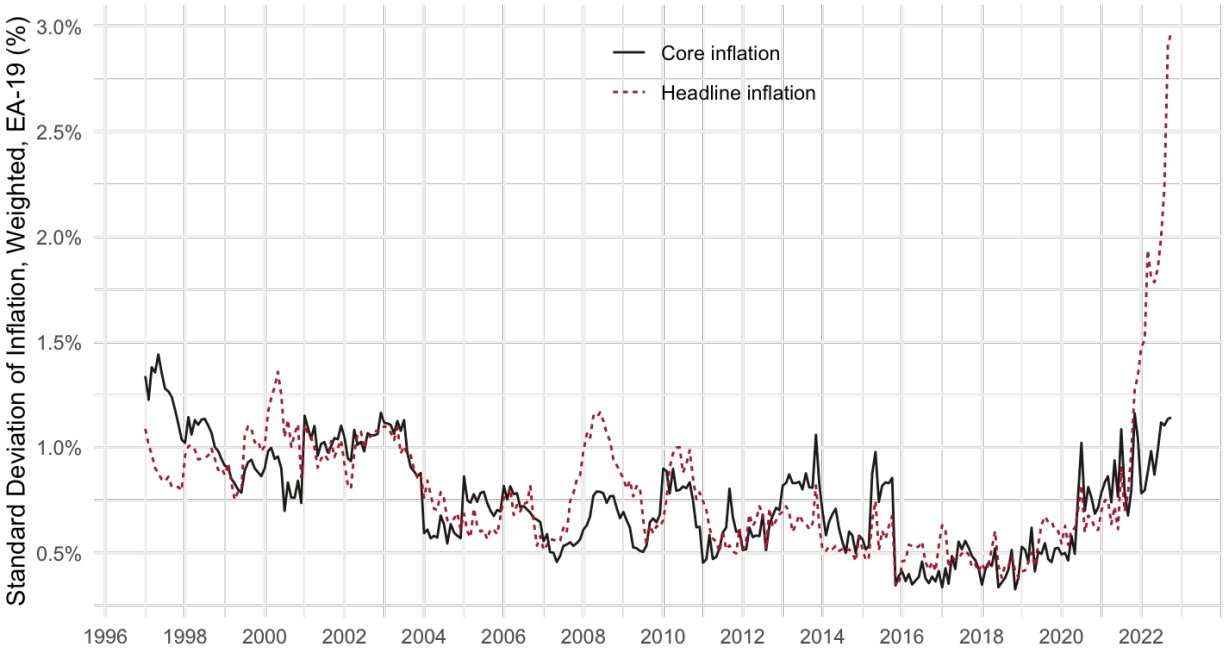
Weighted standard deviations in Figure 2 are also very high for headline inflation: in fact, headline inflation heterogeneity is much higher than it was in 2008: the level of the standard deviation is currently around 3%, while it was just a bit higher than 1% in 2008. In contrast, core inflation heterogeneity has a very different pattern, and it does not appear to be at a particularly high level historically: the current level of core inflation heterogeneity was previously reached several times between 2001 and 2003, for example.

Figure 1: Unweighted standard deviation of inflation rates



Source: Eurostat, authors' calculations.

Figure 2: Weighted standard deviation of inflation rates



2.1.2. Other measures of heterogeneity

Weighted standard deviations show that headline inflation has become more heterogeneous, but that core inflation is not particularly heterogeneous during our current inflationary episode, at least at this stage. We now test for the robustness of this result using another measure of dispersion such as the (weighted) interquartile spread (IQR). Figure 3 shows the alternative measure of inflation heterogeneity for headline inflation, and Figure 4 shows the alternative measure of inflation heterogeneity for core inflation.

The (weighted) IQR, which is the difference between the 75th percentile of the distribution of inflation and the 25th percentile of the distribution of inflation, shows a similar pattern as the standard deviation: headline inflation is at a historically high level of dispersion, while core inflation is not. This confirms the findings in section 2.1.1., which are therefore robust to the use of another measure of inflation heterogeneity.

2.1.3. Taking stock

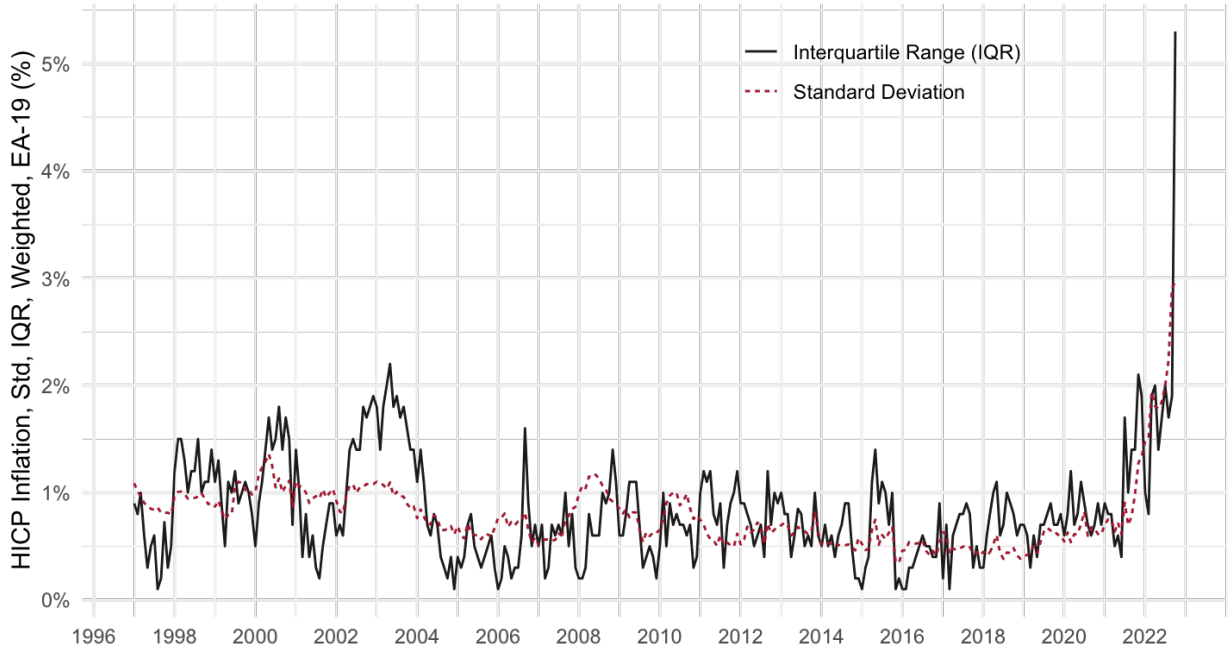
Therefore, what can we say about inflation heterogeneity? Has it risen or not? Which of the two indicators (headline or core) is more relevant for monetary policy is a long-standing debate among policymakers as well as academics. On the one hand, headline inflation is explicitly in the ECB's target (see Box 1). On the other, core inflation is a key inflationary indicator for monetary policymakers (Roger, 1998; Rich and Steindel, 2005; Wynne, 1999). Core inflation may refer to two alternative concepts: the persistent component and the generalised component of inflation. In the footsteps of Friedman (1963), core inflation can be viewed as the persistent component of measured inflation or "a steady inflation, one that proceeds at a more or less constant rate", contrasting with "an intermittent inflation, one that proceeds by fits and starts". The importance of the distinction is that the steady or persistent component of inflation will tend to be incorporated into expectations. Alternatively, core inflation can be viewed as the generalised component of measured inflation or "...the rate at which the general level of prices in [the] economy is changing" (Flemming, 1976).

In this conception, relative price shocks are regarded as "noise", blurring the more general or "underlying" evolution of prices. Very often, central bankers tend to consider core inflation in such a manner, defining core inflation as the aggregate inflation excluding items whose price movements are deemed likely to distort or obscure the more general trend of other prices (Roger, 1998; Wynne, 1999). If the changes in relative prices are temporary in character (e.g., as a consequence of seasonal influences on fresh food prices), the impact on the measured inflation rate should be temporary. Consequently, relative price shocks should typically be associated with transient changes in inflation while the generalised or common component should tend to be more persistent. As a proxy of core inflation, we have followed the common practice consisting of using the CPI inflation series excluding food and energy items (Wynne, 1999). Such a practice has demonstrated the ability to match the mean rate of aggregate inflation and track movements in its underlying trend (Rich and Steindel, 2005).

2.1.4. Changing euro area composition

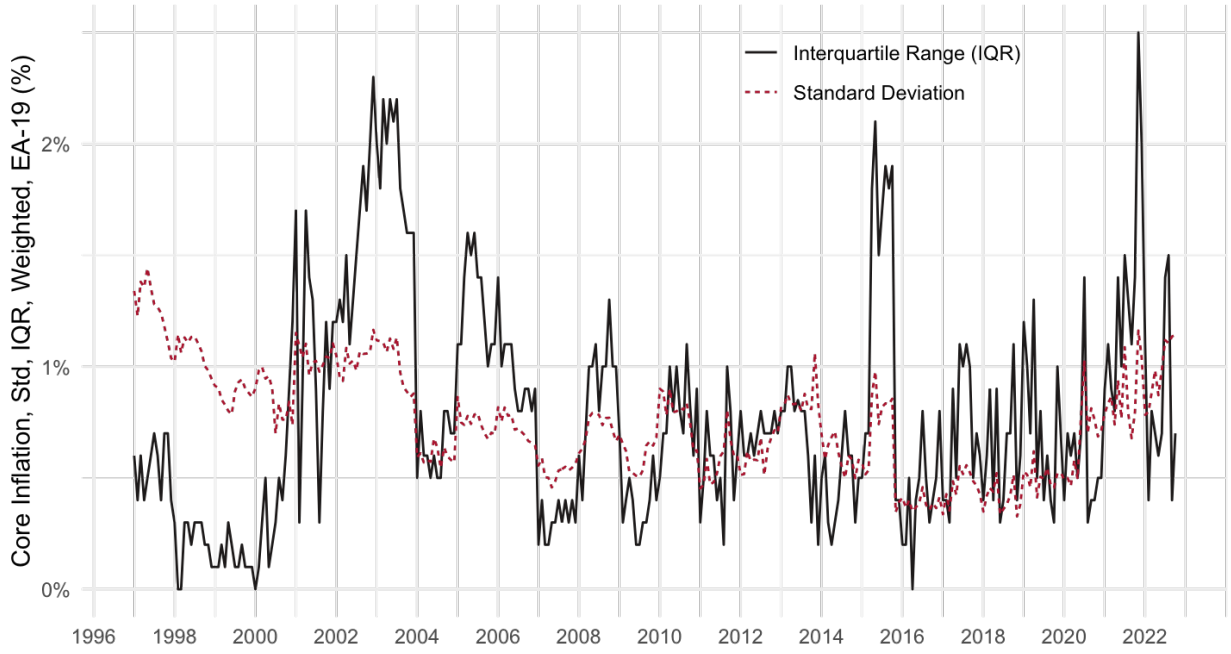
The previous measures may be biased, as not all the 19 countries have been member countries of the euro area since 1999. For instance, inflation was already very high in 2008-2009 in the Baltic countries, but those countries had not yet entered the euro area. Correcting for the composition of countries in "real-time" may better capture the true dynamic of heterogeneity since 1999 and may also provide some insights into structural heterogeneities related to the enlargement of the euro area.

Figure 3: Alternative measures of inflation heterogeneity (headline inflation)



Source: Eurostat, authors' calculations.

Figure 4: Alternative measures of inflation heterogeneity (core inflation)

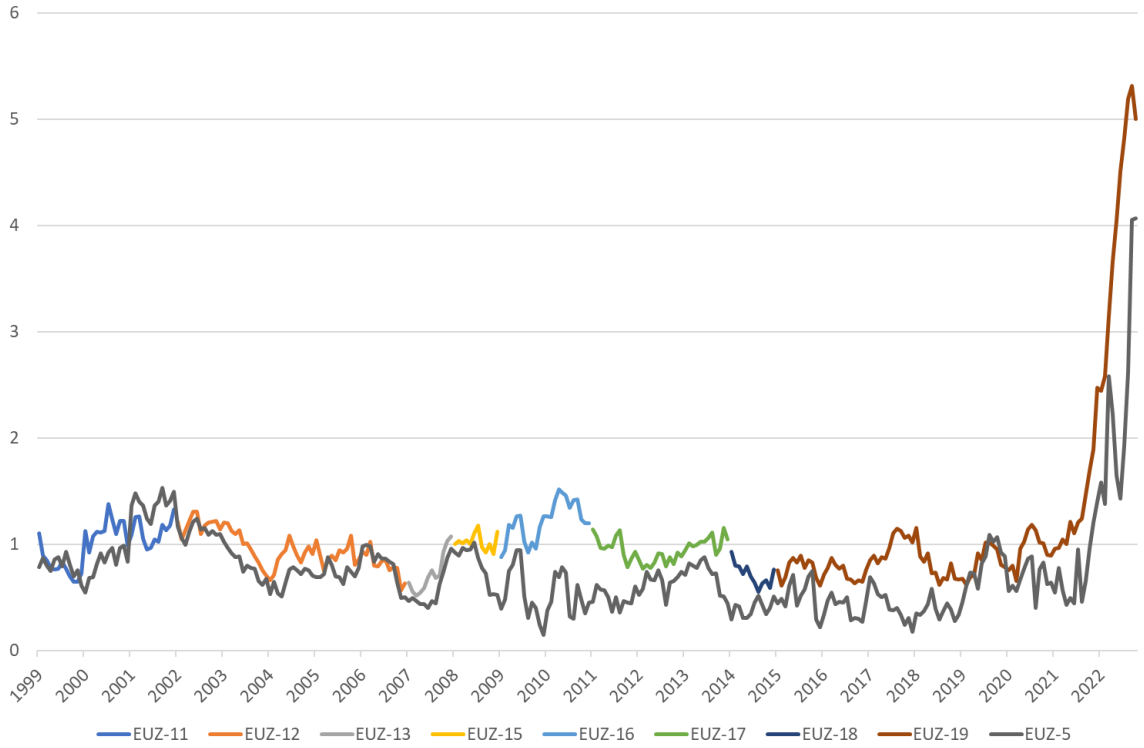


Source: Eurostat, authors' calculations.

The recent upsurge in heterogeneity is now even more striking compared to what has been observed from 1999 to 2020 (Figure 5). Over the past, the standard deviation reached a peak at 1.5 in May 2010,

much less than the 5 percentage points dispersion observed since the summer 2022. As the indicator calculated here is unweighted, it over-weights the rise of inflation in small countries. Consequently, it is worth calculating the dispersion over a subsample of the five biggest countries – Germany, France, Italy, Spain and the Netherlands – which are also members of the euro area since 1999.[3] Even with the EUZ-5 indicator, we observe that heterogeneity has recently risen in the euro area. Inflation is indeed twice higher in the Netherlands (16.8% in October) than in France (7.1%). The high inflation rate in the Baltic countries does not account for all heterogeneity in the euro area. It may be observed that after the integration of the last Baltic country – Lithuania in 2015 – dispersion was not higher on average until 2020 compared to the previous composition of countries (EUZ-18). The three Baltic countries do not structurally increase heterogeneity but may contribute to some spikes notably when energy prices increase.

Figure 5: Historical dispersion of headline inflation in the euro area



Source: Eurostat.

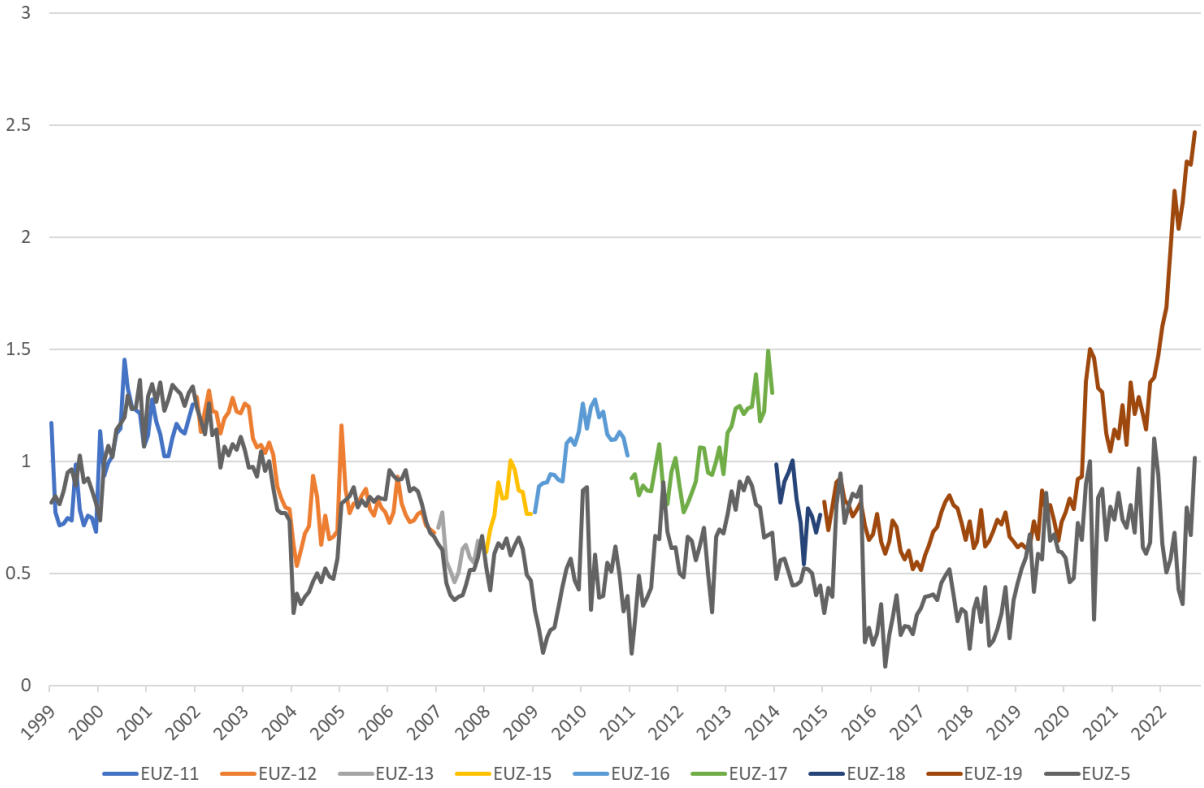
Notes: Dispersion is measured by the unweighted standard deviation. EUZ-11,…, EUZ-19 accounts for the change in the number of countries adopting the euro. EUZ-5 is the euro area with the five largest countries only.

Measured with the core inflation rate, the standard deviation is almost half compared to headline inflation but has also increased recently. However, we may notice here a significant difference when the dispersion is calculated for the EUZ-5 (Figure 6), as it appears that the current heterogeneity among the five largest euro area countries does not exceed its long-run average. Actually, most of the dispersion in the euro area would be related to the high level of core inflation in the Baltic countries and in Slovakia, that is the Central and Eastern Europe countries (CEECs) except Slovenia. In these four countries, the unweighted average inflation stood at 10.6% in September against 5.5% for the rest of the euro area countries. A first insight from the more common indicator of inflation suggests that the

[3] The choice of these five countries is also relevant because it includes countries considered as part of the "core" (Germany and the Netherlands) and countries at the "periphery" of the euro area (Italy and Spain) while France would be representative of the average.

current upsurge in the heterogeneity of inflation is notably driven by energy and food prices. Heterogeneity remains even when excluding these two components of the price index, notably stemming from the role of CEECs.

Figure 6: Historical dispersion of the core inflation in the euro area



Source: Eurostat.

Notes: Dispersion is measured by the unweighted standard deviation. EUZ-11,…, EUZ-19 accounts for the change in the number of countries adopting the euro. EUZ-5 is the euro area with the five largest countries only.

2.2. Where does consumer price heterogeneity come from?

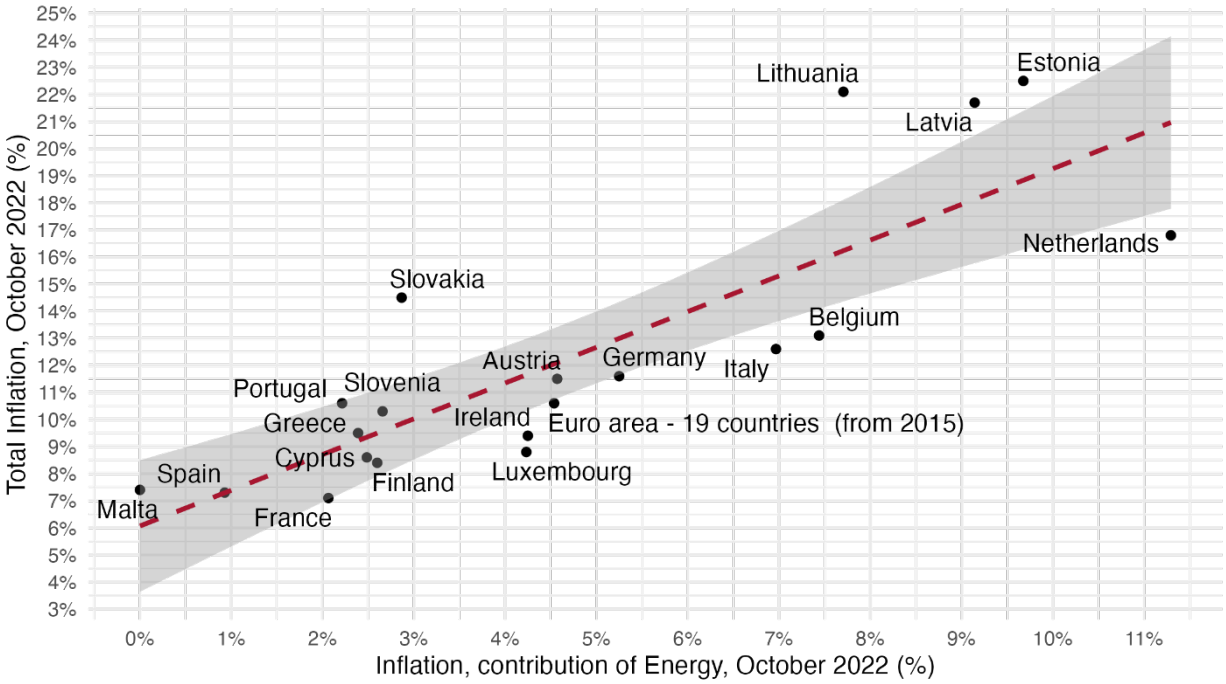
Section 2.1. has shown that the bulk of inflation heterogeneity is in headline inflation, while there is not much heterogeneity in core inflation. This alone should suggest that much of the "action" is actually taking place in energy and food. This intuition is strongly confirmed in Figure 7, which shows the contribution of energy to inflation on the x-axis and total inflation on the y-axis (these are the latest available data from October 2022): one can see from this graph that there is a strong and significant positive correlation between how much energy contributes to inflation and how much inflation there is overall. Similarly, Figure 8 shows an even stronger relationship of total inflation with energy, food, transport and catering contributions to inflation[4].

The importance of energy prices for heterogeneity in inflation rates is confirmed across the euro area, the products with the largest weighted standard deviation (according to the COICOP classification) are electricity, gas and other fuels (with different levels of disaggregation) as well as international flights (whose price depends a lot on the price of a barrel of oil, since it is very correlated to jet fuel prices). Of

[4] Food prices are also present in restaurant prices, hence the inclusion of catering here, though including just food would not change the results much.

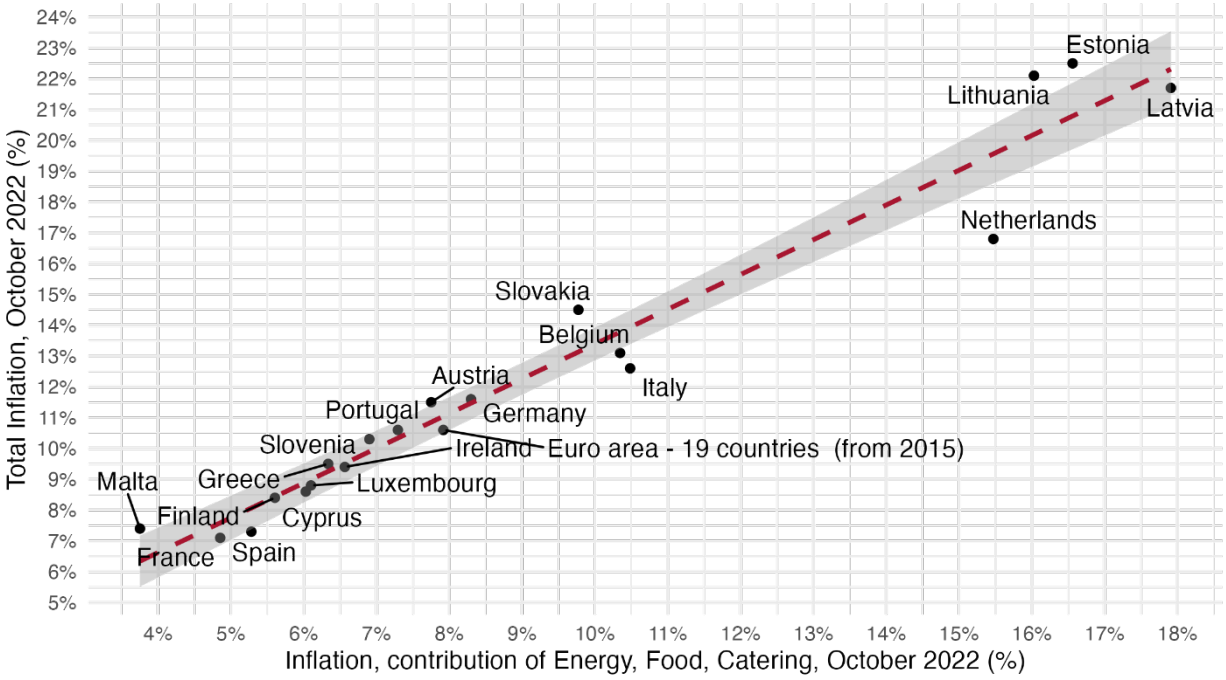
course, this begs the question: where does differential heterogeneity in energy (and food) contributions to inflation come from?

Figure 7: The contribution of energy drives inflation also in the cross-section



Source: Eurostat, authors' calculations.

Figure 8: Energy, food, catering explains even more



Source: Eurostat, authors' calculations.

2.3. Reasons behind inflation heterogeneities

There are many reasons why such large inflation heterogeneities exist across countries. To quote a few, dispersion of the inflation rate may stem from:

- Differences in the weight of food and energy products in the CPI basket;
- Differences in the degree of competition in goods and service markets;
- Higher supply problems in CEECs (in particular in the Baltic states) as a consequence of the sanctions imposed on Russia for its military aggression of Ukraine;
- Differences in the inflation-wage spiral related to the labour market institutions.

In what follows, we examine in a little more detail each of the explanatory factors, except the latter which we will discuss in section 3.

As reported in Table 1, the average weight of energy in the CPI basket is indeed higher for CEECs compared to the rest of the euro (13.4% against 9.2%), explaining why inflation has increased more sharply in those countries in the context of the energy crisis. With respect the weight of food in the basket CPI, there is no difference between the two sub-groups.

Albeit decreasing over the time, energy intensities, measured by the ratio of primary energy to gross domestic product (GDP), are remaining higher in CEECs than in other euro area countries, reaching in 2019, respectively, 3.67 and 2.80 megajoule MJ/USD, 2017 PPP GDP (Table 2). The legacy from the socialist period in terms of production technologies is still present, although vanishing. Due to the need of fostering the green transition, we can reasonably expect that energy intensities of CEECs will continue to converge towards Western standards in the near future, thus suppressing one source of inflation heterogeneities.

Competition in goods and services markets also have an important impact on the speed, frequency and size of price adjustments in the euro area countries (Vermeulen et al., 2012; Gautier et al.,2022; Jouvanceau, 2022). To the extent that the degree of competition differs between euro area countries, it contributes to inflation heterogeneities. In particular, a higher degree of concentration in the retail sector seems to be associated with more frequent adjustment in prices (Vermeulen et al., 2012; Gautier et al., 2022). Interestingly for our purpose, Table 3 shows that changes in consumer prices are both more frequent and sizeable in CEECs than in other euro area countries, a finding that explained why CEECs (and even more so of the Baltic States) had the capacity to move core inflation quickly and strongly into negative territory in 2010, after the price hikes of 2007 and 2008 (Figure 9). This suggests that the ECB should not give too much importance to the high inflation rates in these countries, since they only account for a small share of the euro area *and* inflation hikes may be reverted once the energy crisis has come to an end.

The differentiated impact of the sanctions imposed on Russia for its military aggression on Ukraine also explains some amount of the inflation heterogeneity between euro area countries. In particular, due to their historical links with Russia, the Baltic States have been even more strongly affected by supply chain disruptions. Albeit steadily decreasing, the share of Russia in the total imports still stood in 2021 at 10.4 % for Estonia, 8.9 % for Latvia and 11.6 % for Lithuania (Swedbank, 2022). Energy products account for 34% of imports from Russia in Latvia, 54% in Estonia and 68% in Lithuania. Alongside energy products, there are many products for which a large share comes from Russia: fertilisers, wood,

stones, base or precious metals, etc. By contrast, the share of Russia in the total imports of Slovakia, and even more so of Slovenia, is lower: 6.9% and 0.97% respectively.[5]

Table 1: Energy and food weights in the HICP (in %)

	Energy & Food	Energy	Food
Euro area	14.9	10.1	4.8
CEEC	18.2	13.4	4.7
Euro area excluding CEEC	14.0	9.2	4.8

Source: Eurostat.

Table 2: Energy intensity (in MJ)/USD, 2017 PPPGDP)

	2000	2015	2019
Euro area	4.94	3.45	3.13
Of which CEEC	6.68	4.13	3.67
Of which other euro area countries	3.88	3.05	2.80

Source: World Bank, own computations.

Note: Unweighted average. Energy intensity is defined as the ratio between primary energy supply and gross domestic product measured at purchasing power parity. Energy intensity is an indication of how much energy is used to produce one unit of economic output.

Table 3: Frequency and size of price changes in the euro area (over 2010-2019), in % *

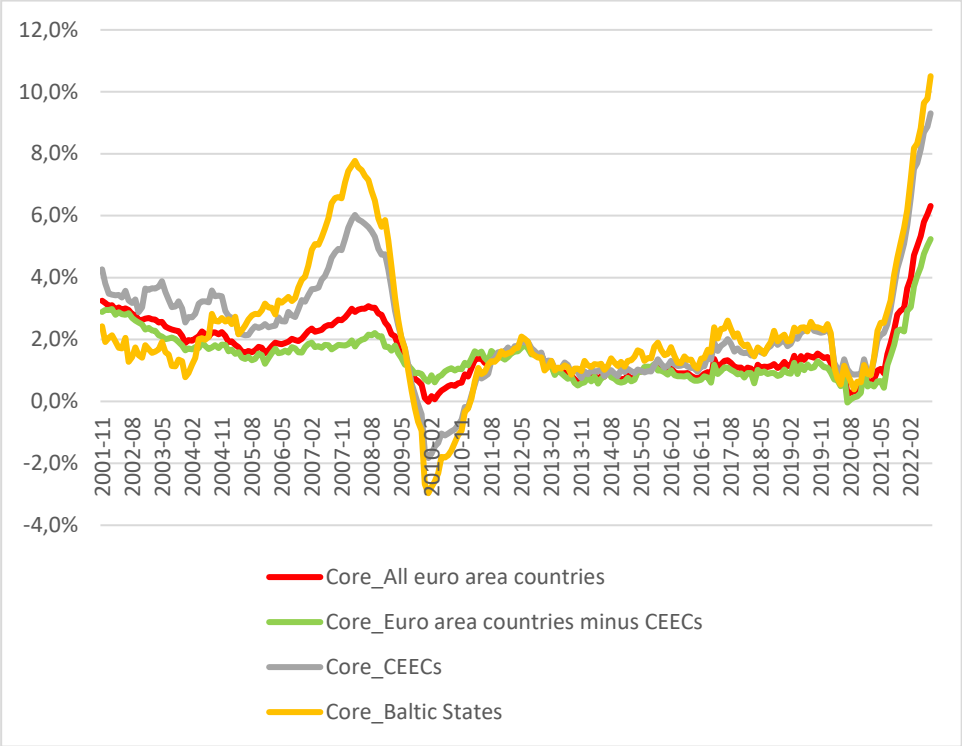
	Including sales				Excluding sales			
	Freq. price changes	% price increases	Median increase	Median decrease	Freq. price changes	% price increases	Median increase	Median decrease
*Euro area***	13.3	64.7	10.2	12.7	8.8	69.6	7.4	8.8
*CEECs****	15.2	62.4	13.3	14.4	9.0	68.7	9.6	9.2
*Other euro area*****	12.5	65.6	9.0	12.1	8.7	69.9	6.6	8.7

Source: Gautier et al. (2022).

Note: * Unweighted average. **Euro area is made of Austria, Belgium, France, Germany, Greece, Italy, Latvia, Lithuania, Luxembourg, Slovakia and Spain. *** CEECs are composed of Latvia, Lithuania and Slovakia. **** Euro area minus CEECs: Austria, Belgium, France, Germany, Greece, Italy, Luxembourg and Spain.

[5] Source: Slovakia: https://tradingeconomics.com/slovakia/imports-by-country; Slovenia: https://tradingeconomics.com/slovenia/imports-by-country.

Figure 9: Core inflation in the euro area (unweighted average for sub-groups)



Source: Eurostat, authors' calculations.

2.4. Heterogeneity in nominal and real wage inflation, and growth in disposable income

Some definitions of "inflation" assume that there is no inflation if there is no general increase in both prices and wages. According to this definition, inflation heterogeneity may also be found in wage inflation, and it is in any case interesting to look at nominal wages, just as much as it is interesting to study consumer prices on their own.

A related question is whether consumer price inflation necessarily implies a drop in purchasing power, as the public perception often has it.[6] To answer this question, a first pass is to look at real wage inflation which amounts to investigating whether nominal wage inflation is larger than consumer price inflation. However, we shall see that this gives a very incomplete picture of the overall situation: what needs to be looked at is the growth in real disposable income which includes all public transfers, not just those reflected in inflation numbers.

2.4.1. Heterogeneity in overall nominal wage inflation

Let us distinguish between minimum wage inflation and overall wage inflation. Minimum wages are sometimes indexed to protect the poorest workers from a loss of their purchasing power due to inflation. It is often an integral part of a minimum wage scheme: there is no point in having a minimum wage if minimum wages are not indexed in some way, since this would then imply that the minimum wage would become less and less binding over time.

[6] This is also a way to justify that central banks attempt to contain consumer price inflation.

Unfortunately, data are lacking with regards to the details of such indexation schemes across countries[7]. Such data are nonetheless very important for assessing the importance of second-round effects across euro area countries, and for the proper conduct of monetary policy in the euro area. Without such detailed data on legal arrangements, we use data from Eurostat on minimum wage growth to measure the level of indexation empirically. Table 4 shows minimum wages in the second semester of 2021 (2021S2), and the first and second semesters of 2022 (2022S1 and 2022S2), and yearly growth in minimum wages between 2021S2 and 2022S2, across European countries for which Eurostat reports minimum wage arrangements. Figure 10 confirms that there exists a correlation between minimum wage increases across euro area countries.

Apart from Belgium and Luxembourg, workers who are not on minimum wages do not benefit from automatic indexation schemes in the euro area (although details vary, and, again, more data on indexations would be very useful). Data on wages are also scarce and available only with a substantial lag so we can only look at the evolution of nominal wages up until the second quarter of 2022 (2022-Q2). Again, Figure 11 shows a positive correlation between nominal wage increases and total inflation. Note that this correlation potentially goes both ways: workers seek to bargain for higher wages when inflation is higher but, in turn, these higher wages can eventually show up in prices, thus feeding consumer-price inflation. The same is true for minimum wages.

This phenomenon is sometimes called the "wage-price spiral" although if the pass-through of wages to prices is less than one-for-one, which is likely the case theoretically (just because labour is not the only component of costs) and appears to be the case empirically (since the slope of the relationship between consumer price inflation and nominal wage inflation is less than 1), then it is not really a "spiral" because each round of wage and price increases gets smaller and smaller, so there is no spiralling of inflation through such a mechanism alone. Having said that, it remains true that the higher the correlation between price and wages, the more persistent the price inflation.

[7] Most recent detailed information on indexation comes from Checherita-Westphal (2022) but is limited to *public* wage, not minimum wage.

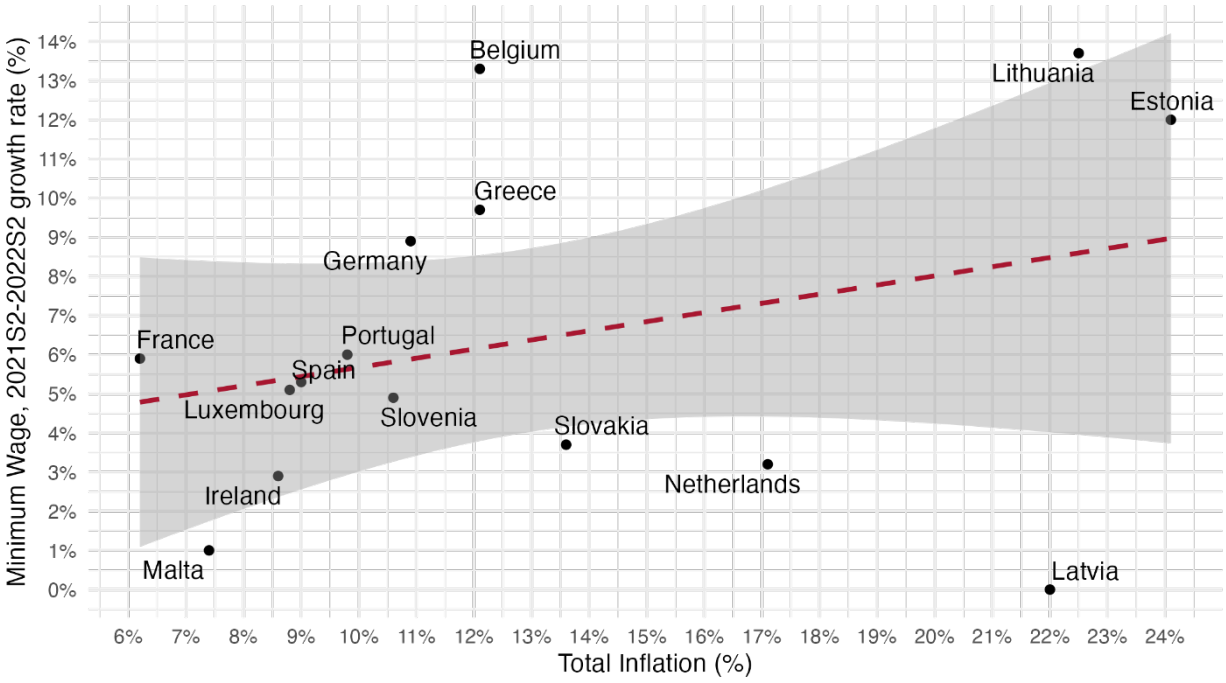
Table 4: Minimum wages in the second semester of 2021 (2021S2), and the first and second semesters of 2022 (2022S1 and 2022S2), and yearly growth in minimum wages between 2021S2 and 2022S2

Geo	2021S2	2022S1	2022S2	% growth
Lithuania	642 €	730 €	730 €	13.7%
Belgium	1625.72 €	1658.23 €	1842.28 €	13.3%
Estonia	584 €	654 €	654 €	12%
Greece	758.33 €	773.5 €	831.83 €	9.7%
Germany	1602 €	1638 €	1744 €	8.9%
Portugal	775.83 €	822.5 €	822.5 €	6%
France	1554.58 €	1603.12 €	1645.58 €	5.9%
Spain	1108.33 €	1125.83 €	1166.67 €	5.3%
Luxembourg	2201.93 €	2256.95 €	2313.38 €	5.1%
Slovenia	1024.24 €	1074.43 €	1074.43 €	4.9%
Slovakia	623 €	646 €	646 €	3.7%
Netherlands	1701 €	1725 €	1756.2 €	3.2%
Ireland	1723.8 €	1774.5 €	1774.5 €	2.9%
Malta	784.68 €	792.26 €	792.26 €	1%
Latvia	500 €	500 €	500 €	0%

Source: Eurostat; Authors' calculations.

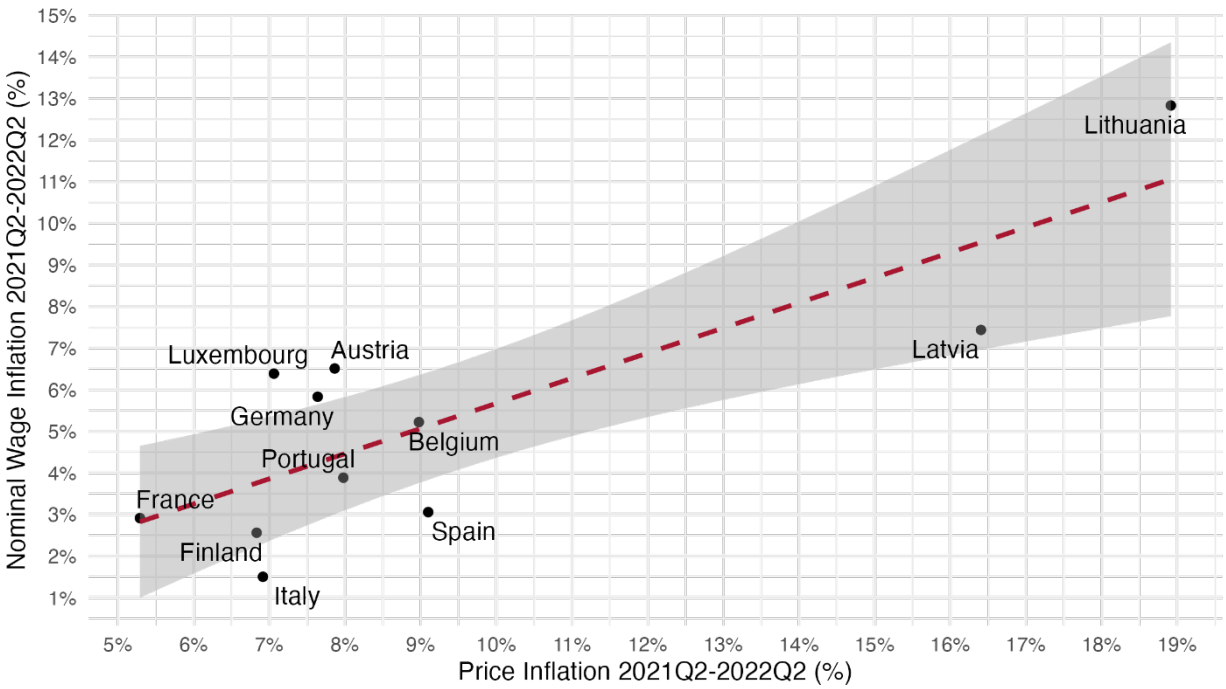
Note: When the minimum wage is paid for more than 12 months per year (as in Greece, Spain and Portugal, where it is paid for 14 months a year), data have been adjusted to take these payments into account. The minimum wage is then calculated as follows: (monthly rate x 14) / 12.

Figure 10: Correlation between minimum wage increases and total inflation



Source: Eurostat, authors' calculations.

Figure 11: Correlation between nominal wage inflation and consumer price inflation

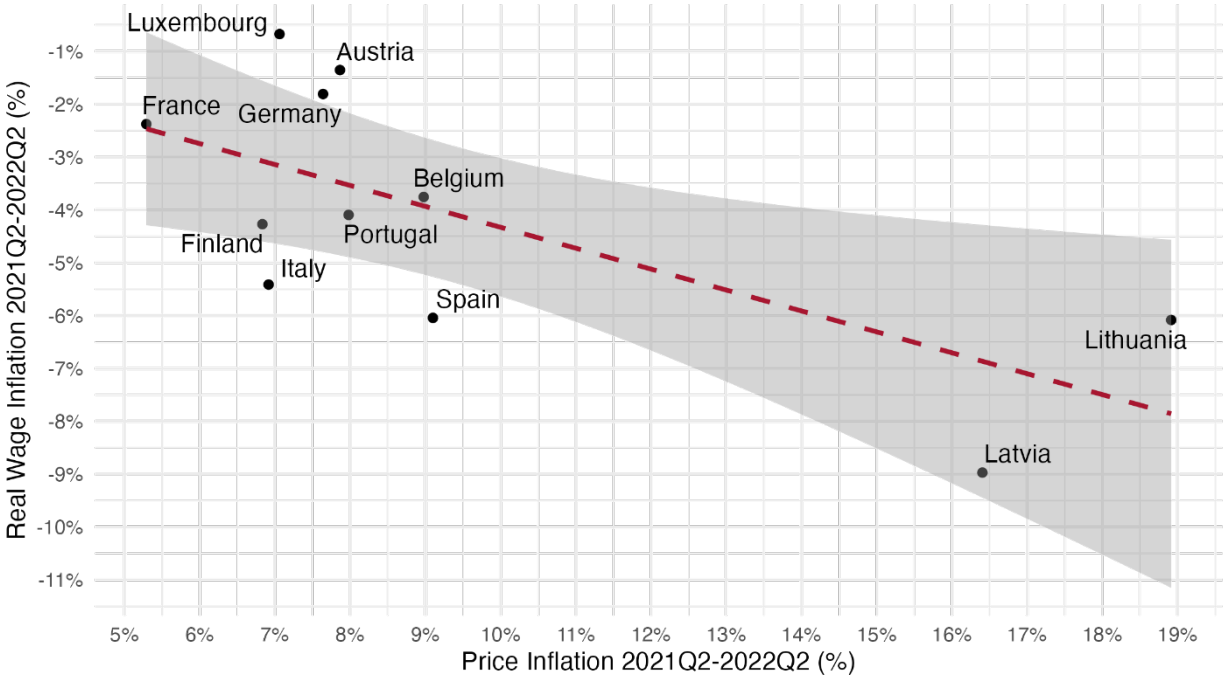


Source: Eurostat, authors' calculations.

2.4.2. Heterogeneity in real wage inflation

Since nominal wage inflation is higher where consumer price inflation is also higher, what can we say about real wages? Here, the less than one-for-one indexation is confirmed, as it is shown in Figure 12: real wages are in fact much lower where inflation is higher. Thus, although the increase in nominal wage is higher in countries with higher inflation, this is also where there is a greater loss in households' disposable income, at least if we limit ourselves to wages and abstract from additional measures such as transfers which might otherwise be taken to mitigate the inflationary shock. Regarding monetary policy, the substantially less than one-for-one indexation of nominal wages implies that the risk of a wage-price spiral in countries with higher inflation is rather contained.

Figure 12: Correlation between real wage inflation and consumer price inflation



Source: Eurostat, authors' calculations.

3. HOW DO THE TRANSMISSION CHANNELS OF MONETARY POLICY INTERACT WITH INFLATION HETEROGENEITY?

As we have documented above, the heterogeneity might be less important when thoroughly analysed. Besides, there may be multiple causes of the cross-country differences in inflation rates, which makes the task of the ECB more difficult. Even if it is undoubtedly an issue for the euro area, the common monetary policy may not be the best tool to handle such a heterogeneity. The implementation of monetary policy mostly relies on a single instrument: the interest rate set by the ECB for the euro area as a whole. It would be a divine coincidence if one instrument was able to achieve the 2% objective in the euro area and to reduce heterogeneity among countries. Furthermore, monetary policy per se may also be a source of heterogeneity should it be asymmetrically transmitted in the euro area. It is indeed widely acknowledged that the Economic and Monetary Union (EMU) is an incomplete monetary union. Neither labour markets, nor financial markets – notably retail banking markets – are fully integrated. There are also important differences in industrial specialisations, financial structures, housing finance and degrees of openness. Because of these structural heterogeneities, the transmission of monetary policy to the output and the inflation rate in the euro area is very asymmetric.

3.1. What do we know about the transmission of monetary policy?

The issue of asymmetric monetary policy transmission has been considered at the early stage of EMU. Despite the convergence criteria set up in the Maastricht Treaty in 1992, there was uncertainty about the effect of the now common monetary policy on economic activity across countries. For instance, with pre-EMU data, Ehrmann (2000) estimates the GDP and inflation responses to monetary policy for 13 European countries, not necessarily members of EMU. He showed that, compared to other countries, monetary policy had stronger effects on the output and the inflation rate in Germany. Among the four largest future EMU countries, the weakest effect was observed in France, whereas in Italy and Spain the output responses were close. However, Boivin et al. (2008), still for the pre-EMU period, reported a stronger output response in Italy and Spain. More recently, Burriel and Galesi (2018) report that the output and price responses to an increase in the ECB balance sheet are strongest in the Baltic countries. The ECB's unconventional measures would have had more expansionary output effects in Germany than in France and Italy and only small and not significant effects in Spain. Regarding prices, the response would have been much more substantial in Spain and France, even if the difference with the response of price in Germany and Italy is not statistically significant.

3.2. Asymmetric transmission of monetary policy and structural heterogeneities

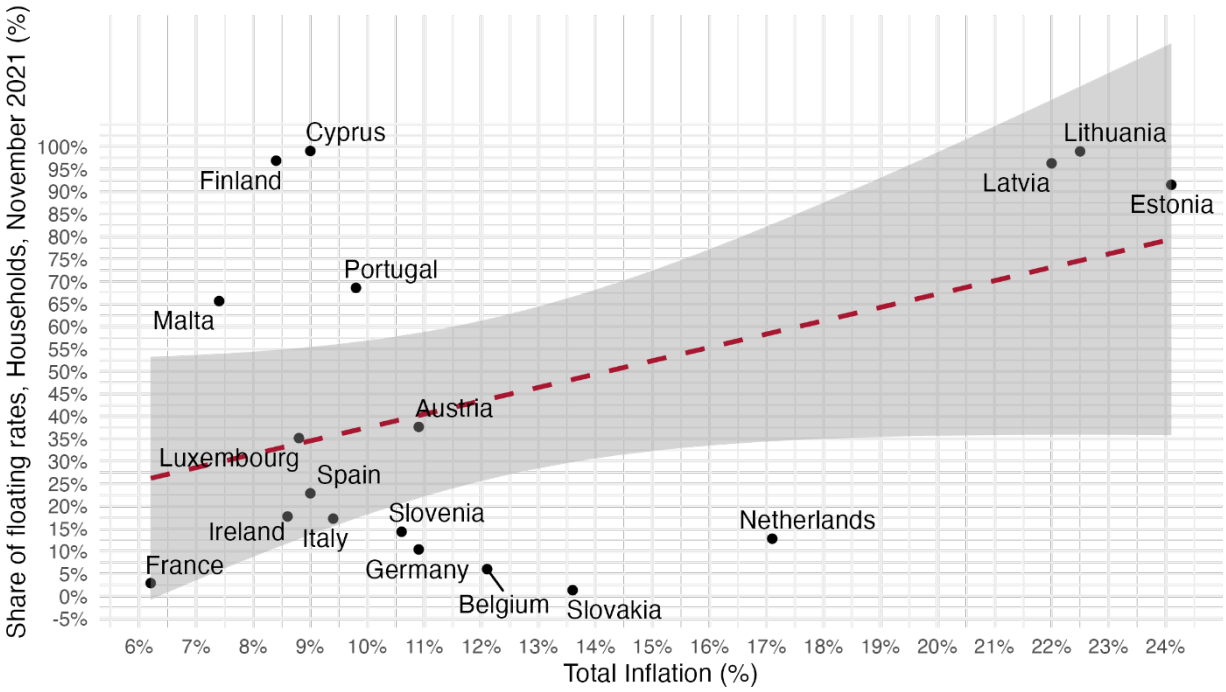
Some papers have also attempted to relate asymmetries in the effect of monetary policy with structural characteristics of each country. For example, Dedola and Lippi (2005) and Peersman and Smets (2005) consider the role of industrial specialisation. If the effect of monetary policy is different across industries, it may contribute to the asymmetric output response among countries. For five countries – Germany, France, Italy, the United Kingdom and the United States – Dedola and Lippi (2005) find that all cross-country differences in the output effect are explained by the industrial specialisations of countries rather than by country-specific effects. Beyond industrial specialisation, the transmission of monetary policy crucially hinges on the role of the financial markets.

Calza et al. (2013) show that the response of consumption to a contractionary shock is stronger for countries with a higher share of variable rate mortgages. According to the ECB, the countries with the highest share of floating rates are Cyprus, Finland, Lithuania, Latvia and Estonia. Among the five largest countries, banks grant more loans with a floating rate in Italy and Spain, respectively 75.4 and 70.4% of

new loans on average since the beginning of 2022. Comparatively, it reaches only 32.9% for France and 60% in Germany. As a consequence, the interest rate on the outstanding amount of consumption loans has increased by 0.2 percentage points (p.p.) from December 2021 to September 2022 in Italy and 0.16 p.p. in Spain. The rise is limited to 0.07 p.p. in France and 0.1 p.p. in Germany.

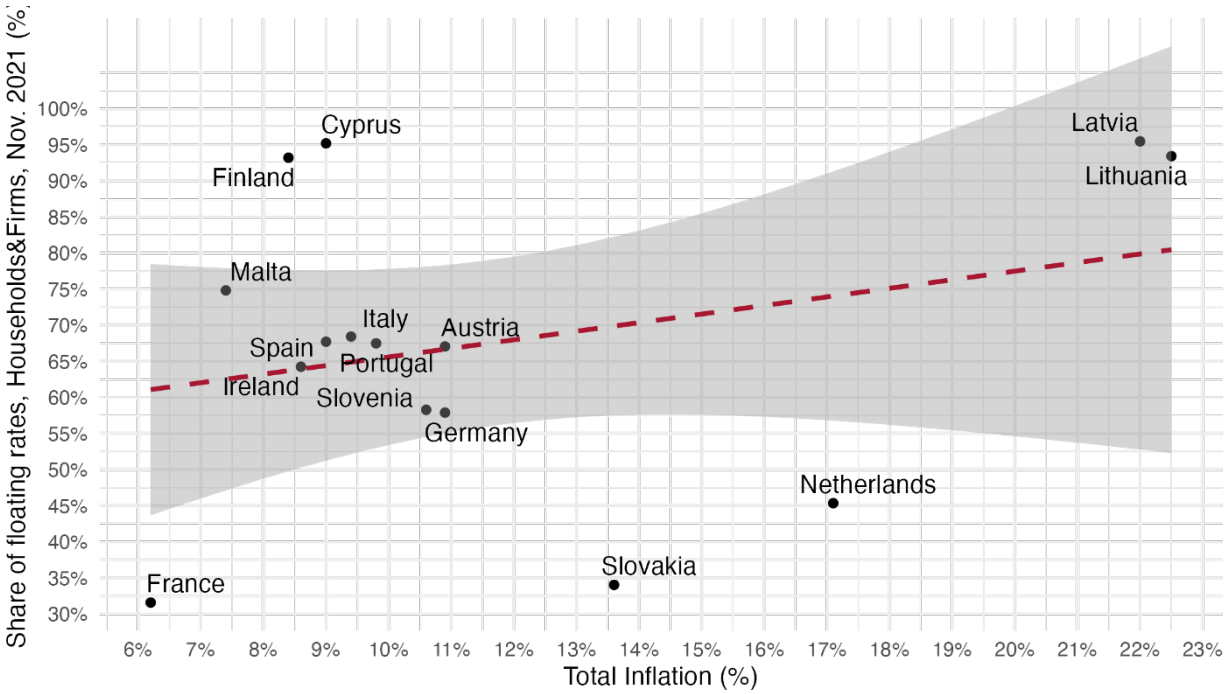
For the mortgage credits, where the maturity of loans is much higher on average, the interest rate increase since December is 0.24 p.p. and 0.4 p.p. in Italy and Spain, respectively, against a small reduction of the same interest rates. The rise in mortgage payments will be stronger in Italy and Spain than in France and Germany, which may weigh down on households' expenditures leading to an "all else equal" stronger effect of monetary policy. Are these countries also those experiencing the highest inflation? In that case, we would expect that the tightening of monetary policy would have larger effects in countries with the highest inflation rate. This would notably be the case for the Baltic countries as shown in Figure 13 and Figure 14. Excluding these countries would reduce the correlation between the share of floating rates and the level of inflation rate. Thus, the ECB may not rely on a divine coincidence that the current tightening would also mitigate heterogeneity in the inflation rates.

Figure 13: Share of floating rates for households and total inflation



Source: ECB, authors' calculations.

Figure 14: Share of floating rates for households and firms and total inflation



Source: ECB, authors' calculations.

Furthermore, the transmission of monetary policy does not only hinge on the share of variable loans. Even if interest rate increases reduce the households' disposable income, some of them may cushion the shock through a decrease in saving. Actually, when the mortgage contract has a floating rate,

households' expenditures would be cut if households were liquidity-constrained.[8] Almgren et al. (2022) confirm the role of liquidity constraints as an explaining factor of the difference in the cumulated or the peak effect of monetary policy in the euro area. For instance, the strongest effect of monetary policy in Latvia coincides with a higher share of liquidity-constrained or "hand-to-mouth" households in this country. Finally, beyond industrial specialisation and financial structures, Georgiadis (2014) also accounts for the role of labour markets in the transmission of monetary policy assuming that more rigid nominal wages imply a weaker reaction of marginal costs and price to a monetary policy shock and a stronger response of output. He finds that asymmetries in the short-term may arise from industry specialisations while in the medium-term they stem from financial structures and labour market rigidities.

3.3. Monetary policy and inequality

The lowest quintiles are hurt disproportionately more by the inflation shock, which is by now a matter of consensus among economists (see e.g., Geerolf et al., 2022). The intuition is quite simple: food and energy represent a higher share of consumption (and income) for low-income households than for high-income households.

To the extent that unemployment also hurts the poor disproportionately, the poorest households would be hurt twice after an inflation shock: initially by the energy and food price shocks in itself, and a second time by the recession brought about or deepened by monetary policy[9].

Would the poorest households be helped if inflation was being kept at a lower level? In addition, to the extent that monetary policy is actually successful in mitigating inflationary pressures, would fighting inflation be more effective for the poor than for the rich? In a recent contribution, Creel and El Herradi (2022) show that contractionary monetary policy by the ECB tends to increase income inequality, although the impact is small

[8] The HANK (Heterogeneous Agent New Keynesian) literature disentangles between agents who face no liquidity constraint and can smooth income shocks by adjusting their saving and agents with liquidity constraints who cannot draw on their saving either because they have no financial wealth – poor households – or because their wealth is invested in illiquid assets. Liquidity constrained households have consequently a higher marginal propensity to consume and cut in their expenses when their income decreased because of higher mortgage payments.

[9] The impact of recessions on inequality has been documented by Heathcote et al. (2010) in the US.

4. CONCLUSION

In this paper, we document inflation heterogeneity in terms of HICP inflation, core inflation, nominal and real wage inflation. We ask what mostly drives this heterogeneity and whether we believe that there is cause for concern. We find that energy and food prices are the main drivers of inflation dispersion, and, at the same time, they account for the highest contribution to inflation.

We show that inflation heterogeneity reflects heterogeneity in energy mixes between countries, which we do not find to be concerning *per se*. We highlight two important facts. First, when we weight inflation dispersion across euro area countries for their relative size, inflation dispersion appears limited and therefore mostly driven by small countries. Second, we show that in these countries and, primarily among them in the Baltic countries, inflation upsurges have been followed by deflationary trends in the past. This is a clear indication that monetary tightening by the ECB should have to be limited: Baltic countries only account for a small share of the euro area and they show fast mean-reversion in inflation rates after crises come to an end.

Taking a broader view, inflation has recently subsided in the US in October 2022 according to the 10 November 2022 release, now at 7.7% since last year. All things equal, this should lead to a relative easing of US monetary policy, reduce upward pressures on the dollar (at the announcement of the CPI release, the US dollar was sharply down) and downward pressures on the euro. In turn, this turning point should reduce inflationary pressures in the euro area, possibly making further tightening of monetary policy redundant.

Constructively, we call for additional data collection efforts to be undertaken by the European Commission, Eurostat and the ECB. Indeed, we know very little about various types of indexations which affect the diffusion of the inflationary process throughout the economy.

As we have repeatedly emphasised, inflation coming from potential second-round effects (wage indexation) is very different in nature from the shock to inflation that the euro area is currently experiencing. There is very little that the ECB can do to alleviate the loss in purchasing power arising from imported inflation.

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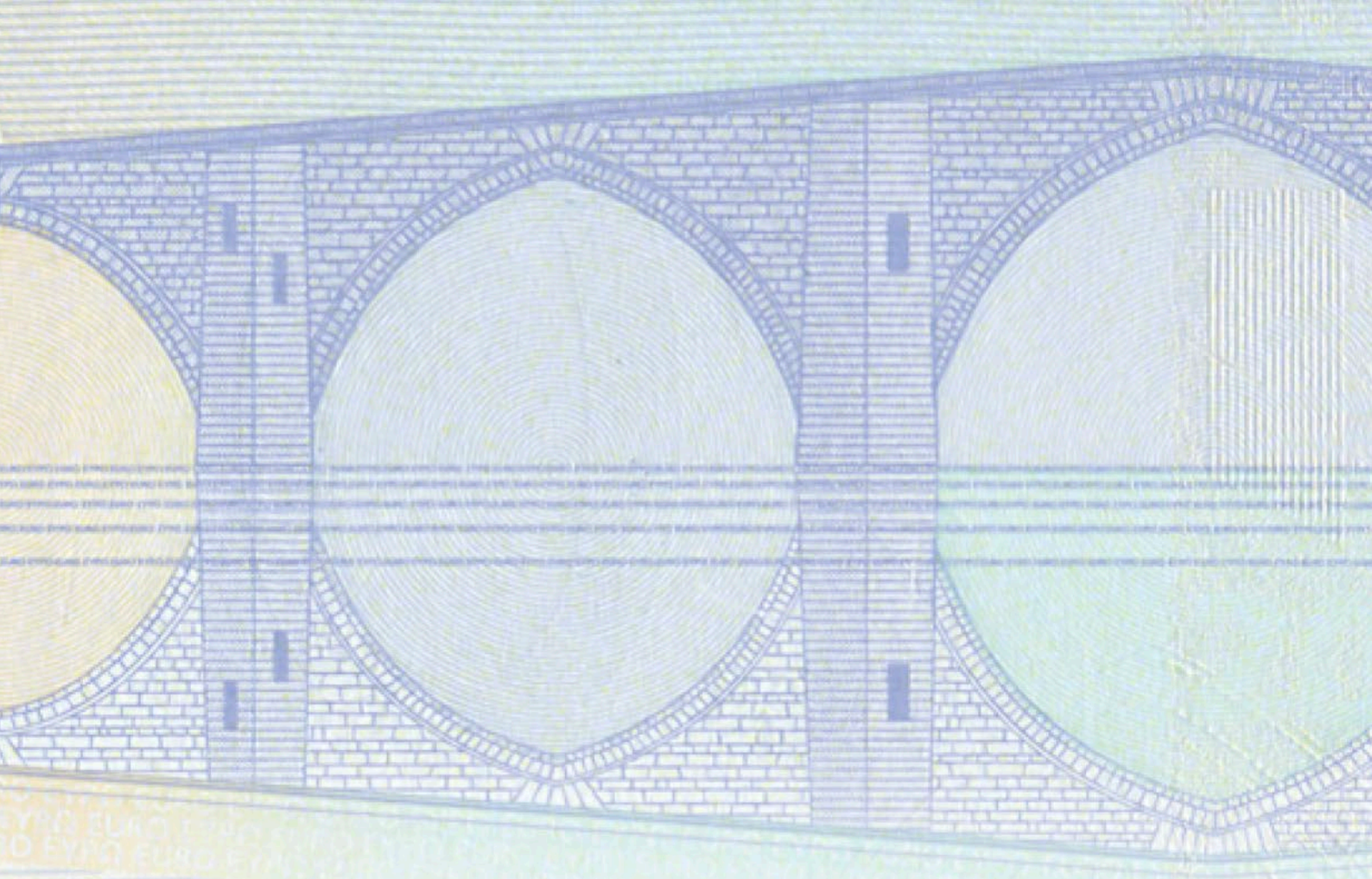


Maintaining credibility is currently the top priority

Josef BAUMGARTNER, Marcus SCHEIBLECKER, Thomas URL

Abstract

The dispersion of inflation rates within the euro area tends to increase in times of very strong energy price increases. A small part of this divergence is due to fiscal policy measures implemented by Member States and aimed at dampening the energy price increase. The monetary policy response of an inflation-targeting central bank to adverse supply shocks depends on the nature of the shock (demand or supply driven, temporary or permanent) and on the credibility of the central bank's commitment to the inflation target.

This paper was provided by the Policy Department for Economic, Scientific and Quality of Life Policies at the request of the Committee on Economic and Monetary Affairs (ECON) ahead of the Monetary Dialogue with the ECB President on 28 November 2022.

CONTENTS

LIST OF ABBREVIATIONS

COVID-19	Corona virus disease (2019)
ECB	European Central Bank
EP	European Parliament
EU	European Union
GDP	Gross domestic product
HICP	Harmonised index of consumer prices
OECD	Organisation of Economic Co-operation and Development
PEPP	Pandemic emergency purchase programme
SMEs	Small and medium sized enterprises
TLTRO	Targeted longer-term refinancing operations
US	United States
VAT	Value-added tax

LIST OF BOXES

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

- **Most of the increase in HICP inflation rates in the euro area is still directly related to the higher raw material prices, especially energy prices.**
- **As the pass-through of higher energy costs to goods and services prices accelerates, core inflation's contribution to the headline inflation rate is rising.**
- **The dispersion of inflation rates within the euro area tends to increase in times of very strong energy price increases.**
- **From a monetary policy perspective, high inflation rates reduced the real short-term interest rate into historically low territory, for the three largest Member States into a range between -4.5% to -9%.**
- **The monetary policy response to an energy price shock (adverse supply shock) varies, depending either on the extent of nominal rigidities in an economy or on the loss function of the monetary authority.**
- **Countries that are net importers of raw materials will experience a worsening of their terms-of-trade.** This results in a transfer of real income/resources to raw material exporting countries.
- **The central bank may follow a wait-and-see policy after a commodity price shock if the formation of prices and wages is flexible and still enjoys high credibility with respect to the inflation target.**
- **If the credibility of the inflation target becomes endangered, the central bank would have to send a strong signal of determination to market participants by raising policy interest rates swiftly.**
- **If inflation rates are highly dispersed between countries in a monetary union, the central bank has two options: (1) to change the weights used to compute the average inflation rate for the common currency area. In this case, the central bank could apply higher weights to countries with more pronounced rigidities. Alternatively, (2) fine tuning that could use macroprudential instruments to manipulate country-specific term spreads and interest rate spreads for credit.**

1. INTRODUCTION

The vigorous upturn in inflation rates is happening worldwide. This hints at imported inflation as the likely source of higher prices in many developed countries, but additionally, the monetary policy cycle was strongly synchronised throughout Organisation of Economic Co-operation and Development (OECD) members over the last couple of years and exceptionally supportive of economic growth.

In contrast to other large economies, the euro area shows a distinctive feature. While in the United States (US) or Canada, the regional dispersion of inflation rates hardly deviates from historic patterns, the euro area shows a swift rise in inflation rate dispersion, which now mirrors episodes like in the year 2000 or during 2007-2009. Obviously, the external increase in raw material prices, starting already in mid-2021 and sharply accelerating after the Russian attack on Ukraine at the end of February 2022, uncovered structural differences among member countries of the currency union. Those differences relate to the quantity of imported energy and commodities used in the domestic production process and the kind of contracts between utilities and their customers in member countries. Europe is also facing an extraordinary inflationary push originating from the immediate pass-through of higher gas prices into electricity prices.

Furthermore, governments in member countries reacted to real income losses from rising energy prices by applying fiscal interventions to reduce the burden of higher energy prices for households and firms in varying degrees. A review across 18 countries shows that 60 interventions have been implemented over the last few months with some countries enacting only one measure while others applied up to five different interventions (cf. annex 1). Thus, part of the cross-country variation in inflation rates results from the varying intensity of fiscal interventions. Moreover, some economic policy measures targeted energy prices directly, while income transfers aimed at stabilising the purchasing power of private households.

The high degree of regional dispersion in inflation rates may create some challenges for the conduct of monetary policy because the main instrument used by the European Central Bank (ECB) are the key interest rates which are uniform across the whole currency union, while inflationary pressure appears to be particularly strong in Eastern European member countries (especially in the Baltic states). We will frame our analysis of monetary policy under a high degree of dispersion into the literature on the optimal monetary response of an inflation-targeting central bank to adverse supply shocks, i.e. energy and commodity price shocks. Our review puts emphasis on the role of central bank credibility for its response to adverse supply shocks. The central bank may react to the high degree of dispersion by either modifying the weights for the computation of the average inflation rate of the euro area or, alternatively, by encouraging the implementation of national macroprudential measures, for example through the European Systemic Risk Board. The second approach would allow for a regional fine tuning of the general interest rate policy.

We will start our discussion in chapter 2 with a description of the driving forces for the recent surge in inflation and continue with presenting a decomposition of inflation rates into four broad categories of goods and services. Furthermore, we compare the inflation dispersion within the euro area to the US and Canada and discuss the role of fiscal interventions implemented by national governments to dampen the increase of energy prices for households and firms. This comparison provides a rough impression of the degree of dispersion in inflation rates which can be attributed to the fiscal policy response by member countries to the energy and commodity price shock. We continue in chapter 3 with a literature survey on the optimal monetary policy response to adverse supply shocks and discuss the possibilities of inflation-targeting central banks to take into account regionally dispersed inflation rates in their monetary policy setting. In the final chapter we draw some conclusions on the consequences of dispersed inflation rates for monetary policy.

2. INFLATION AND INFLATION DISPERSION IN THE EURO AREA IN 2021 AND 2022

2.1. Driving forces of high inflation in 2021/2022

The rise of inflation started in the rebound to the slump in prices due to the COVID-19 recession in 2020. It was amplified by a change in the structure of private consumption due to COVID-19 restrictions and behavioural changes which led to an increase in demand for (durable) consumer goods and a decline in spending for services. These changes combined led to a significant decline in private consumer spending. However, as unprecedented fiscal support measures stabilised disposable household incomes, private savings rose sharply in the euro area. As a consequence of the higher demand for consumer goods, global industrial production and international trade volumes for goods increased strongly.

In spring 2021, global industrial production and world trade volumes had already exceeded pre-pandemic levels by almost 10%. This development continued until summer 2022. In order to produce these goods, demand for raw materials and intermediate products as well as for labour increased sharply and production reached its capacity constraints, causing world market prices for raw materials (especially energy) and goods to soar. Due to the higher volumes in international goods trade, global transportation infrastructure also reached its limits leading to a steep rise in transportation costs.

Higher private savings together with very low interest rates due to a very expansive monetary policy (policy rates at or close to zero and quantitative easing) resulted in negative real returns on saving accounts and government bonds. Historically low rates for mortgage loans resulted in a very high demand for real estate, especially housing, pushing up production in construction and dwellings and consequently pushing up world market prices for building and raw materials.

In addition to these pandemic-related developments that pushed world market prices already upwards, a reduction in the supply of natural gas to Europe occurred as of summer 2021, when Russia (Gazprom) stopped filling its gas storage facilities in central Europe. As a consequence, wholesale prices for natural gas and electricity in Europe strongly increased.

Hence, in 2021, inflation, as measured by the harmonised index of consumer prices (HICP), started to accelerate in the euro area, as well as all over the globe, driven mainly by energy prices (mineral oil products in spring and natural gas and electricity prices in summer/autumn). In addition, transport costs increased strongly due to supply chain disruptions, and the availability of consumer goods declined. Together with the pass-through of higher energy costs, prices of industrial consumer goods and food began to rise as well.

With the beginning of the Russian invasion in Ukraine and in response to Russia's aggression, which was in violation of international law, the European Union (EU), US, United Kingdom (UK), Japan, and other countries imposed extensive sanctions against Russia. As a result, energy and food prices in Europe experienced an additional price push (especially for natural gas and electricity), and inflation rose to levels not seen since the two oil shocks in the 1970s.

Although headline inflation rates in the euro area and the US show a similar level, their composition is very different, which reflects two main characteristics (Figure 1):

(i) The **sources of high inflation rates**

- US: mainly core inflation (2022 average January-September: +6.2%; energy +29.8%).
- Euro area: mainly energy prices (2022 average January-September: +38.2%; core +3.6%).

(ii) The **position in the inflation cycle**:

- US: the pass-through of higher energy prices and higher labour costs is well advanced and there are tentative signs that inflation might reach its peak soon.
- Euro area: energy prices are still rising (especially natural gas prices) and their pass-through to consumers has not yet been completed. Moreover, second-round effects from high inflation to wage increases, consequently leading to further price increases, have not yet taken place.

2.2. Inflation dispersion in the euro area

A country's headline inflation as measured by the HICP is determined by the changes in individual prices and its weighting structure. Public authorities have an impact on the price formation mechanism via administered prices (which are permanently under the influence of the public administration), taxes and excise duties, as well as via temporary interventions (Box 1). In this subsection we deal with the first two sources that influence inflation dispersion within the euro area in the high inflation period in 2021/2022. To put the situation in the euro area into context, we compare it with regional inflation dispersion measures for the US and Canada. In section 2.3 and annex 1, we turn to the role of administered prices and special measures taken by individual member countries in the wake of the currently very high inflation.

Box 1: Components of headline inflation (HICP)

- Domestic market prices of HICP items.
- Country-specific weighting schemes of HICP items due to national consumption preferences.
- Public administration influences on prices:
  - Administrated prices.
  - Taxes and subsidies on products.
  - Regulative price measures.

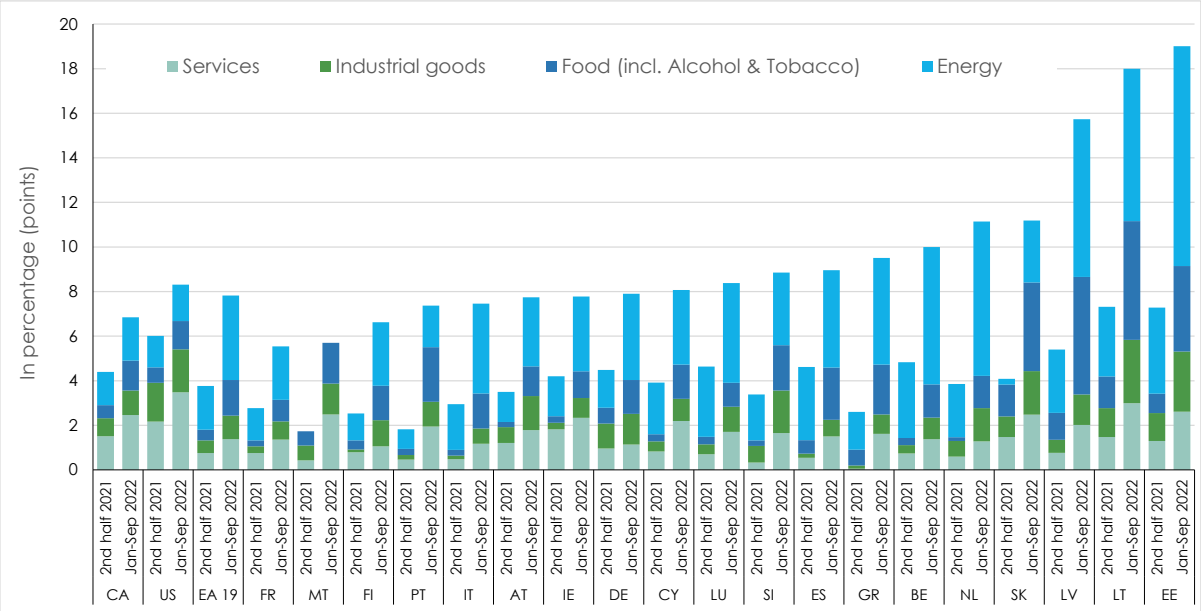
Source: Authors' own elaboration.

In October 2022, inflation in the euro area (10.7%; flash estimate) was at its highest level since the introduction of the common currency and also inflation dispersion as measured by range (maximum, minimum) and by standard deviation within the common currency area has reached an all-time high. Some countries show (relatively) lower rates of inflation (France, Spain, Malta; 7% to 7.5%) whereas other countries experience very high rates (Netherlands, Baltic states; 17% to 22.5%)[1].

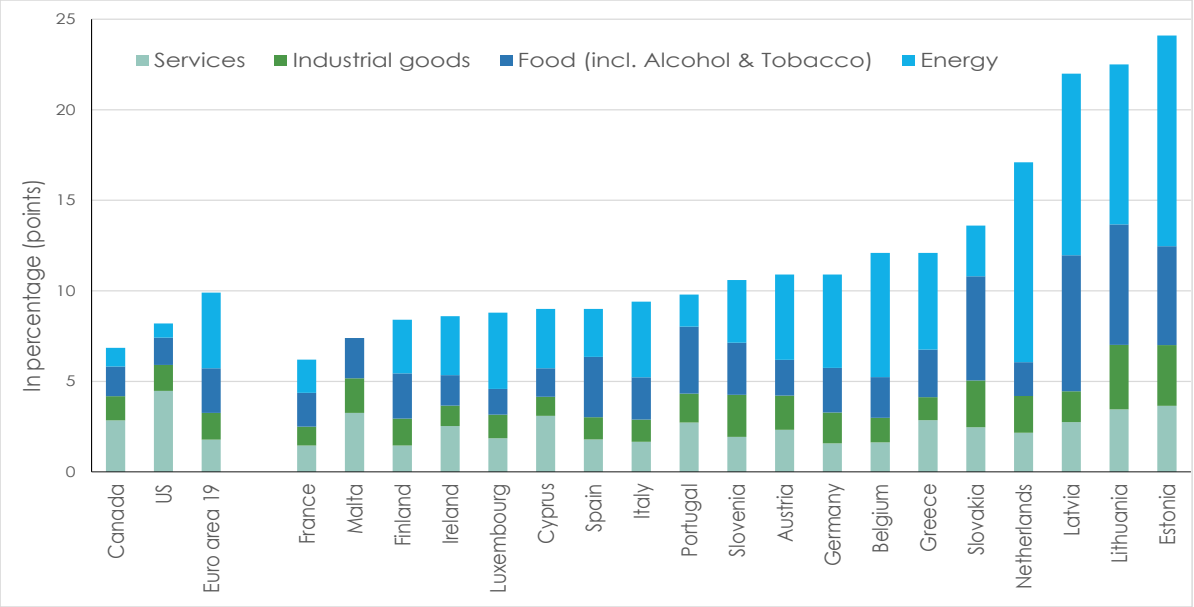
[1] According to Eurostat (2022) flash estimates for HICP inflation rates for the euro area for October 2022. https://ec.europa.eu/eurostat/documents/2995521/15131964/2-31102022-AP-DE.pdf/4675c498-4825-af49-fcfa-0aebf563cd22.

Figure 1: Inflation (contributions) euro area, US and Canada

Panel A: Average contributions July to December 2021 and January to September 2022



Panel B: September 2022



Source: Eurostat, U.S. Bureau of Labor Statistics, Statistics Canada; WIFO calculations.

Note: Contributions of four product groups to headline inflation; the sum of industrial goods (dark green) and services (light green) represents the contribution of core to headline inflation.

For most countries the main contribution to HICP inflation still comes from energy prices (Figure 1 – Panel A), but as the pass-through of higher costs into the prices of almost all consumer goods is intensifying, the contribution of non-energy product groups to headline inflation is also increasing. In September 2022, the share of core inflation in headline inflation was higher than the January-September average in all euro area countries (Figure 1 – Panel B).

The earlier and stronger increase of inflation in the Netherlands, and the Baltic states as compared to the other euro area members is foremost due to a more direct connection of retail energy prices for consumers to the world market prices for coal (Baltic states) and European wholesale prices for natural gas and electricity (all four countries), respectively.

A stronger and faster transmission of energy price increases to retail prices seems also to be happening in the business sector in these four countries, as the prices of other non-energy products also increased stronger than the euro area average. Energy price increases are considered as economy wide shocks and as such affecting all firms in an industry in a fairly similar way. Hence, the stronger the energy price shocks, the stronger and faster they are transmitted to other prices.

This is particularly true for food prices in the Baltic states, which have increased by between 20% and 30% since June 2022, significantly more than in the other euro area countries. The higher weight of food in the HICP goods basket further amplifies the inflationary contribution of food.

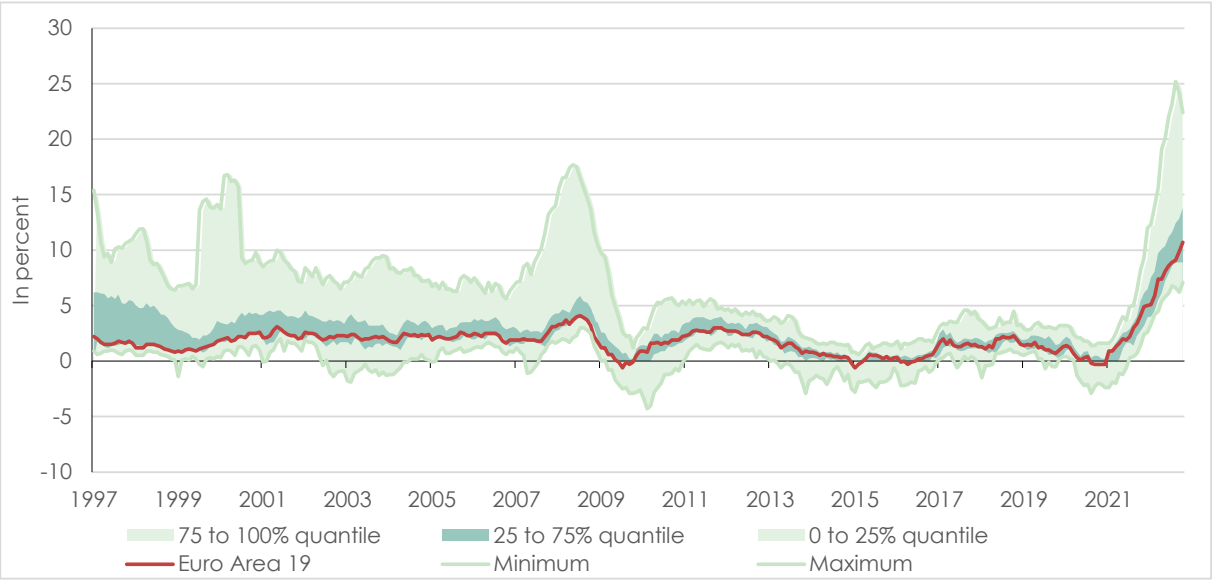
Higher inflation is eroding the purchasing power of wages and salaries. Depending on how quickly price increases result in stronger wage adjustments, higher labour costs will be passed on to prices (price-wage-price spiral). This explains to some extent the more persistent inflation differentials.

In Figure 2, we present two measures of inflation dispersion in the euro area over a longer period. In Panel A, the range of the monthly headline inflation rates in the euro area Member States (maximum and minimum) is displayed as well as the 50% quantile around the regional median (dark green area).

Another measure of inflation dispersion summarises the variation in inflation rates across countries by using the monthly standard deviations for headline and core inflation for euro area Member States. In panel B, we apply it to two country samples: euro area 12 is the subset of the 12 Member States that were already part of the union when the euro was introduced as a physical currency in 2002; euro area 19 includes all current members. We compare the variation within the euro area with similar measures for the US (4 regions, 9 census divisions, respectively) and Canada (13 territories).

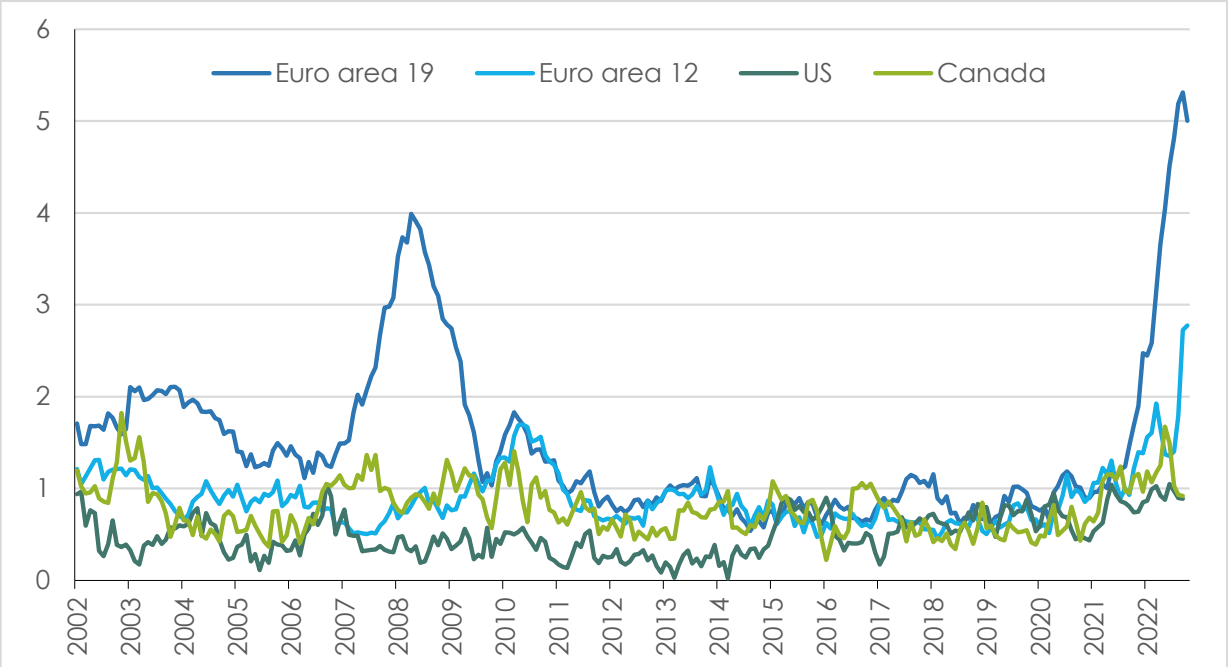
Figure 2: Regional inflation dispersion in the euro area, the US, and Canada

Panel A: Distribution of inflation rates in the euro area across member countries, monthly year-on-year changes



Source: Eurostat, Macrobond – The dark green area shows the 50% quantile around the regional median. The light green areas show the upper and lower 25% quantiles.

Panel B: International comparison of the standard deviations for regional inflation rates



Source: Eurostat, U.S. Bureau of Labor Statistics, Statistics Canada; WIFO calculations.

Note: Headline inflation rates; Euro area 12: monthly unweighted standard deviation of 12 member countries in 2002. Euro area 19: all current members, monthly unweighted standard deviation of 19 countries.
US: unweighted standard deviation of 4 regions (2002 to 2018 and 9 divisions (2019 to 2022), respectively.
Canada: monthly unweighted standard deviation of 13 territories.

For the low inflation period 2010 to 2020, the measures of inflation dispersion for the euro area, the US and Canada are quite similar and do not change much over time. For the US and Canada, this holds also for the high inflation period 2021/2022. In the euro area, the inflation dispersion for both measures strongly increases. For the euro area 12 subgroup, the high inflation rate in the Netherlands is responsible for the hike in inflation dispersion in 2022[2]. In addition, also the Baltic states show enormous increases in its inflation rates which then lead to the even stronger spike in the euro area 19 measure.

The above finding is in line with results of earlier studies. Altissimo et al. (2010) show that the degree of dispersion within the 10 euro area member countries in the period 1990 to 2004 was around twice the comparable measures computed within the German Länder, the Spanish Comunidades Autónomas, or Italian cities. This shows that the dispersion of inflation rates across European borders was higher as compared to those within European countries. Also, Beck et al. (2009) find that price dispersion in the euro area was twice as large as across 11 metropolitan areas in the US. However, they also put their result into perspective by mentioning the small number of regional units in the US which tends to reduce measures of dispersion.

2.3. Policy measures to fight inflation directly

Prices for various consumer goods are not determined by market forces but set by public administration, for example fees for water supply, sewerage disposal and waste management and (in

[2] The Netherlands – as a small country – matters with respect to measures of dispersion because the standard deviation or the difference between maximum and minimum values are unweighted statistics. In this case the size of the deviation from the mean becomes relevant.

some countries) also for natural gas, electricity and district heating. Inflation might differ in some countries because of the varying extent of price adjustments for administered prices (Table 1). Two patterns emerge: when this instrument is used to dampen inflation, price adjustments are very low[3] or these prices are even reduced.

In other cases, however, the revenue aspect of the state or municipal budget might be the primary concern. Under such circumstances, prices under public control are increased (sometimes even excessively). This effect is all the stronger, the higher the share of administered prices in the basket of consumer goods is. In the Netherlands, administered prices in September 2022 were almost 50% higher than a year ago. With a 23% weight in the HICP, prices in the Netherlands are more strongly determined by public authorities than in all other euro area countries. In September 2022 in the Netherlands, 11 percentage points of the headline inflation rate (17.1%) were due to administered prices (almost all of it came from regulated natural and electricity prices). In the Baltic states, administered prices were between 35% (Latvia) and 75% (Estonia) higher than a year earlier (with a weight of 10-12%). Most of these increases are due to strong rises in regulated energy prices.

Furthermore, changes in product taxes like value-added tax (VAT) and other excise taxes are included in the calculation of the HICP. The same holds for product subsidies, like those in public transport or by reducing pharmaceutical products prices. In addition, regulative measures like price caps can influence total HICP developments. Euro area member countries recently put in place various measures in order to shield private households as well as companies from the dramatic price increases. Some of these measures have (temporary) direct effects on the HICP.

Table 1: Importance of administered prices in the euro area

	Weight (2022)	Positions (2022)	July to December 2021	January to September 2022	September 2022
	In percent	Number	Average rate of change in percent against same period of the previous year		
Austria	9.27	25	2.1	3.1	3.8
Belgium	13.34	22	1.0	2.5	3.1
Cyprus	11.72	17	7.7	**11.6**	**16.2**
Germany	12.46	30	2.5	-0.6	1.7
Estonia	12.15	12	**28.1**	**70.0**	**75.4**
Greece	10.17	16	5.1	21.1	12.5
Spain	7.12	18	2.5	4.7	3.7
Finland	11.18	14	2.4	11.5	**16.9**
France	17.63	30	4.5	6.0	6.1
Ireland	8.06	16	0.2	6.0	5.7
Italy	7.67	14	**11.5**	**17.9**	**18.8**
Lithuania	11.85	24	**12.2**	**29.9**	**45.3**
Luxembourg	9.30	21	1.7	3.2	4.1

[3] In September 2022, in Germany, administered prices were a mere 1.7% up from one year ago.

	Weight (2022)	Positions (2022)	July to December 2021	January to September 2022	September 2022
	In percent	Number	Average rate of change in percent against same period of the previous year		
Latvia	10.55	21	**9.1**	**25.7**	**35.3**
Malta	10.48	11	0.1	0.9	1.7
Netherlands	**23.00**	21	6.8	**25.6**	**49.5**
Portugal	12.30	22	0.7	1.4	1.9
Slovenia	7.67	15	6.0	7.9	5.9
Slovakia	20.84	20	-0.1	**12.4**	**11.1**
Euro area 19	12.52	.	4.3	7.3	**10.4**

Source: Eurostat, Macrobond.

Other measures which mainly target the income of private households via transfers have effects on demand and hence on prices. Such measures intentionally support real income and stabilise private demand. If income support measures are not closely targeted to lower income households but broadly based (and too generous) they might be inflation-enhancing. Furthermore, subsidies to utilities providing energy services to private households and small and medium sized enterprises (SMEs) will directly dampen prices of energy related components in the HICP. They can also potentially reduce the pressure on SMEs to pass-through higher energy prices into final goods and services prices.

When authorities in Member States became aware of the untypical extreme price increases of basic consumer products, they took various measures to shield private households from an excessive loss in their purchasing power. The measures implemented by euro area member countries vary considerably. Annex 1 provides an overview of the different interventions targeting (selected) product or services prices directly. Indirect inflation effects of measures targeting households´ income via transfers are not considered. Country information has been derived from various sources. Sgaravatti et al. (2021) provide an extensive overview about measures. This information has been supplemented by other official publications like Budgetdienst (2022) or Prammer and Reiss (2022) and other national sources from the internet[4]. Furthermore, the members of the Association of European Conjecture Institutes business cycle network, supported the collection of information by their country-specific knowledge.

Our survey of fiscal policy measure from members of the euro area reveals that national governments supported private households and firms by reducing taxes and by implementing price caps on various energy sources. We collected only those measures that had an impact on the inflation rate and did not venture into transfer payments. The list in annex 1 shows that euro area countries implemented around 60 discretionary measures over the last 2 years to directly target energy prices which are included in their HICPs.

It is difficult to quantify the effects on individual country's HICP of all these measures. This is part of the work of statistics offices and economic research institutes in the member countries.

[4] See for instance https://static.eurofound.europa.eu/covid19db/cases/GR-2022-12_2264.html for another euro area wide overview or https://www.bundesregierung.de/breg-de/suche/faq-entlastungen-2065232 for measures taken in Germany.

For France, the freeze of the gas price at the level of October 2021 as well as the near abolition of the electricity excise tax from EUR 22.50 to EUR 0.50 are quite substantial changes. Due to their significant weight in the HICP, a substantial dampening of HICP as compared to other countries seems to be plausible. Also, for Spain, the reduction of the VAT from 21% to 10% on electricity, free train tickets for short and middle distances as well as a EUR 0.2/litre fuel subsidy (which is a price reduction of around 10%) seem to be more extensive measures than observed in many other countries.

3. MONETARY POLICY IN THE EVENT OF HIGH INFLATION DISPERSION WITHIN A CURRENCY AREA

3.1. The optimal monetary policy response to supply shocks

Energy price shocks can be interpreted as adverse supply shocks, which reduce the supply of energy and as a consequence lead to an increase in the price of energy. If a country is a net importer of energy, this deterioration of the terms-of-trade will inevitably reduce domestic demand and the associated cost-push inflation will reduce potential output. The lower terms-of trade imply a transfer of purchasing power from the energy importing to the energy exporting countries. The optimal policy response then depends on the nature of the energy price shock: being either temporary or permanent; and on the time needed for the economy to converge to the new potential output level. Furthermore, it depends on how much relative weight the central bank attributes to deviations from potential output versus the deviation from price stability.

The optimal monetary policy response to adverse supply shocks has been subject to intensive research since the big oil price shocks of the 1970s. The original analysis was based on Keynesian models with sticky prices. Gordon (1975) used such a model and concluded that an exogenous adverse supply shock will reduce the long-run price level of non-energy goods and thus the optimal response of the monetary authority will be an accommodative intervention. The analysis by Phelps (1978) and Gramlich (1979) led to the same conclusion.

Blinder (1981) studied oil price shocks in a wage contracting framework of the Fischer (1977) type. If a positive oil price shock hits such an economy, nominal wages will increase if monetary policy does not respond to the shock. The optimal monetary policy will then be contractionary to bring output quicker to potential. Bernanke, Gertler and Watson (1997) provide empirical evidence for this type of response by the US monetary authority. They find that monetary policy is endogenously responding to supply shocks by increasing the short and long-term rate in the base scenario. In their view, the deep recessions after positive oil price shocks were a consequence of the restrictive monetary policy implemented by the Federal Reserve to avoid inflationary concerns. Hamilton and Herrera (2004) question these results and identify bigger direct negative effects of oil price shocks on output.

Rotemberg (1983) transfers the argument from models with sticky wages into the class of sticky price models. He built a model with two uses of energy. Energy is an intermediate input in the production of domestic goods and at the same time it is a consumption good demanded by private households. If there are costs of adjusting prices, then a positive energy price shock (adverse supply shock) should lead to a restrictive monetary policy course leading to a reduction of the money supply. The restrictive move immediately lowers output and brings the economy faster back to the potential output path. Fischer (1985) stresses the role of wage stickiness in the adjustment mechanism and argued that as long as real wages are flexible, supply shocks do not require a monetary response.

Turnovsky (1987) uses an IS-LM model augmented by an aggregate supply curve. The model includes a supply shock and shocks to the demand for goods and money. Wage stickiness is introduced by one-period wage contracts. The objective of the central bank is to minimise the variance of the deviations from the frictionless output level and Turnovsky (1987) concludes that monetary policy can be effective only if the indexation of wages is incomplete. With full information on all three shocks, monetary policy can replicate the output level of the frictionless economy and demand shocks will be fully corrected.

Cecchetti (2000) puts more emphasis on the relative weight of deviations in output and inflation rates from their target values and their relative weight in the loss function of the monetary authority. He distinguishes demand and supply shocks by their impact on output and inflation rates. While demand

shocks move output and inflation rates in the same direction, supply shocks move output and the inflation rate into opposite directions. In this simple model, the central bank has only one instrument available, i.e. the money supply. By adjusting the money supply the central bank can move output and the inflation rate only into the same direction. This can be shown by going through the process of a money supply expansion in real terms: First, real money balances will increase, causing demand to go up and finally prices will start to increase, correcting the initial monetary expansion. In this simple set-up, supply shocks create a trade-off for the central bank because the authority must choose between stabilising output or stabilising inflation. When the loss function is concentrated on stabilising the inflation rate, the bank will choose to increase the policy rate such that the inflation rate does not rise. If the central bank's focus is fully concentrated on output deviations, it will not respond to a supply shock at all, because this response stabilises output in the model. If the central bank has a positive weight on both parts of the loss function – inflation and output deviations – it will increase the key interest rate but not as much as in the case of full inflation targeting.

Kilian (2009) also stressed the importance of monetary policy objectives for the effect of energy price shocks on the economy. Starting from the fact that developed economies responded more strongly to positive oil price shocks in the 1970s as compared to oil price shocks happening after 1995, he concludes that monetary policy regime shifts were responsible. The stagflation period in the 1970s was a consequence of the breakdown of the Bretton Woods fixed exchange rate system which removed the nominal anchor from monetary policy in the beginning of the 1970s. A similar regime shift in the opposite direction occurred under Chairman Paul Volcker in 1979 such that since the early 1980s price stability became universally accepted as a policy goal. Barsky and Kilian (2002) argue that oil price shocks will not result in sustained inflation under a credible policy rule.

Kilian (2009) extends the analyses to the potential sources of oil and commodities price variations. He stresses that commodity prices are endogenous and respond to the global business cycle which itself responds to monetary policy. Importantly, if the oil price is endogenous, the central bank should respond to the underlying source of excess demand for or excess supply of oil (Kilian, 2008). Moreover, an oil price shock has two transmission channels: (1) as an input in domestic production it creates a cost push to domestic production (supply channel), and (2) it reduces the purchasing power of domestic households (demand channel). Kilian (2008) shows that the supply channel is weak while the demand channel usually dominates, which implies, that oil price shocks should be interpreted as adverse demand shocks and sudden oil price increases will be recessionary and deflationary.

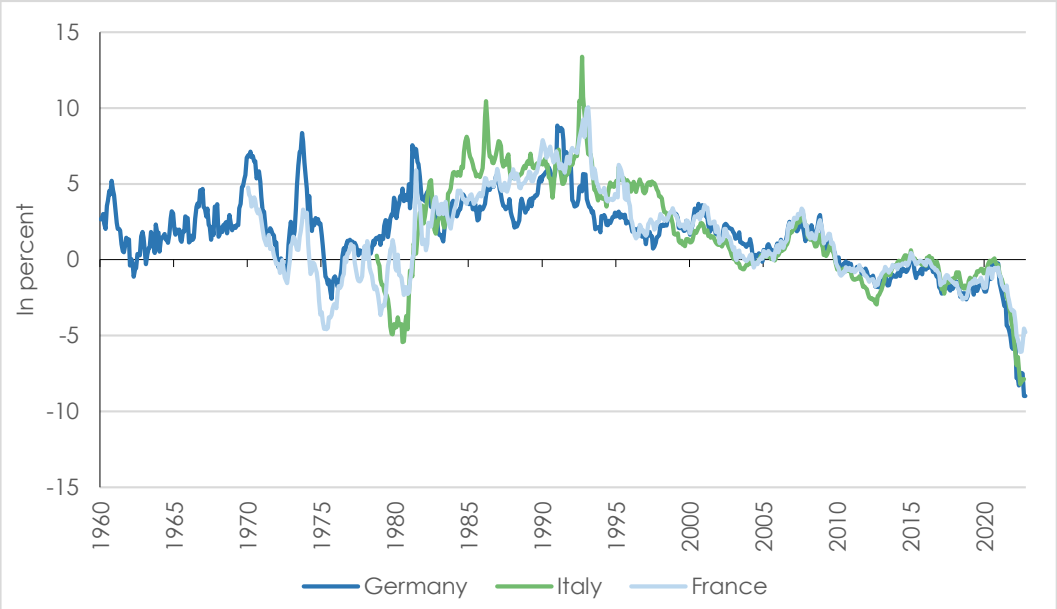
In addition, Kilian (2009) stresses the role of real wage rigidities for monetary policy decisions. The central bank may choose not to respond to the pass-through of a onetime increase in oil prices into producer prices if inflationary expectations are well anchored. In this case the central bank can tolerate a drift in the inflation rate. If inflationary expectations become unanchored, the central bank will have to follow a more vigilant anti-inflationary policy. If supply reductions dominate oil price fluctuations, the central bank should make sure that inflationary expectations remain well anchored.

3.1.1. The current monetary policy stance

The current policy stance of the euro area can be deduced from the development of the real (ex-post) short-term interest rate in Figure 3. Over the period from 1960 until 1998 we present the short-term real interest rate for Germany, France, and Italy; after the formation of the European Monetary Union 1999 we use the euro area 3-month interest rate. For the computation of real interest rates we use the national inflation rates, thus Figure 3 presents different values also for the period with a common euro area interbank market.

The surge in inflation rates started slowly in the second half of 2021 and gained momentum in spring 2022 after Russia attacked Ukraine which caused a sharp increase in energy and commodity prices. The short-term real interest rates are now at the lowest level recorded since the 1960s indicating a very expansionary monetary policy despite the contraction signalled by recent increases in ECB policy rates.

Figure 3: Real short-term (3 month) interest rates



Source: European Money Markets Institute (EMMI), German Federal Statistical Office, OECD, French National Institute of Statistics & Economic Studies (INSEE).

Note: From 1999 onwards, the differences in the real short-term interest rate of the three countries only reflects the differences in inflation.

3.2. Monetary policy under very dispersed inflation rates

The euro area displayed a high degree of inflation rate dispersion already in the run-up to the currency union. Indeed, joining the currency union was regarded very early as an instrument to quickly lower inflation rates without having to pay the full cost of disinflation in terms of lost output (Giavazzi and Giovannini, 1989; Cuñnado and de Gracia, 2010). Figure 2, Panel A, shows some parameters of the empirical distribution of monthly year-on-year inflation rates in the euro area over the period 1997 through 2022. It is clearly visible that the dispersion was comparatively high during the first years of the monetary union and during the financial market crisis. After the trough in economic activity in 2009, the dispersion was comparatively low until the mid of 2021, when oil prices started to climb in response to a demand recovery after the COVID-19-related disruptions faded out.

3.2.1. Potential sources for regional inflation differentials

Altissimo et al. (2010) and Beck et al. (2009) identify four sources of heterogeneous inflation rates in a monetary union:

- Balassa – Samuelson effect: countries that experience higher productivity growth in the traded goods sector will also show higher consumer prices inflation. The reason is that productivity growth in the traded sector will translate into an increase in the overall wage rate throughout the economy. While the prices of traded goods are tied by international competition, firms in the non-traded goods sector can increase their prices to cover higher wage bills. This effect

requires perfect labour mobility between the traded and non-traded goods sectors and low or no benefits from productivity gains in the non-traded goods sector.

- Heterogeneity in economic structures of member countries (e. g. the price setting mechanism, wage rigidities, degree of competition in goods and labour markets, preferences, technologies, policy response).
- Exposure to common and idiosyncratic shocks from both supply and demand sides (e. g. the role of area wide monetary policy impulses, exchange rate movements or oil price changes, inappropriate domestic policies such as misaligned fiscal policies.).
- Differences between the actual positions of the economies within their business cycles.

Some authors tried to identify the sources of inflation differentials in the euro area empirically. For example, Altissimo et al. (2010) show that inflation in the services sector had higher variation among the euro area members, and energy prices were also a source of higher inflation rates. Beck et al. (2009) identify factor market distortions and other structural characteristics as the main source for inflation differentials rather than local cyclical and growth dynamics. Moreover, in the time dimension, monetary policy or oil price developments contribute about half of the variation in inflation rates (cf. also Stavrev, 2007).

3.2.2. Is there an optimal policy response under a high degree of inflation dispersion?

Optimal monetary policy decisions in a multicountry set-up with a common currency and a central bank with an inflation target are analysed in Benigno (2004). He uses a two-region dynamic stochastic general equilibrium model with monopolistic competition and price stickiness. His framework delivers a simple welfare criterion based on the utility of the consumers. This criterion is used to evaluate the consequences of monetary policy decisions in the whole currency area. In line with the literature on optimal policy responses to supply shocks, Benigno (2004) shows the relevance of the degree of wage stickiness. If both regions have the same degree of nominal rigidity, the optimal outcome is obtained by targeting a weighted average of the regional inflation rates. The weights coincide with the economic size of each region (as used in the HICP). If the degree of rigidity is different across regions, the nearly optimal plan for an inflation targeting policy gives a higher weight to the inflation rate in the region with the higher degree of nominal rigidity.

Brissimis and Skotida (2008) follow a similar strategy and use a New Keynesian general equilibrium model with staggered price setting. They derive optimal weights for the ECB's target inflation rate, the HICP, which do not correspond to the relative size of countries, rather the ECB should optimally account for structural characteristics of the participating economies. They suggest that the policy rate should be adjusted to stabilise more the variables of the country with the lower nominal rigidity and the lower intertemporal elasticity of substitution of consumption. The structural differences among member countries, however, are hard to measure empirically, hence the computation of weights becomes questionable. Brissimis and Skotida (2008) also point towards the role of economic integration plays and the reduction in structural differences initiated by the common monetary policy. Continued financial market integration and stronger trade linkages among member countries will further reduce structural differences. Moreover, if the ECB credibly anchors inflation expectations at the 2%-target within a systematic monetary policy framework, the ECB can significantly reduce uncertainty and volatility, since monetary policy is factored in private sector's expectations and forward-looking economic decisions.

Some authors conclude that, in the presence of pronounced relative inflation differentials, the ECB did already deviate from the weighted inflation rate target based on economic size. If some countries may

experience quite low levels of inflations or even approach a situation of deflation, the ECB might have been reluctant to pursue a tightening policy because of the "fear of national deflation" with possible contagion effects spreading through the euro area (Fendel and Frenkel, 2009; Pirovano and Van Poeck, 2011).

A more pragmatic approach towards monetary policy decision making under a high degree of regional dispersion in inflation rates has been suggested by Brunnermeier (2010). He starts from the observation that a prolonged increase in the money supply will eventually translate into an increase in the price level. In a monetary union, the central bank can only set a single interest rate for member countries, but the euro area is not an optimal currency area from the viewpoint of the traditional literature[5]. Instead of fine tuning the weights given to individual countries in the loss function of the central bank, the common interest policy can be better tailored to regional needs by using tools that directly affect the interest rates for credit and the term spreads (yield curves) in the respective member country. The ECB followed this approach already when deciding to allow the portfolio shares of reinvested maturing bonds (bought under the pandemic emergency purchase program [PEPP]) to deviate from the size-based weights prescribed before.

Moreover, macroprudential instruments can be set at the national level and coordinated through the European Systemic Risk Board. This would allow to impose haircuts and stricter collateral requirements for mortgages or loans issued in member countries that experience high inflation rates and excessive capital inflows. This increases the costs of refinancing these products for banks and ultimately creates higher term spreads and interest rates for credit in the respective country. Although this disaggregated policy approach looks favourable in terms of regional fine tuning, we want to stress that political pressure against macroprudential measure will emerge[6].

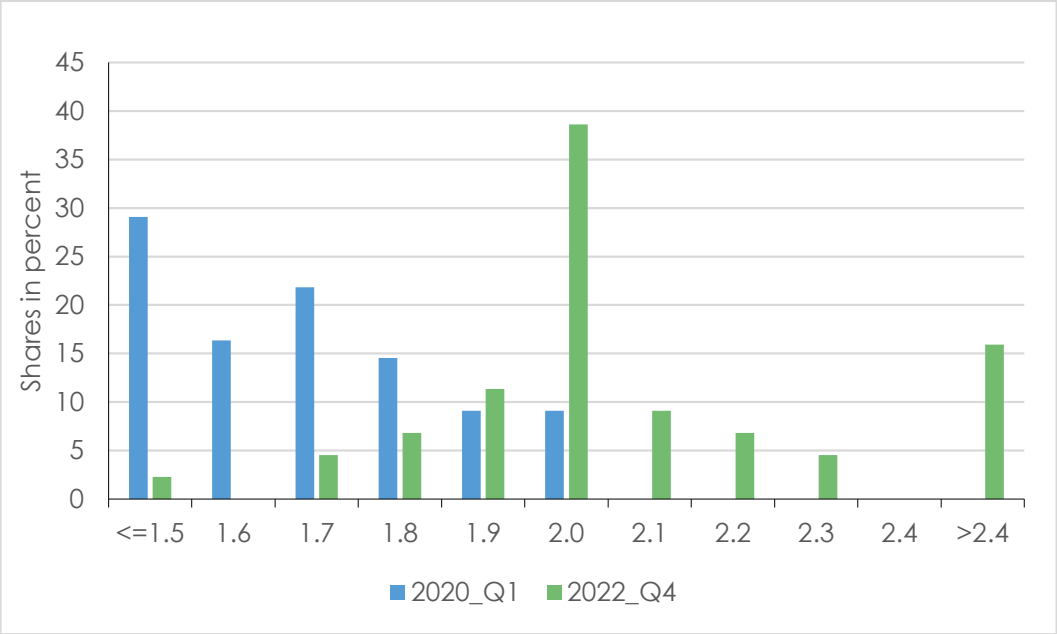
For open economies, energy and commodity price shocks have another special feature: Higher import prices for energy and commodities worsen the terms-of-trade and consequently result in a transfer of real income/resources from net importers of raw materials to raw material exporting countries. If prices and wages are flexible, the central bank may lean back and wait until the pass-through of the raw material price shock has been absorbed through the system. This relaxed approach requires that the inflation goal is credible despite the burst of inflation throughout the monetary union. If the credibility of the inflation target becomes endangered, the central bank would have to send a strong signal of determination to market participants by raising key interest rates swiftly.

Observing the distribution of long-term inflation expectations among the participants in the Survey of Professional Forecasters conducted by the ECB confirms that inflation expectations over a five-year horizon shifted upwards between the beginning of 2020 and the last quarter of 2022 (cf. Figure 4). Participants slowly moved their expected long-term inflation rate up from 1.7% to an average value of 2.2%. Although the distribution of expected long-term inflation rates shifted to higher values compared to 2020 and now also supports values above 2.5%, a close inspection of individual answers by participants reveals that inflation expectation were still well anchored in fall 2022.

[5] Gächter et al. (2017) discuss optimum currency union criteria with an emphasis on business cycle comovements.

[6] See e.g. Bloomberg, 4 November 2022: https://www.bloomberg.com/news/articles/2022-11-04/bank-executives-frustrated-over-interference-and-demands-from-ecb?leadSource=uverify%20wallrference-and-demands-from-ecb?leadSource=uverify%20wall. As of Nov. 11th 2022.

Figure 4: Long-term inflation expectations in ECB survey of economic forecasters



Source: ECB.

4. CONCLUSION

The analysis of inflation differentials within the euro area reveals an increase in inflation dispersion starting around the mid-2021, which accelerated after the Russian attack on Ukraine at end of February 2022. Most of the increase in HICP inflation rates is still directly related to the increase in prices of internationally-traded energy sources and commodities. Prices of energy and commodity intensive consumer goods and services, however, are also affected by the pass-through of higher input prices in final good prices. Furthermore, worker representatives are likely to respond to higher inflation rates by increasing their wage demands in collective and individual wage bargaining processes.

The dispersion of inflation rates within the euro area tends to increase in times of strong energy price increases. We have shown that around the introduction of the common currency, throughout the financial market crisis, and now in the Russian-Ukrainian war the dispersion of inflation rates went up. What is new with respect to the current period, is the significant increase in the average inflation rate. From a monetary policy perspective this resulted in historically low real short-term interest rates – in the range between -4.5% to -9% for the larger euro area member countries. Small Member States in Eastern Europe face even lower real interest rates. Thus, the monetary policy stance now appears very accommodative in historical perspective, in particular, if the large stocks of securities accumulated by the Eurosystem under several asset purchase programs is taken into account.

A review of potential monetary policy responses to an energy price shock (adverse supply shock) produces diverse recommendations, depending either on the extent of nominal rigidities assumed by the authors or by the loss function used to measure the success of central bank interventions. The main reason for this divergence is due to the special characteristics of supply shocks in combination with the effect of changes in key interest rates. While an adverse supply shock moves output down, but the inflation rate up, an interest rate cut will move both variables in the same positive direction. This creates a trade-off for the central bank with respect to their inflation or output targets.

For open economies, energy and commodity price shocks have another special feature: Higher import prices for energy and commodities worsen the terms-of-trade and consequently result in a transfer of real income/resources from net importers of raw materials to raw material exporting countries. If prices and wages are flexible, the central bank may lean back and wait until the pass-through of the raw material price shock has been absorbed through the system. This relaxed approach requires that the inflation goal is credible despite the burst of inflation throughout the monetary union. The latest survey of professional forecasters conducted by the ECB does not show signs of lacking credibility so far. If the credibility of the inflation target becomes endangered, however, the central bank would have to send a strong signal of determination to market participants by raising key interest rates on an accelerated course.

The optimal monetary policy response to an adverse supply shock in a monetary union with highly dispersed national inflation rates may concentrate on the way to compute the average inflation rate for the euro area. The weights currently used to compute the euro area average inflation rate are based on the size of member countries' economies. One may attempt to complement these weights with factors accounting for nominal rigidities in the price and wage formation processes in member countries. In this case, countries with higher rigidities would get a higher weight in the computation of the average euro area inflation rate. Alternatively, the central bank may retain the existing weights and adjust the key interest rates in line with the divergence from the inflation target. Country-specific fine tuning could then be implemented by using macroprudential instruments – preferably through with the European Systemic Risk Board – to manipulate national term spreads and interest rate spreads for credit.

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ANNEX 1

Austria

- Mandatory green electricity levy paused from 1 January 2022, leading to a loss in public in come of EUR 1.7 billion.
- Lowering the electricity levy from EUR 0.015/kilowatt hour (kWh) to EUR 0.001 between May 2022 and June 2023.
- Lowering the natural gas levy form EUR 0.066 /m^3 to EUR 0.01196 between May 2022 to June 2023.
- The regional government of Lower Austria agreed on a deduction of EUR 0.11/KWh for residential electricity prices between September 2022 and September 2023. The deduction will cover 80% of an average household's consumption and will cost around EUR 250 million.
- Price cap per household up to a quantity threshold financed by subsidies to electricity companies (electricity price break). December 2022 to July 2024.

Belgium

- Extension of a reduced social energy tariff from October 2021 to December 2022.
- Reduction of VAT for electricity from 21% to 6% from March 2022 to December 2022.
- Reduction of tax on petrol and diesel by EUR 0.175/litre, starting mid of March 2022.

Cyprus

- Introduction of a 10% price discount on electricity bills for all households between November 2021 and February 2022.
- Reduction of VAT on electricity from mid of December 2021 from 19% to 9% and 5% for vulnerable households.
- Additionally, a price cap for vulnerable households on electricity and a staggered cap (between 50 and 80% reimbursement) for other households depending on their electricity consumption from September to December 2022.
- VAT cut to 5% on retail petrol from mid of December 2021 onwards till mid of January 2023.

Estonia

- Energy prices were capped from January until March 2022, for households to EUR 0.12 kWh for electricity and EUR 65/m^3 for gas.
- Lowering of electricity and gas network charges (half price) for households and enterprises from October 2021 to March 2022.

Finland

- Lowering VAT on electricity from 24% to 10% from December 2022 to April 2023.

France

- Reduction of electricity tax for private households from EUR 22.50/megawatt hour (MWh) to EUR 0.50 from February 2022 to January 2023.
- Regulated gas tariff frozen from October 2021 to December 2022.
- Reduction of wholesale market prices for nuclear electricity sales by government subsidies to providers.

- Subsidised discount on fuels, between 1 April and 31 December 2022, applied to both private individuals and firms.
- Petrol price subsidy of EUR 0.30 per litre implemented in September 2022.

Germany

- Reduction of the levy for renewable energies (paid by electricity consumers) from EUR 0.065/kWh to EUR 0.0372 on the wholesale price starting from July 2022.
- Reduction of energy tax on fuels (by EUR 0.2955 for gasoline, EUR 0.1404 for diesel, EUR 0.616/kilogram (kg) for natural gas and by EUR 0.1266/litre for liquid gas) from June to August in 2022.
- Introduction of a fixed price train ticket for EUR 9 from June to August in 2022, valid for nation-wide travels.
- Reduction of the VAT rate charged on natural gas from the regular rate of 19% to 7%, from October 2022 to March 2024.

Greece

- Subsidy for electricity consumption of private households for consumption under 300MWh/vulnerable households/ others:
  - September 2021: EUR 30/EUR 30/EUR 20,
  - October 2021: EUR 60/EUR 80/EUR 20,
  - November and December 2021: EUR 130/EUR 150/EUR 20.
- The mode changed in 2022 to a split of subsidy for the first consumed 150 MWh and the second 150 MWh, for vulnerable households up to 300 MWh and nothing for quantities above:
  - January 2022 EUR 160/EUR 120/EUR 180,
  - February and March 2022: EUR 150/EUR 110/EUR 170.
- Set of a wholesale price cap for electricity and revenues generated from the difference between the set price and the market price the energy producers sell will be returned to the Green Transition Fund.
- Subsidy for private households´ gas consumption: January to March 2022: EUR 20/MWh, April 2022: EUR 40/MWh, May to June 2022: EUR 20, July – August 2022: EUR 30
- Subsidy for the consumption of agricultural electricity for the period August - December 2021 (paid per consumed quantity unit).
- Subsidy for diesel prices of EUR 0.15/litre for April 2022 and from May-October 2022 EUR 0.12 for private households.

Ireland

- In April 2022, excise duty on petrol reduced by EUR 0.20/litre, EUR 0.15/litre of diesel and of EUR 0.02 for gas oil. These reductions were originally meant to remain in place until 31 August 2022 and were then extended until October 2022.
- VAT on gas and electricity cut from 13.5% to 9% from 1 May to 31 October 2022.
- Temporary reduction in Public Service Obligation (PSO) public transport fare of 20% from the end of April 2022 to the end of 2022.

Italy

- Abolition of fixed levies on electricity for users with power consumption below 16.5 kW for the period October 2021 to June 2022 and reduction of levies for the period July - December 2021. In January 2022 these levies were abolished for all groups. Furthermore, general system

charges applied to private households and non-household low-voltage consumers were abrogated until December 2022.
- Reduction of the VAT rate on natural gas from 22% to 5% and of fixed levies during the period October 2021-June 2022. Reduction of excise taxes on natural gas and of general system charges in the natural gas sector from May to December 2022.
- From 22 March to 31 May 2022, and 22 August to 20 September 2022, reduction of the excise duty rates on petrol and diesel used as motor fuel.
- Reduced VAT rate of 5% for the July-December 2022 period for the supply of methane gas used for combustion for civil and industrial purposes.

Latvia

- From 1 January 2022 to 30 April 2022, full coverage charges by the government to all electricity end-users for two sub-components of total electricity tariff (electricity system distribution component and mandatory procurement component meant as an electricity tariff supplement to cover mandatory "green" procurement), including the applicable VAT.
- Reduction of natural gas charges for private household customers for the period from January to April 2022. The fee reduction is applied if the actual tariff in the relevant calendar month exceeds EUR 34.00 per MWh (excluding VAT).
- For the period from January to April 2022, private household customers receive a reduction in central heating service charges (including VAT). The fee reduction is applied if the actual tariff in the relevant calendar month exceeds EUR 68.00 per MWh.
- 50% reduction of electricity system distribution component fee for all consumers.

Lithuania

- Abolition of VAT for central heating from January to April 2022 with compensation of heat energy companies.
- Further measures to be implemented for October 2022 - April 2023.

Luxembourg

- The price of electricity was stabilised, or even slightly reduced, for residential customers by the reduction of included sustainable energy production fees from February 2022 onwards.
- Substantial reduction of the price of natural gas for residential customers by taking over temporary network costs by the government from February 2022 onwards.
- Reduction of consumer prices for petrol, diesel and heating oil by EUR 0.075/litre. These measure lasts until the end of July 2022 for petrol and diesel, and until end of December 2022 for heating diesel.
- Freezing of home rent increases from May 2020 to June 2021.

Malta

- Reduction of the excise duty on unleaded petrol from EUR 490.058 to EUR 359 per 1000 litres and the tax on diesel has been cut to EUR 330 from EUR 413.078 from December 2021 until the end of 2022.
- Granting of allowances and cash injection to EnelMalta to compensate for a freeze of prices at 2014 level during the whole year of 2022.
- Distribution of EUR 10 million to liquefied petroleum gas (LPG) gas providers in the first 6 months of 2022 to contain price increase.

The Netherlands

- Implementation of a price cap on gas and electricity for households from January 2023 onwards. The price cap on gas will be EUR 1.45/m3 gas (including taxes) up to a yearly usage of 1200 m^3. For all usage above this level households will have to pay market prices. The price cap on electricity is EUR 0.4/kWh (including taxes) up to a yearly usage of 2.900 kWh, for all usage above this level households will have to pay market prices.
- Reduction of the tariff applied on electricity in the first tax bracket by EUR 0.05436/kWh (excluding VAT) and a reduction of the tariff applied on electricity in the second tax and third tax bracket by EUR 0.00201/kWh (excluding VAT) from January to December 2022.
- Reduction of the VAT on energy (natural gas, electricity and district heating) from 21 % to 9% from July until December 2022 and lowering of excise taxes on such products for the same period.
- Reduction of excise duties on petrol and diesel by 21 % (from EUR 0.173/litre to EUR 0.111) from April to December 2022.

Portugal

- Reduction of excise taxes on diesel and petrol by EUR 0.01/litre and EUR 0.02, respectively, between 16 October 2021 and 30 June 2022.
- Reduction of the fuel tax equivalent to reduce the VAT rate from 23% to 13% and for electricity from 13% to 6% from October 2022 onwards.

Slovakia

- In November 2021, the electricity tariff for the operation of the system (TPS) and the electricity distribution fee for the unregulated market (costs of EUR 97 million) were significantly reduced.

Slovenia

- Halving of the excise duty on electricity and reduction of those on fuel by about EUR 0.02/litre for regular petrol, EUR 0.05 for diesel, EUR 0.08 for heating oil and EUR 0.01/m^3 for natural gas, from February to April 2022.
- In September 2022, capping of prices of electricity and gas for one year for private households. Lower excise duty and lower value-added tax (9.5%) on energy products and electricity between September 2022 and May 2023 (except heating oil).
- Regulation of the prices of motor fuels at service stations outside of highways, from June 2021 onwards.
- Temporary decrease of the CO^2 levy, the surcharge for renewable energy sources (URE) and the surcharge for the promotion of electricity generation from renewable energy sources from September 2022 onwards.

Spain

- Reduction of the special tax on electricity (IEE) from 5.11% to 0.5% from December 2021 to June 2022.
- Reduction of the VAT rate on electricity from 21% to 10% for consumption of up to 10 kWh from July 2021 to July 2022 and from 10% to 5% from July 2022 to December 2022.
- Implementation of a government subsidy of EUR 0.20/litre fuel which is deducted at the gas station from April 2022 to June 2022.

- Reduction of 100% of all the transport subscriptions and multi-trip tickets for trains in short and mid-distance (Cercanas, Rodales) operated by RENFE, the national railway company, as of 1 September 2022, and until 30 December 2022, and up to 50% of train and 30% of urban and metropolitan transport subscriptions already subsidised under Royal Deree-Law (RDL) in validation.

According to its price stability mandate, the European Central Bank (ECB) conducts a single monetary policy by targeting the aggregate euro area inflation rate. Even though monetary policy is not geared towards addressing inflation dispersion between Member States, wide inflation differentials have implications for monetary policy. At the moment of extreme volatility and high energy prices, Member States experience very high levels of headline and core inflation dispersion, affecting monetary policy transmission. Notable differences can also be viewed in inflation expectations and wage-price dynamics, with all these factors putting constraints on the ECB to deliver on its price stability mandate effectively.

Three papers were prepared by the ECON Committee's Monetary Expert Panel, analysing inflation dispersion in the euro area and the policy implications arising from wide inflation differentials.

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