STUDY

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Monetary Dialogue Papers, March 2023

European Parliament

Prospects for monetary policy one year into the war in Ukraine

Compilation of papers

Supporting monetary policy scrutiny

Economic Governance and EMU Scrutiny Unit (EGOV)
Directorate-General for Internal Policies
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EN

Prospects for monetary policy one year into the war in Ukraine

Compilation of papers
Monetary Dialogue March 2023

Abstract

24 February 2023 marked one year since the start of the Russian invasion of Ukraine. Before the war, starting in 2021, the euro area was experiencing inflationary pressure attributed to supply-side factors, in particular to pandemic-related supply chain disruptions. The war in Ukraine amplified inflationary pressures through energy and food prices, later feeding into goods and services inflation. Later in 2022, the relative contribution of demand-side factors became more prominent. With the recent easing of energy prices, headline inflation is slowing down while core inflation continues to increase.

Four papers were prepared by the ECON Committee's Monetary Expert Panel, analysing current inflation dynamics and the inflation outlook.

This publication is provided by the Economic Governance and EMU Scrutiny Unit (EGOV) for the Committee on Economic and Monetary Affairs (ECON), ahead of the Monetary Dialogue with ECB President Christine Lagarde on 20 March 2023.

This document was requested by the European Parliament's Committee on Economic and Monetary Affairs.

AUTHORS

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Pierpaolo BENIGNO, Universität Bern
Paolo CANOFARI, Università Politecnica delle Marche, Ancona
Giovanni DI BARTOLOMEO, Sapienza Università di Roma
Marcello MESSORI, Luiss Guido Carli, Roma

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Frederik KURCZ, DIW Berlin

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Jérôme CREEL, Sciences Po-OFCE and ESCP Business School
François GEEROLF, Sciences Po-OFCE, CEPR and University of California, Los Angeles

ADMINISTRATOR RESPONSIBLE
Drazen RAKIC

EDITORIAL ASSISTANT
Adriana HECSER

LINGUISTIC VERSIONS
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ABOUT THE EDITOR
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To contact Economic Governance and EMU scrutiny Unit or to subscribe to its newsletter please write to:
Economic Governance and EMU scrutiny Unit
European Parliament
B-1047 Brussels
E-mail: egov@ep.europa.eu

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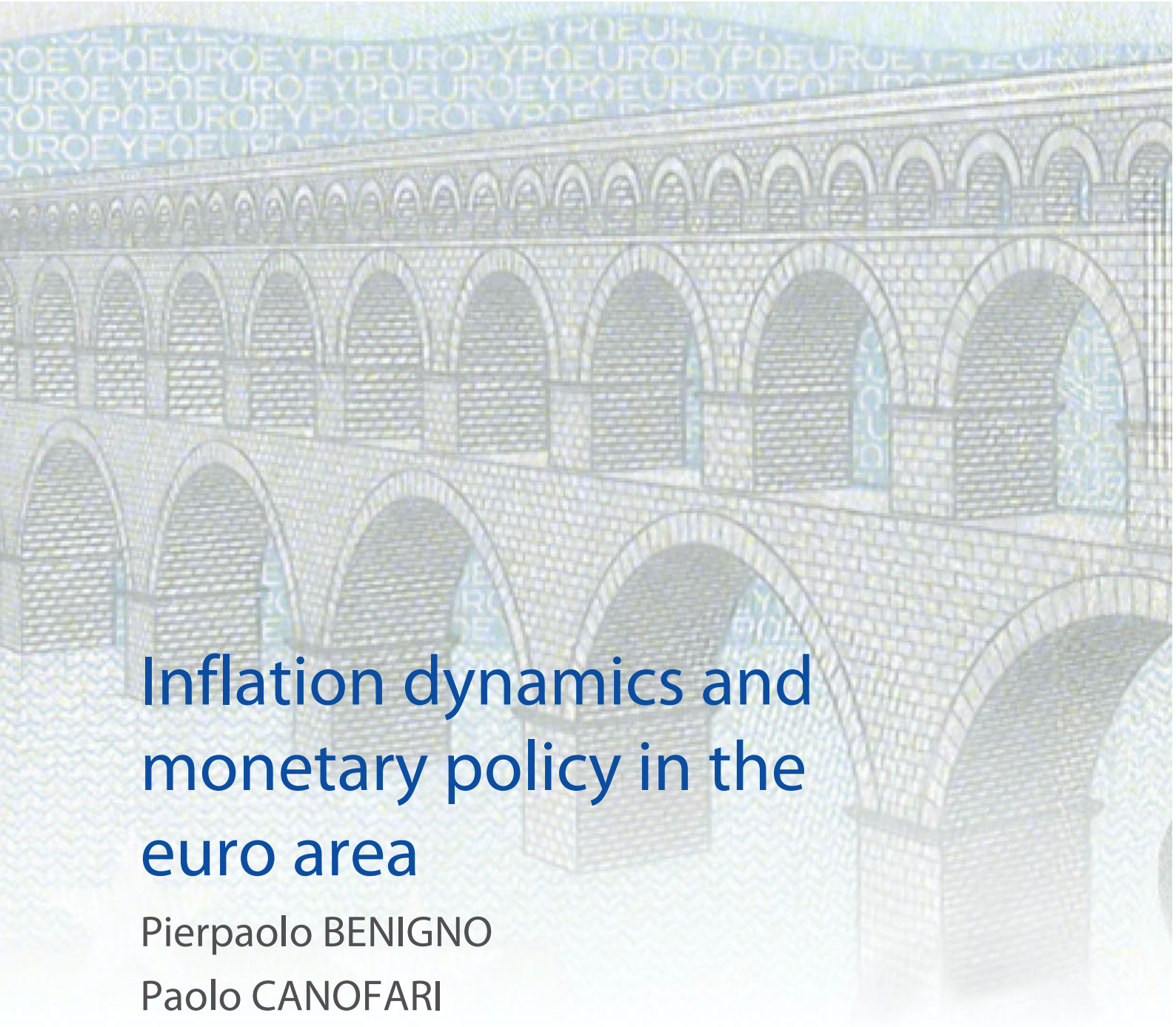

Inflation dynamics and monetary policy in the euro area

Pierpaolo BENIGNO

Paolo CANOFARI

Giovanni DI BARTOLOMEO

Marcello MESSORI

Abstract

The surge in inflation rates experienced by the euro area since the beginning of 2021 is rooted in supply shocks that have led to bottlenecks and an energy crisis. This paper shows that the shifts of inflation expectations into prices could cause some persistence in the excessive inflation process. In this last respect, the flatness of the Phillips curve implies that the unemployment-inflation sacrifice ratio is high; hence, there are substantial costs of bringing inflation down through a contraction in aggregate demand. However, a restrictive monetary policy stance appears unavoidable to keep inflation expectations anchored. A compelling policy mix can overcome this trade-off by supporting a favourable scenario with a soft landing of the economy and an inflation rate returning to target at the medium-long horizon.

This paper was provided by the Economic Governance and EMU Scrutiny Unit (EGOV) at the request of the Committee on Economic and Monetary Affairs (ECON) ahead of the Monetary Dialogue with the ECB President on 20 March 2022.

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LIST OF ABBREVIATIONS

APP	Asset purchase programme
CPI	Consumer price index
ECB	European Central Bank
Fed	Federal reserve system
GDP	Gross domestic product
HICP	Harmonised index of consumer prices
NAIRU	Non-accelerating inflation rate of unemployment
PEPP	Pandemic emergency purchase programme
RRF	Recovery and Resilience Facility
UK	United Kingdom
US	The United States

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EXECUTIVE SUMMARY

- **The surge in inflation experienced by the euro area since the beginning of 2021 is rooted in supply shocks** due to post-pandemic bottlenecks and the energy crisis.
- **The current inflation dynamics can be described as displaying a significant pass-through of external shocks or shifts in inflation expectations into prices**, with some degree of inflation persistence.
- In this last respect, **empirical evidence is offered by the unemployment-inflation sacrifice ratio**: this ratio is considerably high in the euro area, meaning that bringing inflation down through a contraction in aggregate demand is costly.
- **Given that a restrictive monetary policy can directly affect only the demand side, this policy stance risks causing a recession** in the euro area economy.
- **However, a restrictive monetary stance in the euro area appears unavoidable** for keeping inflation expectations anchored.
- **Hence, the ECB's monetary policy faces a trade-off** that could lead to stagflation in the euro area.
- **The consequences of this trade-off can be weakened** into a favourable soft-landing scenario thanks to the unexpected resilience of the euro area economy observed recently.
- **Implementing this scenario would require that the excessive inflation rates adjust to the price stability target at the medium-to-long-term horizon through gradual monetary policy restrictions**.
- **However, this strategy should be supported by an effective "policy mix"** based on the positive interaction between monetary and fiscal policy.
- Monetary policy should keep excessive inflation rates under control, and fiscal policies (national and centralised) should support the absorption of the supply-side bottlenecks that triggered the inflation process.

1. INTRODUCTION

The Russian invasion of Ukraine has been an existential economic shock for the European Union. The war has affected energy, other raw materials, and food prices. It has created extreme uncertainty and consequent unstable expectations about the economic prospects of the EU and the euro area. However, despite this negative impact, the current evidence and the forecast of the euro area's inflation dynamics and output growth are slightly encouraging. Indeed, the euro area's headline inflation rate slowed for the third consecutive month in January 2023 to 8.5% (from a peak of 10.6% in October 2022) even if, again in January, the core inflation rate reached 5.3%, while two months before it was 5%.[1] Moreover, the EU's economic rebound was quite strong in 2021, and the euro area economy showed unexpected resilience in the first three quarters of 2022. Nevertheless, the preliminary estimates show a significant slowdown in the average growth of euro area's gross domestic product (GDP) in the last quarter of 2022, although less dramatic than expected (see Eurostat, 2023).

The European Central Bank (ECB) ended its net purchase of financial assets under the pandemic emergency purchase programme (PEPP) and asset purchase programme (APP) during March - June 2022. In the same period, it finished refinancing operations at negative interest rates. Then, from July to October 2022, the ECB's Governing Council raised its key interest rates three times for a total of 200 basis points (bps), and in December 2022 and February 2023, these increases were followed by two further rises of 50 bps each. Today (end of February 2023), the interest rate on the ECB's main refinancing operations is thus equal to 3%, and that on deposits to 2.5%. This latter value represents the benchmark for the interbank market due to the abundance of bank reserves.

The first signals of slowing headline inflation, recalled above, have not eased the ECB's policy strategy. In the last meeting, the ECB restated the intention to raise its interest rates by a further 50 bps at the next meeting in March 2023 and to follow a path of sufficiently restrictive interest rates until price stability is restored. Moreover, the ECB is on the verge of starting a process of quantitative tightening. It confirmed that the monthly replacement of the stock of the financial assets at maturity, which relates to the APP, will be halved – that is, this replacement will be reduced at an average of EUR 15 billion per month from March to June 2023. The reduction will continue after June at a pace driven by future macroeconomic data.

The ECB's position is understandable. In the second half of 2021 and the first two months of 2022, authoritative members of the ECB's Executive Board maintained that the positive and growing gaps between the euro area's price dynamics and the 2% target were triggered by temporary bottlenecks in international supply chains (see Lane, 2021; Schnabel, 2021 and 2022a; Lagarde, 2022a). They recognised the structural threat of excessive inflation rates in the euro area just after the Russian invasion of Ukraine started. At that point, the ECB became committed to the implementation of a monetary policy restriction to reach yearly price dynamics of 2% in the medium term, independently of the consequences for the real economy (Schnabel, 2022b; Lagarde, 2022b). Hence, according to the dictum "*errare humanum est perseverare autem diabolicum*,"[2] the ECB is constrained not to lowering its guard too early.

The last observation does not mean that the ECB's current and future decisions, communicated at the February 2023 meeting, were in perfect continuity with the position taken at the December 2022

[1] As specified in Section 3, we follow the definition of core inflation adopted by Eurostat: a yearly percentage change in the euro area harmonised index of consumer prices (HICP) with the exclusion of items such as "energy, food, alcohol, and tobacco."

[2] "To err is human, but to persist is diabolical."

meeting. Despite the ambiguous responses offered by President Lagarde during the last press conference, most financial investors got the feeling that the already announced interest rate hike for March 2023 was not necessarily incompatible with a future monetary policy more influenced by its possible negative impact on the economic growth of the euro area. The slowdown of the economic trend in the last quarter of 2022 endorses such interpretation as the usual statement that the ECB's "future policy rate decisions will continue to be data-dependent and follow a meeting-by-meeting approach."

Given this uncertain framework, building a detailed picture of the euro area's economic outlook linked to the recent price changes is essential. Hence, our paper analyses the impact of the war at the EU's eastern borders and the related energy crisis on the macroeconomic and inflation dynamics of the euro area. Specifically, it aims at explaining the divergence between headline and core inflation rates by referring to the primary causes. This step should also offer analytical and empirical keys to assess the medium-term inflation outlook and the effectiveness of current monetary policy measures.

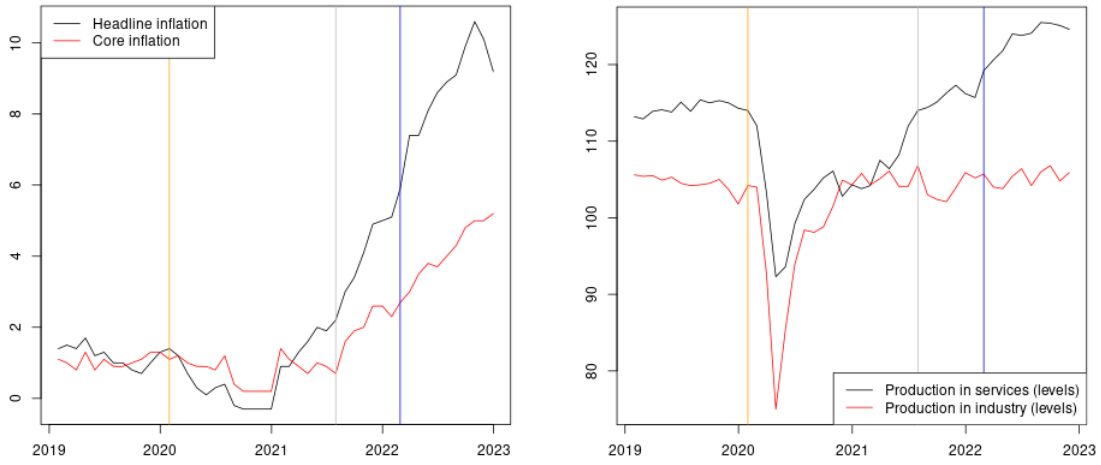
The remaining part of the paper is structured as follows. Section 2 retraces some aspects of the macroeconomic and price dynamics characterising the peak of the COVID-19 pandemic, the rebound phase, and the war in Ukraine period. Section 3 delves deeper into the empirical data, focusing on inflation and unemployment. Section 4 outlines a general assessment of the ECB's monetary policy measures since March 2022 and provides some conclusions.

2. A FIRST LOOK AT THE DATA ON INFLATION

We live in times of economic, social, and geopolitical turbulence. Current events have produced overlapping economic shocks; therefore, it is challenging to disentangle single causes and consequences. This section examines some macroeconomic data to identify the economic trends that have emerged in the transition from the pandemic to the post-pandemic situation and to assess the specific impact of the war in Ukraine. We highlight three potentially significant breakpoints for an economic regime change, namely the onset of the pandemic crisis (end of January 2020), the reversal of inflation dynamics, identified as the moment in which inflation rates in the euro area surpassed the 2% target (July 2021), and the Russian invasion of Ukraine (end of February 2022).

Figure 1 shows the dynamics of the euro area headline and core inflation rates (left-hand panel) and those of the euro area industrial and services production indexes (right-hand panel). The headline inflation rate started to rise at the beginning of 2021. Its dynamics accelerated from mid-2021 to autumn 2022. In the same period, industrial production depleted its rebound from the steep decline in the first half of 2020 and entered a phase of substantial stagnation, including a decline in the third quarter of 2021 and a few months of 2022. The growth rate of the euro area economy in 2021 and the first three quarters of 2022 was mainly due to the good performance of the services sector. The core inflation rate followed a trend analogous to the headline inflation rate with a time delay of six months and continues to rise today.

Figure 1: Euro-area headline and core annual inflation rates (left), and the industrial and services production indexes (right)



Source: Eurostat. Monthly Data.
Note. Yellow: 01/2020 (COVID-19 outbreak), Grey: July/2021 (headline inflation over the 2% target), Blue: 02/2022 (war in Ukraine).

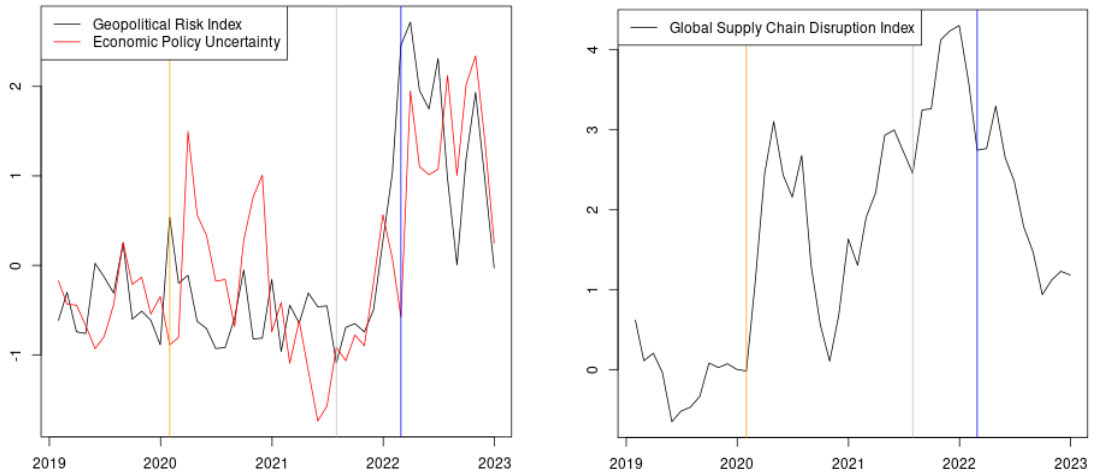
This descriptive evidence makes it clear that excessive inflation rates in the euro area started before the war in Ukraine and were triggered by the supply-side constraints caused by the pandemic. The unexpected persistence of the bottlenecks in the international supply chains of raw materials and other inputs explains the difficulties of the euro area's industrial productions in translating the rebound into

a medium-term recovery.[3] The low elasticity of several goods' supply hindered quantity adjustments to the resumption of an aggregate demand blocked by the pandemic but then sustained by generous fiscal policy transfers to firms and households. Consequently, the adjustments were centred on price increases of the inputs, which were gradually transferred to the prices of final goods and services. The Russian invasion of Ukraine accelerated and worsened the inflationary process in the aggregate.

Despite this persuasive narrative, it is important to distinguish the relative contributions of supply and demand factors and the role of monetary policy in the euro area inflation process. Moreover, the split between temporary and persistent components, the impact of the various price shocks, the balance between (external and internal) variables and the formation of inflation expectations has yet to find convincing and shared explanations (see Lane, 2022). It follows that forecasts of the euro area price dynamics in the medium-to-long term are affected by a high degree of uncertainty.

Figure 2 compares the dynamics of indexes on economic and geopolitical uncertainty (left panel) with that of an index of disruption in the global value chains (right panel). It is apparent that the Russian invasion of Ukraine caused a significant economic shock for the euro area with uncertainty reaching an absolute peak; however, before the war in Ukraine, the uncertainty was profoundly increased by the eruption of the pandemic and by its contrasted evolution. In 2021, uncertainty became strongly correlated (given an intuitive time lag) with the breaks in the supply chains. Conversely, just before the war in Ukraine started, the global supply chain disruption index decreased, and—after a modest and short-lived upward rebound due to the war—it started decreasing again. Then, this new decrease ceased to be correlated with the uncertainty indexes' dynamics. Today, the indexes under examination remain above the thresholds reached before the pandemic crisis.

Figure 2: Indexes on euro area uncertainty (left) and global value chains disruption (right)



Source: Policy Uncertainty webpage and Bloomberg. Monthly Data.
Note. Yellow: 01/2020 (COVID-19 outbreak), Grey: July/2021 (headline inflation over the 2% target), Blue: 02/2022 (war in Ukraine).

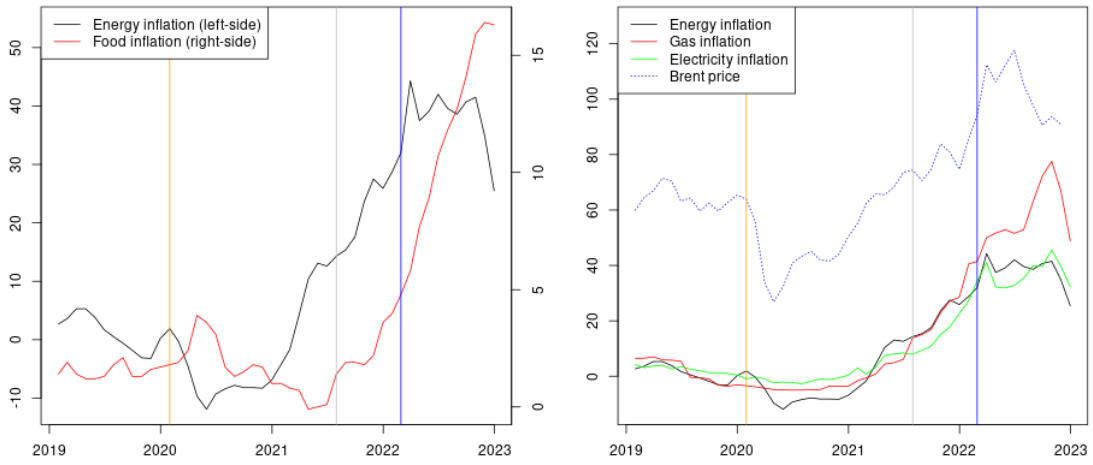
Figure 3 provides a more detailed analysis of the specific components that may have triggered and driven the inflation process in the euro area. The comparison relates the dynamics of the price of foods

[3] This phenomenon could also be a determinant of the higher growth rate recorded by some of the most fragile EU Member States, such as Italy, in 2021 and 2022. Supply bottlenecks mainly hit the production sectors utilising medium-high and high technologies, whereas they had minor consequences on the traditional activities in industry and services.

and energy as a whole (panel a) and that of a selected subset of energy products (panel b).[4] Food and energy prices are crucial because they are assumed to represent reliable proxies of the supply-side constraints that characterised the persistent impact of COVID-19 on the euro area economy. As the headline inflation rate surpassed 10%, food and energy price dynamics contributed around two-thirds. We can thus state that the supply-side bottlenecks played a crucial role in triggering the euro area inflation process and remained a critical determinant of its recent evolution. However, not all energy products played the same role. As shown by panel (b), even if energy products were affected by supply shortage pressures, their price dynamics did not always follow the same path.[5]

Figure 3: Food and energy inflation rates (panel a), and inflation rates of selected energy products (panel b)

(panel a) **(panel b)**



Source: Eurostat. Monthly Data.
Note. Yellow: 01/2020 (COVID-19), Grey: July/2021 (headline inflation over the 2% target), Blue: 02/2022 (war in Ukraine).

Based on Figure 3 (panel (b)), the last statement is strengthened by the evidence in Figure 4, which reports the price dynamics of some industrial inputs (raw materials) in the euro area since 2019. With a few exceptions, these prices increased until the Russian invasion of Ukraine; afterwards, they recorded significant decreases that were only partially offset in the last quarter of 2022. This evidence implies that the prices of the selected raw materials had counter-cyclical dynamics concerning the hikes of the inflation process and were not influenced by the resilience of the euro area economy in the first three quarters of 2022. A plausible explanation is that these same prices depended on the intensity of the supply chain disruption, as illustrated by the index in Figure 2.

[4] Note that the term "energy inflation" in Figure 3 refers to a general index in (a) and to the weighted average of the listed specific indexes in (b).

[5] According to Lane (2022), it is challenging to identify or forecast the medium-term inflation path in today's environment characterised by recurrent external shocks, energy instability, the Russian invasion of Ukraine, and varying price dynamics.

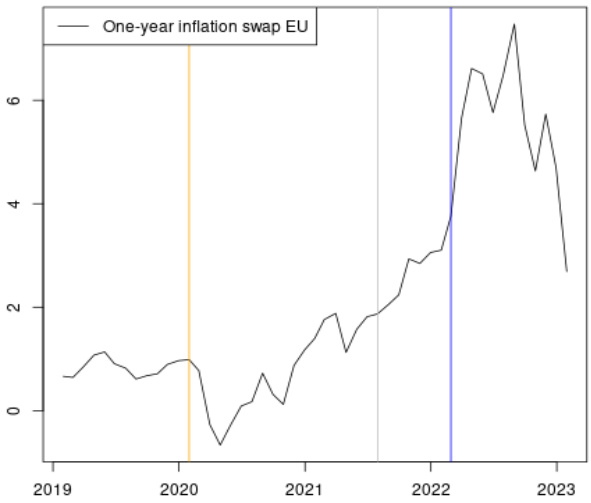
Figure 4: The prices of selected imported inputs

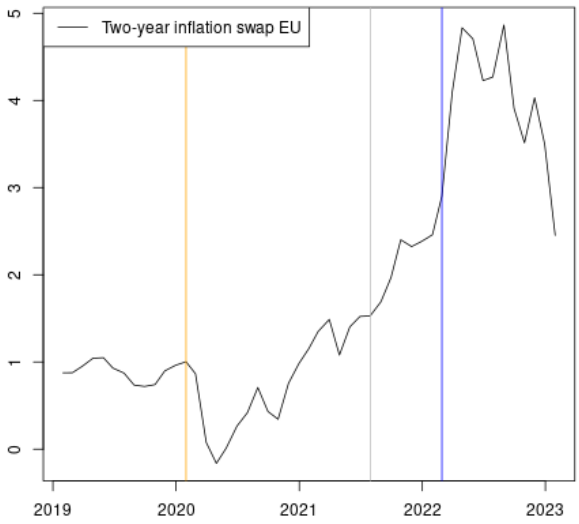
Source: Datastream (Thomson Reuters). Monthly Data.

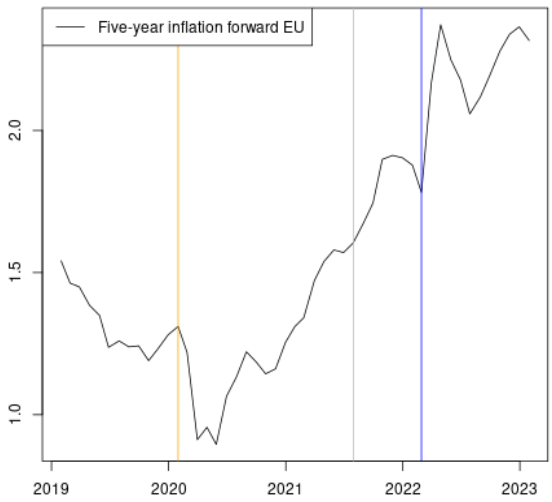
Note. Yellow: 01/2020 (COVID-19), Grey: July/2021 (headline inflation over the 2% target), Blue: 02/2022 (war in Ukraine).

The descriptive evidence of the euro area inflation process from 2020 to the beginning of 2023 can be completed by examining two aspects crucial for assessing the future evolution of this process: the dynamics of inflation expectations and wages. Figure 5 refers to the former aspect. It considers three well-known market measures of expected inflation based on inflation-indexed swap rates. The three panels of the figure show the average monthly swap rates from 2019 onwards for the euro area: the upper and middle panels show one- and two-year inflation expectation dynamics, while the lower panel shows the dynamics of five-year inflation expectations. It is apparent that, in all the three-time horizons, inflation expectations fell sharply during the economic depression of the first half of 2020. Then, when the euro area economy rebounded (second half of 2020) and recorded significant growth rates (2021), the relative inflationary expectations rose sharply. These increases can be attributed to the start and persistence of bottlenecks in the global value chains, along with the ECB's expansionary monetary policies.

Figure 5: Inflation expectations in the euro area





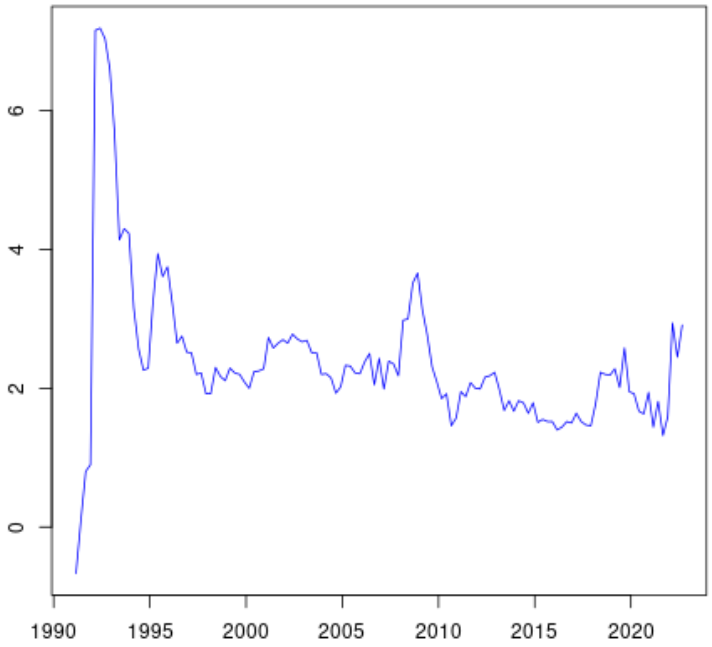


Source: Datastream (Thomson Reuters). Monthly Data.
Note. Yellow: 01/2020 (COVID-19), Grey: July/2021 (headline inflation over the 2% target), Blue: 02/2022 (war in Ukraine).

Monetary policy can also explain the evolution of inflation expectations after the start of the war in Ukraine. As shown by the three panels of Figure 5, this dramatic event implied a significant rise in short-term (1- and 2-year) and long-term (5-year) inflation expectations. However, due to the ECB's restrictive monetary policies starting in March 2022, all measures of inflation expectations decreased in the second quarter of that year, and the two short-term measures have kept decreasing. Despite their decline, the 1- and 2-year inflation expectations remain unanchored to the 2% target; and the long-term inflation expectations are slightly off the 2% target. Moreover, the long-term inflation expectations restarted to increase in the third quarter of 2022. This evidence suggests that the ECB should be ready to keep its policy interest rates high to anchor the inflation expectations to price stability, thus easing a medium-term reduction in actual inflation rates.

Figure 6 shows the growth rate of negotiated wages in the euro area, which captures the outcome of collective bargaining processes.[6] In the third quarter of 2022, wages started to grow at a moderate pace also in the euro area (around 3% relative to the same quarter of the previous year). If we assume an average yearly increase of about 1% in labour productivity, wage growth would be aligned with delivering the ECB's 2% medium-term inflation target. Hence, leaving aside any assessment regarding income distribution, data show that wage pressure is negligible or is – at most – a second-round effect in the euro area. However, according to many economists (e.g. Visco, 2023), the risk of a wage-price spiral remains a significant concern of the ECB.[7]

Figure 6: Annual percentage change in euro area's negotiated wages



Source: ECB. Monthly Data.

To sum up, the previous descriptive data show that the war is not the source of the inflationary shock. The disruption of the international value chains and the related energy shock due to the pandemic had a much more severe impact on the euro area's inflation than the war in Ukraine. As stressed by the dynamics in food prices, this impact has yet to be fully absorbed; input prices remain too high except for wages. Consequently, even if long-term inflation expectations in the euro area followed a decreasing trend in the second quarter of 2022, they would not be entirely anchored at the 2% target. Moreover, this promising trend was interrupted in the second half of 2022. Consequently, a prolonged inflation phase above the target could pose a significant de-anchoring risk.

[6] Negotiated wage rates are published one month earlier than the other wage indicators based on quarterly national accounts; moreover, they are not affected by statistical distortions due to the inclusion of job retention schemes. However, negotiated wage rates suffer from several drawbacks. They are backward-looking indicators without any information on scheduled increases in future remunerations; they react to changes in the labour market with a lag of several quarters; they adjust more slowly than compensations per employee during an economic crisis (Koester *et al*., 2020.)

[7] Other indicators suggest that the negotiated wages understate the current nominal wage dynamics in the euro area. We can refer to the wage growth tracker based on job posting data (Adrjan and Lydon, 2022) and the Beveridge curve (Lane, 2022.)

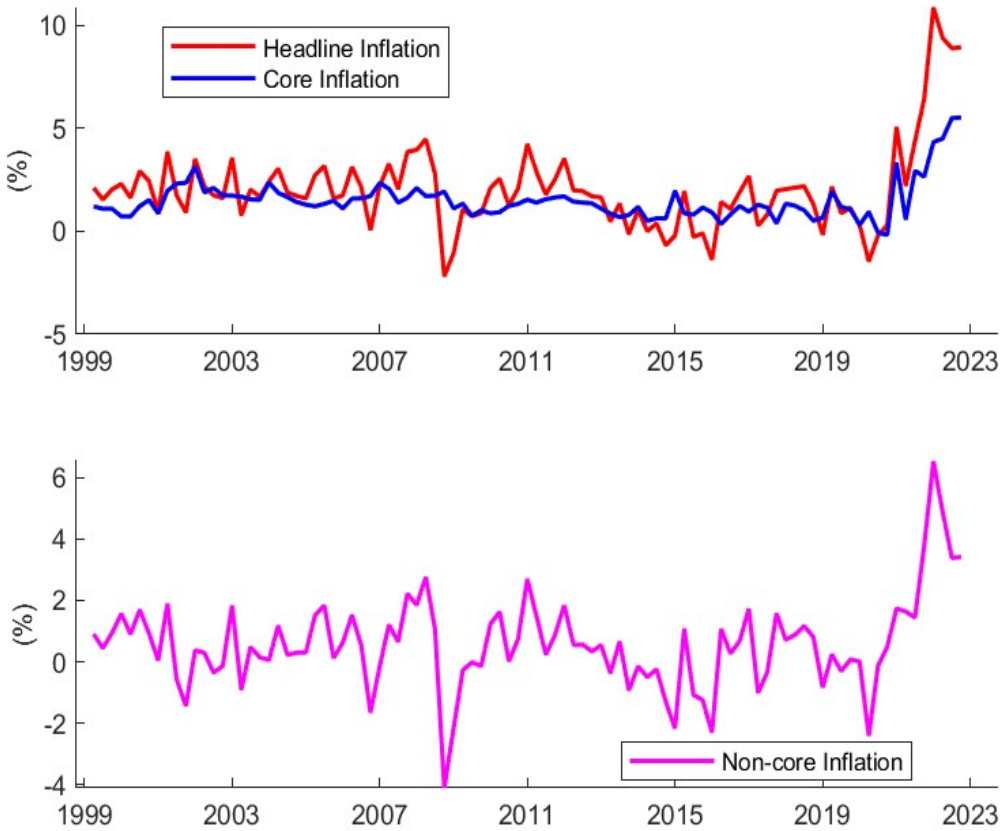
3. AN EMPIRICAL AND ANALYTICAL DEEPENING

Headline inflation, hereinafter denoted with π^h, can be decomposed into its core and non-core components, π^c and π^{nc}, respectively. Therefore, we have the following identity at each point in time:

$$\pi_t^h = \pi_t^c + \pi_t^{nc}$$

Figure 7, in the upper panel, shows the dynamics of the headline and core inflation rates since the beginning of the euro, computed using the HICP and – then – removing the price dynamics of energy, food, and other items. Figure 7, in the bottom panel, shows the dynamics of the non-core component: the difference between the headline and core inflation rates.[8]

Figure 7: Euro area headline inflation and core inflation (top panel) rates, non-core inflation rate (bottom panel)



As discussed in Section 2, the food and energy components can be considered a good proxy of the supply shock that hit the euro area in the period after the pandemic started, although they do not fully

[8] All data in this section are collected on a quarterly frequency.

represent the sectors whose prices have been mainly affected by the pressure coming from the supply bottlenecks.[9] We will refine this measure later in the section using import prices.

As shown in the previous section, the headline inflation rate started to surge between the first and second quarters of 2021. It has been closely followed by a rapid increase in the core inflation rate, although with a time lag, suggesting the vicious circle of the adverse energy/supply shock feeding into the core inflation rate that has contributed to pushing the headline inflation rate upward, compounding the effects of the non-core components. To better understand the dynamics of headline and core inflation, we should include the determinants of core inflation in a theoretical framework.

Since the celebrated work of Phillips (1958), economic literature has postulated a relationship between the inflation rate and the slack in the economy, namely the unemployment rate or the output gap. Referring to United Kingdom (UK) data, Phillips (1958) found a negative relationship between wage dynamics and unemployment rates, named the Phillips curve. That curve was then popularised by Samuelson and Solow (1960) as a relationship between the inflation rate and the unemployment rate. Since then, this relationship has been subject to several criticisms and tests that have improved the original formulation. The most important addition has been the inclusion of inflation expectations as an essential shifter of the inflation-unemployment relationship (see Phelps, 1967; Friedman, 1968; and Lucas, 1973).

The inclusion of inflation expectations supported its "existence" on an empirical ground during the inflationary and disinflationary episodes of the 1970s. However, in the aftermath of the 2007-2008 financial crisis, the evidence of subdued inflation largely disconnected from the economic slack has been used to argue against the existence of a Phillips curve, and in favour of purely statistical modelling of excessive inflation, entirely unrelated to economic activity (see, among others, Stock and Watson, 2007 and 2009). To vindicate this view, the recent surge in inflation rates might instead suggest that the Phillips curve is still alive.[10]

Despite the various criticisms, the Phillips curve is a central piece of the macro-models central banks use to make their forecasts. Drawing from the recent developments in the New-Keynesian literature on endogenous price rigidities,[11] this curve is seen as the result of the optimising behaviour of firms that set their prices by accounting for their demand and for other firms' pricing decisions and by considering that the chosen prices will be sticky for some periods.

In a general formulation that included the previous consideration, core inflation would be related to its past values; the unemployment gap (defined as the difference between its current value and its natural level); a measure of the supply shocks; and the current expectations on future core inflation. This specification is in line with more recent studies that have investigated the existence of the Phillips curve.[12]

Consistently with the original formulation, the New-Keynesian Phillips curve should display a negative relationship between the inflation rate and the unemployment gap. Hence, it is important to specify the concept of the natural unemployment rate. Whereas there are several definitions, one could think of it as the low-frequency component of unemployment around which cyclical unemployment

[9] With reference to the United States (US), Ball *et al*. (2022) focus on a weighted median measure of the consumer price index (CPI). This measure of the inflation rate has the advantage of filtering out large price changes in any industry rather than just in the food and energy sectors.

[10] For the euro area, see Moretti *et al*. (2019), Beqiraj *et al*. (2020), and Ball and Mazumder (2021).

[11] See Woodford (2003), and Galì (2015).

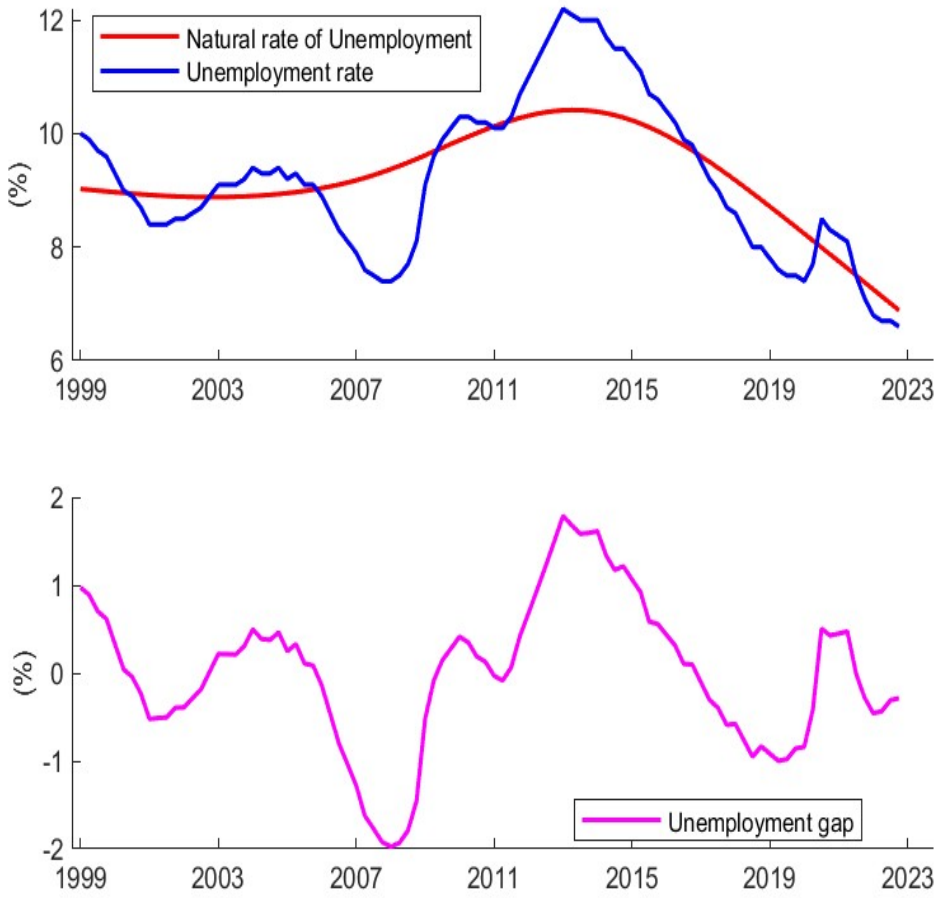
[12] See Ball and Mazumder (2021), Ball *et al*. (2022), Benigno and Eggertsson (2023). See also Blanchard (2016), Blanchard *et al*. (2015), Moretti *et al*. (2019), Beqiraj *et al*. (2020).

movements may put upward or downward pressure on prices. It could also be interpreted as the unemployment rate at which there is no pressure on prices, in line with the traditional definition of non-accelerating inflation rate of unemployment (NAIRU). Here we interpret the natural unemployment rate as the low-frequency component of the unemployment rate.[13]

Figure 8 plots the unemployment rate of the euro area and its long-run trend in the upper panel. Starting from a value of 10% at the inception of the monetary union, the unemployment rate decreased to 7% before the financial crisis to reach more than 12% after the European sovereign-debt crisis. Then, it progressively decreased, reaching its lows before the pandemic crisis. Currently, it is at its lowest value of 6.8%. The lower panel displays the difference between the unemployment rate and its trend, i.e. the cyclical component. The unemployment rate was higher compared to the trend during 2003-2006. Then it went back above the trend after the 2007-2008 financial crisis and the 2011 European sovereign-debt crisis. The unemployment gap reached a maximum of 1.8% around 2013. After a period of macroeconomic recovery that enabled unemployment rates to fall below the trend, the pandemic has pushed these rates back above the trend, but only momentarily. Currently, the unemployment gap is marginally below the trend.

[13] The low-frequency component is extrapolated through a Hodrick-Prescott filter.

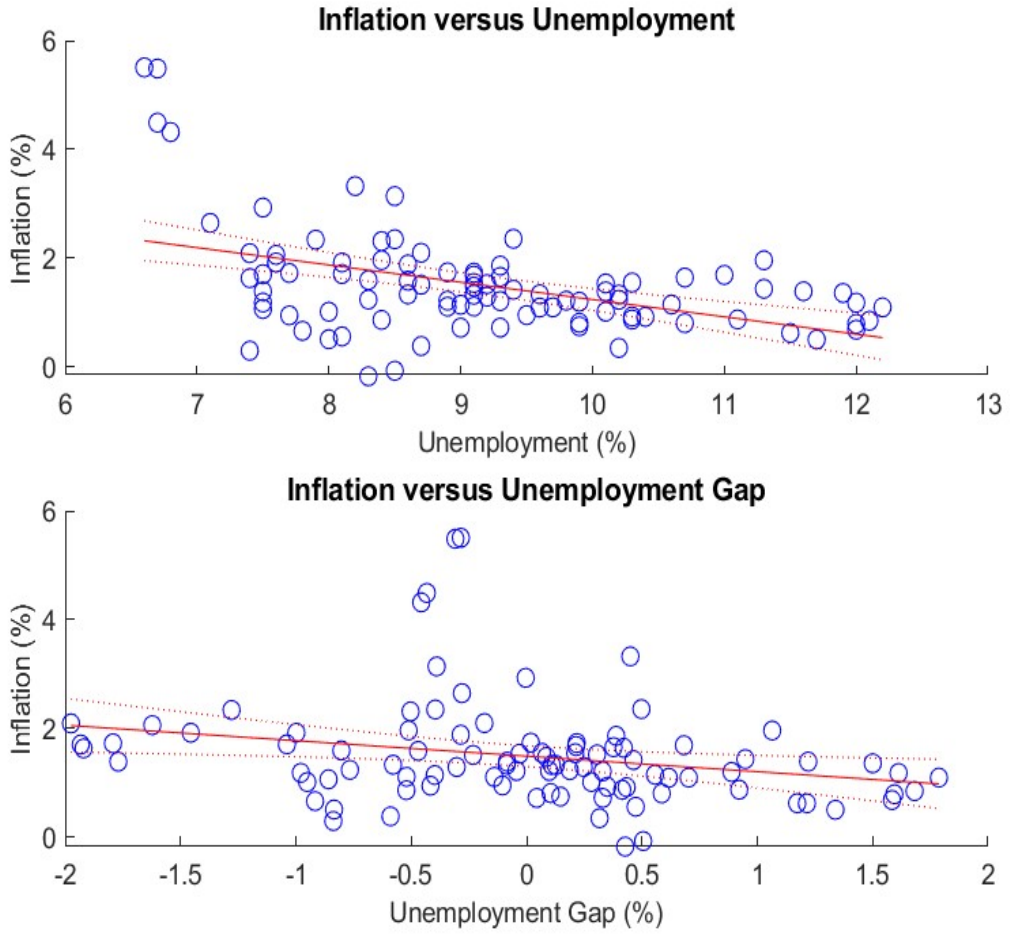
Figure 8: EA19 unemployment rate and its trend (top panel), and the unemployment gap (bottom panel)



Source: Datastream (Thomson Reuters). Quarterly Data.

Figure 9 provides a preliminary evaluation of the relationship between inflation and unemployment rates in the upper panel, and between inflation and the unemployment gap, in the lower panel. At a first visual examination, both measures of the economic slack are negatively related to inflation, although both curves are on the flat side. This observation points to a low value of the slope of the Phillips curve. The magnitude of the slope has important policy implications because its inverse measures the so-called *sacrifice ratio*, i.e., the percentage of unemployment gap that should be generated to reduce inflation by 1%. The flatter the curve, the higher the sacrifice ratio.

Figure 9: The inflation-unemployment trade-off



Source: Authors' elaboration on ECB and Datastream (Thomson Reuters) data. Quarterly Data.

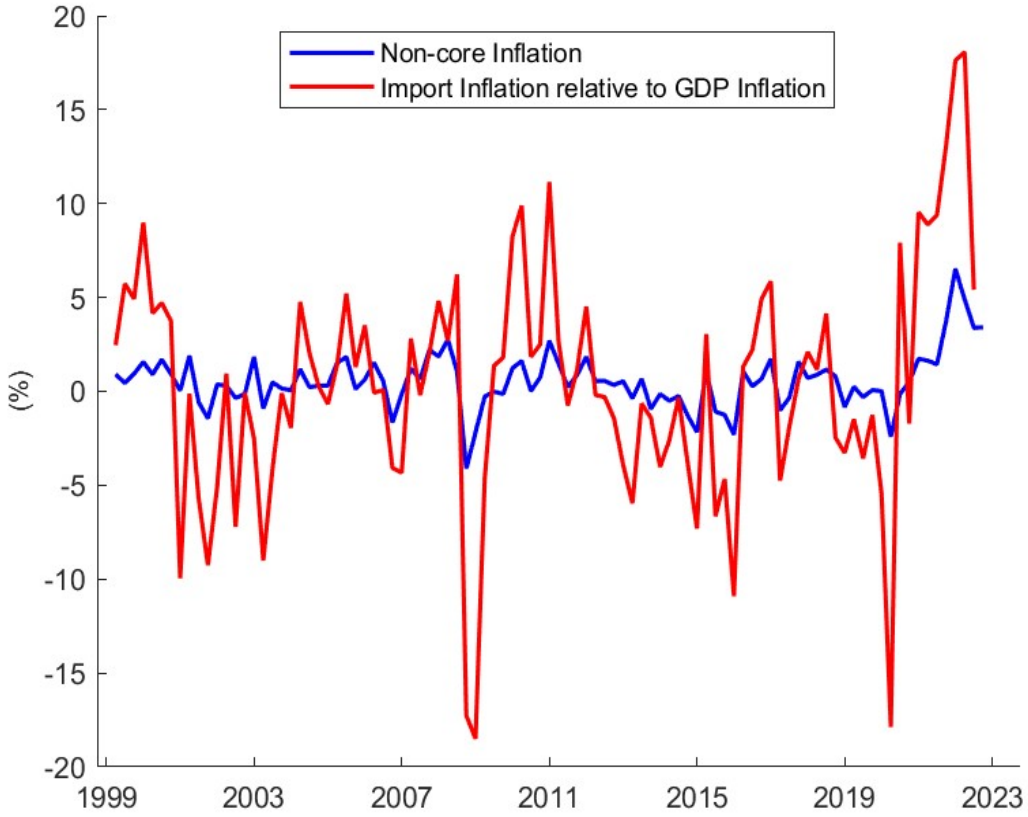
It is necessary to complete our analysis by discussing other variables that can influence the inflation rate.

In general, the inflation rate has some degree of persistence because of the pressure of wages or intermediate-goods prices on producer prices. This latter channel should operate through supply value chains. These linkages might be significant determinants of the intrinsic persistence of the inflation rate, even in the case of shocks of temporary nature. The higher the persistence, the harder any attempt to bring this inflation rate down through a contraction in demand, lower output, and higher unemployment.

Additional shifters of the Phillips Curve are supply shocks, which can originate from different sources. In general, those shocks are due to cost variations of firms' inputs that are not easily substitutable in production processes. Energy costs offer a good example. Figure 7 (see above) shows a proxy of the energy/supply shock in the difference between headline and core inflation.

Figure 10 complements the last evidence by examining the differentials between the inflation rates computed using the import price deflator and those computed using the GDP deflator. Figure 10 shows that the import-price measure of inflation is much more volatile than the non-core component of inflation; however, despite this heterogeneity, the two measures are correlated. Let us underline that the recent import inflation surge is unprecedented in its magnitude and persistence. Differently from GDP inflation, it has reached values higher than 15% at annual rates.

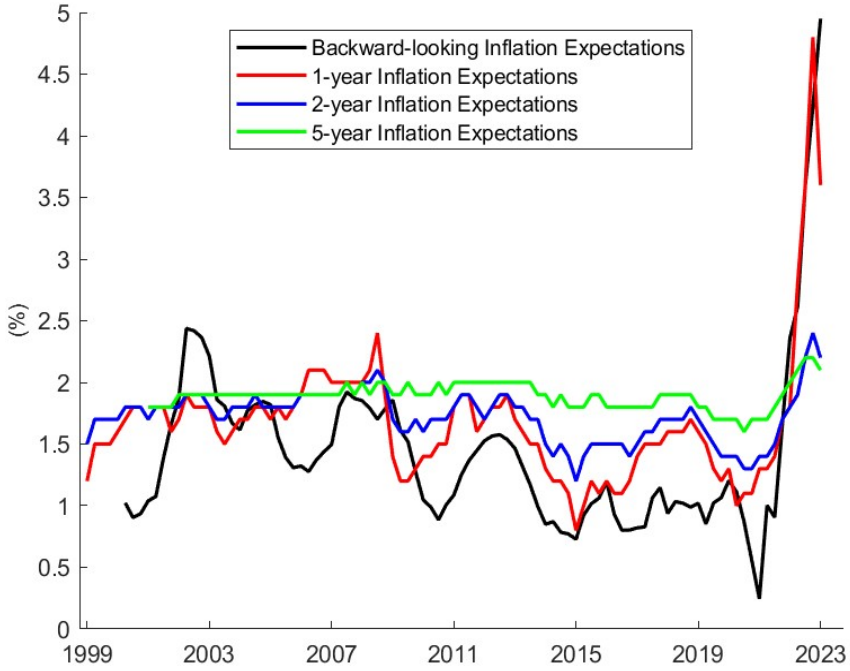
Figure 10: Non-core inflation rate and the difference between inflation of the import deflator and that of the GDP deflator



Source: ECB. Quarterly Data.

In the New-Keynesian Phillips curve, an additional crucial element is the component capturing inflation expectations. Several measures are available as proxies for this component, from surveys and market-based expectations. We plot some of the possible indicators in Figure 11. Moreover, we elaborate an *ad-hoc* measure of inflation expectations, labelled "backward-looking inflation expectations" (see again Figure 11). The value of this last measure represents, in each quarter, the average of the core inflation rate over the four previous quarters. Hence, our indicator is intended to capture the extent to which agents look at past inflation rates when formulating expectations of future inflation. Comparing the "backward-looking inflation expectations" with other measures of inflation expectations is interesting. We use the Survey of Professional Forecasters' measures for 1-, 2-, and 5-year horizons. The 1-year inflation expectations closely follow our backward-looking measure during the recent surge, showing that such expectations are dis-anchored from the ECB's 2% inflation target. Survey expectations at 2-year and 5-year horizons show that these longer-run expectations are much more anchored. However, it must be noted that, in the previous year, they have increased above the inflation target pursued by the ECB.

Figure 11: Measures of inflation expectations in the euro area



Source: Datastream (Thomson Reuters). Quarterly Data.

Having described the various components of the New-Keynesian Phillips curve, we utilise some preliminary evidence, not reported here, regarding the relationship between core inflation and its determinants.[14] The exercise supports our previous analysis and leads to four results: 1) the New-Keynesian Phillips curve is flat; 2) excessive inflation has a certain degree of persistence; 3) external shocks influence this curve positively; 4) the expectations channel has a positive impact on inflation. Let us analyse points 1) – 4) in detail because these points are essential for assessing the effectiveness of the ECB's monetary policy.

The Phillips curve is flat in the euro area. This flatness implies that the sacrifice ratio is high, i.e. unemployment should increase by around 10% to bring inflation down by 1%. This result suggests that, in the euro area, it is not easy to bring down excessive inflation by contracting aggregate demand, which is one of the two channels available to monetary policy—the other being the inflation-expectations channel. It follows that the ECB becomes less powerful once inflation is entrenched in the economy.

The inflation modelling through the New-Keynesian Phillips curve shows that the inflation process has some degree of persistence in the euro area, suggesting that excessive increases in prices can persist in the economic system without further external shocks once inflation starts to pick up. At annual rates, in the euro area, a 5% quarterly increase in prices results in a 2.5% corresponding increase in the following quarter without any other shock hitting the economy.

External shocks, captured by the difference between headline and core inflation rates or between import and GDP inflation rates, also matter in determining core inflation in the euro area. For example, an increase of one percentage point in the headline/core inflation-rate differential has a pass-through

[14] This evidence is based on four estimations.

of 0.30% in the core inflation of the euro area. The same import/GDP inflation differential increase has a pass-through of around 0.04%; however, it should be recalled that the latter measure is much more volatile (more than three times) than the former (see Figure 10).

Finally, in the euro area, inflation expectations are a significant determinant of inflation. This result is important because it stresses that anchoring expectations to the target is crucial in keeping inflation rates down. In our empirical exercise, we use 2-year inflation expectations that are anchored. Nevertheless, their deviations from the inflation target can significantly affect the inflation dynamics in the euro area.

4. CONCLUSIONS: THE CURRENT MONETARY POLICY TRADE-OFFS

Our discussion allows for a descriptive interpretation of the surge and persistence of the euro-area excessive inflation rates since the beginning of 2021 (see also Visco, 2023). The main source of the European inflation shock is external and comes from the supply bottlenecks in energy and other production inputs[15]. This shock has a positive pass-through into core inflation in the sense that it has a persistent behaviour. Hence, we could argue that this persistence has kicked in to compound the effects of the shock into the euro-area inflation process that has led to the high inflation rates we have seen in the data. There is no clear evidence that aggregate demand has been much more responsible for the surge of the excessive inflation in the euro area[16]. Conversely, there is some evidence that the initial inaction of the ECB has caused a temporary dis-anchoring of inflation expectations that could have contributed to a vicious circle between increasing inflation expectations and the surge in actual inflation rates.

Our tentative interpretation of the inflation surge and persistence in the euro area can help us understand the hesitancy of the ECB's monetary policy observed from the second half of 2021 to the spring of 2022 and the restrictive U-turn process implemented since the summer of 2022.

As we have already mentioned, the supply-side bottlenecks at the origin of the rapid increase of price dynamics in the euro area since the beginning of 2021 convinced the ECB's Governing Council that excessive inflation should have been a temporary phenomenon. According to this view, breaks in the international supply chains, although unexpectedly persistent, were in the process of being absorbed, thus eliminating the main cause of high inflation. When the euro area inflation rates surpassed the target of 2% (July 2021) and reared up, the process was reviewed as the last burst of flame. This strengthened the perception that the provisional nature of excessive inflation was coupled with the feeling that a monetary policy restriction would have been ineffective in overcoming supply-side bottlenecks. This restriction would have reduced the aggregate demand, negatively affecting the economic phase.

This position was still dominant at the beginning of 2022 (Schnabel, 2022a; and Lagarde, 2022a.) Hence, despite the increase in the euro area's average inflation rates from 2.2% in July 2021 to 5.9% in February 2022, the overall recommendation of the ECB's Governing Council was to continue a moderately expansionary stance in monetary policy. The ECB's announcement in the meeting of mid-December 2021 and the prudent statements at the beginning of February 2022 offer evidence of this position: the end of the pandemic programme (the PEPP), to be achieved in March 2022, should have been accompanied by a temporary strengthening of the other programme (the APP.)

In the perception of the ECB, this interpretation of price dynamics was disproved by the Russian invasion of Ukraine. In spring 2022, many members of the Governing Council unambiguously recognised that the euro area's excessive inflation was not a contingent phenomenon. Consequently, in compliance with the ECB's target and analytical approach, authoritative members of the Executive Board affirmed that the monetary policy should become restrictive regardless of its macroeconomic impact. In the August 2022 meeting at Jackson Hole, Schnabel (2022b) argued that the ECB's

[15] The specificities of this type of inflation are analysed by Korinek and Stiglitz (2022), Stiglitz and Regmi (2022), and Buti and Messori (2022).

[16] This statement is based on two pieces of empirical evidence: the New Keynesian Phillips curve is flat, and the recent data show low unemployment (see Figure 8). However, we should be able to draw clear-cut conclusions only with a further examination that goes beyond the purpose of this paper. The following are just two warnings. Even if we had not found a similar trend in our empirical exercise, the Phillips curve could have steepened so that the sacrifice ratio would have become lower. It could also be that our empirical exam of the unemployment trend underestimates the natural unemployment rate so that the actual values of the unemployment gap are not so low.

institutional duty is to put price dynamics under control independently of supply-side or demand-side causes of excessive inflation. This is equivalent to stating that the ECB's monetary policy should reduce the aggregate demand for an amount capable of compensating the exogenous constraints in the aggregate supply. However, these constraints were severe and still exist in the euro area. Moreover, we have shown that the flatness of the New Keynesian Phillips curve makes it hard to bring down excessive inflation by contracting aggregate demand. Hence, the compensation principle implies that monetary policy restrictions should be large enough to lead to a recession.

The decisions taken by the ECB's Governing Council since June 2022 can be read as a gradual implementation of this strategy. Considering the delayed effects that the monetary policy should have on price dynamics (at least two quarters), the impact of the ECB's initiatives on the euro area economy has been more positive than expected. The ECB complemented the end of its net asset purchase programmes (March –June 2022) by tightening the re-financing conditions of the banking sector (June 2022) and by increasing the policy interest rates by 300 bps in the meetings from July 2022 to February 2023. Moreover, in March 2023, it will start a process of quantitative tightening, and it should further increase its interest rates by more than 50 bps[17]. Combined with the weakening of the supply-side bottlenecks and, specifically, with the released tensions in the international energy markets, these ECB's initiatives already had a favourable impact on the inflation process. In the euro area, headline inflation rates have decreased since November 2022. Despite a slowdown in the area's economic growth during the last quarter of 2022, most Member States showed unexpected resilience. According to the recent forecast of the European Commission (2023), the euro area's average growth rate in 2023 will be positive (slightly below 1%), so the risk of a recession in the Member States has decreased.

A rigid interpretation of this "good news" leads to disappointing results, however. On the one hand, even if achieved, the favourable scenario outlined above would not solve Europe's macroeconomic problems. At the end of February 2023, the core inflation rate has not reached its maximum in the euro area. Moreover, the expectations imply substantial stagnation, and headline inflation rates largely above the 2% target for the next six quarters. It follows that, at best, the euro-area economy would continue to be characterised by a high risk of "stagflation"[18], although less severe than forecasted in the recent past. On the other hand, if it were remembered that monetary policy restrictions have delayed effects and that the impact of the ECB's monetary restrictions is still largely unachieved in the euro area (see above), the headline and core inflation rates would be bound to decrease further, but at the cost of an even higher risk of macroeconomic stagnation.

Hence, the ECB would face a dilemma. Despite the impressive sequence of five increases in policy interest rates in seven months (two of 75 bps and three of 50 bps), the level of these rates appears to be either insufficient to adjust the average inflation rate to its target in the medium term, or adequate to control inflation in the medium term but at the cost of a severe recession. The reasons that justify this dilemma are evident. The ECB's monetary policy cannot absorb the excessive inflation rates by directly addressing supply-side bottlenecks. It can only adapt the aggregate demand to the constrained aggregate supply through a severely restrictive stance. However, as we already stated, headline and, especially, core inflation rates are downward sticky, implying that this stance risks

[17] See Section 1. In the press release following the February meeting, Ms Lagarde recalled the ECB's commitment to increasing the policy interest rates by 50 bps at the next meeting in March and to continue the restrictive stance after that date. In the meantime, the ECB's President restated that the upcoming monetary policy decisions will be data-driven.

[18] In the euro area, stagflation is a situation characterised by an inflation rate higher than the 2% target and by an economic growth rate nil or so low to be assimilated to a stagnation. The latter concept has been associated with various definitions and has often been coupled with a steadily high unemployment rate (see e.g. Schumpeter, 1954, part III chs. 6-7 and part 5 ch. 5.)

transforming the current slowdown and the forecasted stagnation of the euro area economy into a recession.

Financial investors' short-to-medium-term bets did not share this rigid provisional conclusion, at least until mid-February 2023. On the one hand, financial investors have maintained that supply-side bottlenecks are weakening in the euro area economy due to changes and repairs in supply chains; therefore, excessive price dynamics would be undermined independently of the monetary policy stance. On the other hand, they have maintained that the aggregate demand for goods and services would remain vibrant in the euro area. The conclusion has been that the ECB should not continue its increases in policy interest rates, and the euro area could restart a robust growth process.

As partially shown by the evolution of financial markets in recent days (end of February)[19], the descriptive empirical evidence analysed in the previous section stresses that such a favourable scenario was too optimistic. As a result, financial investors risked reproducing the erroneous forecast made by the members of the Governing Council in the second half of 2021: an underestimation of the persistence of the euro area inflation process. Without an adequate monetary policy, this persistence could make the current slowdown in price dynamics asymptotic to thresholds of the headline inflation rate and, specifically, of the core inflation rate, which remain largely above the ECB's target.

At first sight, this double representation of possible future events translates the ECB's dilemma into a trade-off constraining future monetary policy choices in the euro area into two opposite "corner" solutions characterised either by an excessively restrictive stance or by an excessive laxity.[20] We maintain, instead, that there are intermediate solutions that cannot lead to first-best equilibria, as it is very often the case with economies hit by external (or internal) shocks, but which can avoid the main drawbacks of the two "corner" solutions.[21] The latter can be depicted in the following way.

On the one hand, the ECB stays attached to its main objective (price stability) as specified by the 2% inflation target in the medium term and aims at minimising the absorption time of excessive price dynamics. According to our empirical evidence, the persistence of the core inflation rate, the flatness of the New Keynesian Phillips curve, and the consequently high value of the "sacrifice ratio" would require a very restrictive ECB monetary stance to implement this solution. Policy interest rates should, at least, reach a 5% threshold, and the quantitative tightening should be strengthened. Hence, monetary policy would dramatically increase the probability of an economic recession.

On the other hand, by adopting a tolerant attitude towards an inflation rate higher than 2% but decreasing towards a standard of 3.0-3.5%, the ECB should limit the increases in the policy interest rate to a threshold equal to 3.5-4.0%, as well as its quantitative tightening so that the monetary policy stance would not disincentivise economic growth. However, placing the inflation rates on a gradual

[19] From October 2022 to mid-February 2023, in the euro area the dynamics of the share prices indexes had a "bullish" trend. Conversely, since mid-February 2023, the euro-area stock markets have been characterised by increasing volatility. It is too early to state if this volatility signals the starting of a "bearish" market or is just a temporary "bearish trap". Moreover, the current term structure of interest rates is represented by a hump-shaped curve suggesting that market investors are now forecasting a steeper path of interest rates than in the recent past.

[20] Analytically, a corner solution leads to a boundary (or corner) equilibrium where one of the variables of the maximising function has a value of zero at the optimal constrained choice (see e.g., Varian, 1984, p. 26). Here, the expression is used in a non-technical way to indicate that the corner equilibrium excludes an intermediate mix between two extreme choices. In the case under examination, a "corner solution" would mean that the ECB either pursues only its main target of price stability or it gives up its statutory duty to preserve only short-term economic growth.

[21] In the Seventies of the past century, the non-Walrasian microeconomics elaborated models with market imperfections and imperfect information (see Arrow, 1971; Akerlof 1970). Consequently, the sub-optimal equilibria that the traditional approaches confined to specific cases became the general results, whereas the optimal equilibria based on a standard maximising problem became a benchmark assuming non-binding constraints. It is intuitive that the non-Walrasian approach opened the doors to models with multiple equilibria. Thus, the main analytical problem became the selection of the best equilibrium compatible with a number of binding constraints (see e.g., Myerson, 1991). A second-best equilibrium is the result of an efficient mechanism design that, however, cannot reach the benchmark represented by the first-best equilibrium. In the recent literature, these various concepts of equilibria are subject to a critical scrutiny (see e.g., Attar *et al.,* 2022),

decreasing path would become unlikely in this case. Our previous empirical evidence underlines that inflation expectations can have a destabilising impact when dis-anchored from the target. Additionally, the ECB's tolerance towards a new and higher inflation standard would be detected by financial investors and would dis-anchor, by definition, their expectations to the old target. This reaction would trigger further increases in price dynamics leading to a possible spiral between expected and current inflation rates.

There are, however, interesting intermediate avenues between the two previous "corner" solutions, which are characterised by keeping a credible commitment to the 2% inflation target without forcing the adjustment timing (see Visco, 2023). This intermediate solution implies that an expected (or a temporary) decrease in energy and other raw material prices could allow for a gradual weakening in the trend of policy interest rates and quantitative tightening. In contrast, an expected revival of the excessive inflation process should trigger a moderately restrictive response. We are ready to recognise that this strategy is based on a narrow path and, as such, is risky. The relative monetary policy stance requires restoring that minimum dose of "forward guidance" able to offer credible communication to financial investors and, in the meantime, safeguard the ECB's flexibility. The forward guidance and the flexibility should credibly signal, respectively, that the ECB is not questioning the objective of price stability with the 2% inflation target and that the ECB takes the responsibility to pursue this target with an appropriate timing compatible with economic growth in the euro area.

This intermediate strategy would define the equilibria, amid the two corner solutions based on a compromise regarding the medium-term horizon necessary to comply with the monetary policy objective. This means that, in the short term, the equilibrium values of the ECB's policy interest rates and quantitative tightening will be lower and the inflation rates higher than in the case of the most restrictive corner solution. In the medium-to-long term, the target of 2% will be met, differently from the case of the relaxed corner solution, but the macroeconomic growth rate will be higher than in the case of the most restrictive corner solution. A key feature of this compromise is that the ECB should be able to keep the inflation rate under control and the inflation expectations anchored without harming growth extensively.

Today, it is hard to foresee the upcoming choices of the ECB and its attitude toward handling the risks concerning the intermediate strategy outlined above. The recent forecasts of the 2023 euro-area economic dynamics suggest that supply-side bottlenecks are weakening despite the negative evolution of the war in Ukraine. The inflationary pressures of energy and other raw materials are decreasing because of this weakening. Moreover, the persistence of excessive inflation rates from July 2021 to February 2023 is eroding the purchasing powers of households and firms whose nominal incomes were supported by huge transfers during the pandemic (from 2020 to 2021) and the energy crisis (2022). When consumers and capital goods purchasers exit from their current "monetary illusion" and become aware of their actual budgets, the aggregate demand in the euro area will slow down despite the parallel implementation of centralised European programmes.[22] The prevailing expectations are that the market evolution could justify and ease the ECB's intermediate policy strategy. The counter-shift of the supply curve, triggered by weaker bottlenecks, and the downward

[22] The reference is to Next Generation EU and its main programme (the Recovery and Resilience Facility: RRF). Euro area Member States have access to RRF funds through the successful implementation of reforms and investment outlined in their National Recovery and Resilience Plans. The massive resources mobilised by these programmes in the period 2021-2026 represent a strong support to national public and private investments. However, a large part of these financial resources should be utilised for the digital and green transitions, which require important production reorganisation. Assessing the RRF's short-term impact on the aggregate demand and supply in the euro area would require further analysis. In our reasoning, we neglect the issue.

shift of the demand curve, caused by the decrease in the average purchasing power, would reduce the excessive inflation trend and legitimise the moderation in the monetary policy restrictions.

The remaining uncertainty in the economic outlook depends on many other factors. Here, let us stress three possible factors: the parallel decisions the Fed took in the US, the evolution of European economic governance, and the implementation of national and centralised fiscal policies.

For at least two reasons it is difficult to conceive a decoupling of the US and euro area's monetary policies in the upcoming years. First, the exchange rates between the US dollar and the euro had, and can still have, a significant direct impact on the European inflation process. Hence, the ECB cannot adopt a much more tolerant monetary policy than the Fed in 2023 and the following years to avoid a euro depreciation relative to the US dollar that would push up euro area's inflation rates. Consequently, the Fed's monetary decisions will influence the ECB's own monetary strategy. In this respect, the US is characterised by a more traditional inflation process mainly due to a demand excess. Hence, it is likely that the Fed will soon have a more expansionary attitude than the ECB.

This international factor further supports the ECB's intermediate strategy. However, the latter strategy is also influenced by internal factors. Two of these factors are crucial: the review of the EU's economic governance and related fiscal policies. In spring 2023, the European Council is expected to provide political guidance on the European fiscal framework, in agreement with the lines of the Communication published by the Commission in November 2022. Moreover, in March 2023, the Commission is expected to table proposals to respond to the protectionist initiatives undertaken by the Biden Administration (see, in particular, the "Inflation Reduction Act"). The alternative is to favour national industrial initiatives by further weakening European rules on state aid or to combine a limited loosening of these rules with a centralised industrial policy jointly financed at EU level. These two factors will characterise the evolution of the EU's fiscal policies and determine if there is room for a compelling combination of fiscal and monetary policies.

The pandemic shock emphasised the importance of the policy mix in selecting effective monetary and fiscal policies. The evolution of the ECB's monetary policy will largely depend on the willingness of European institutions to pursue this same method in today's different scenario.

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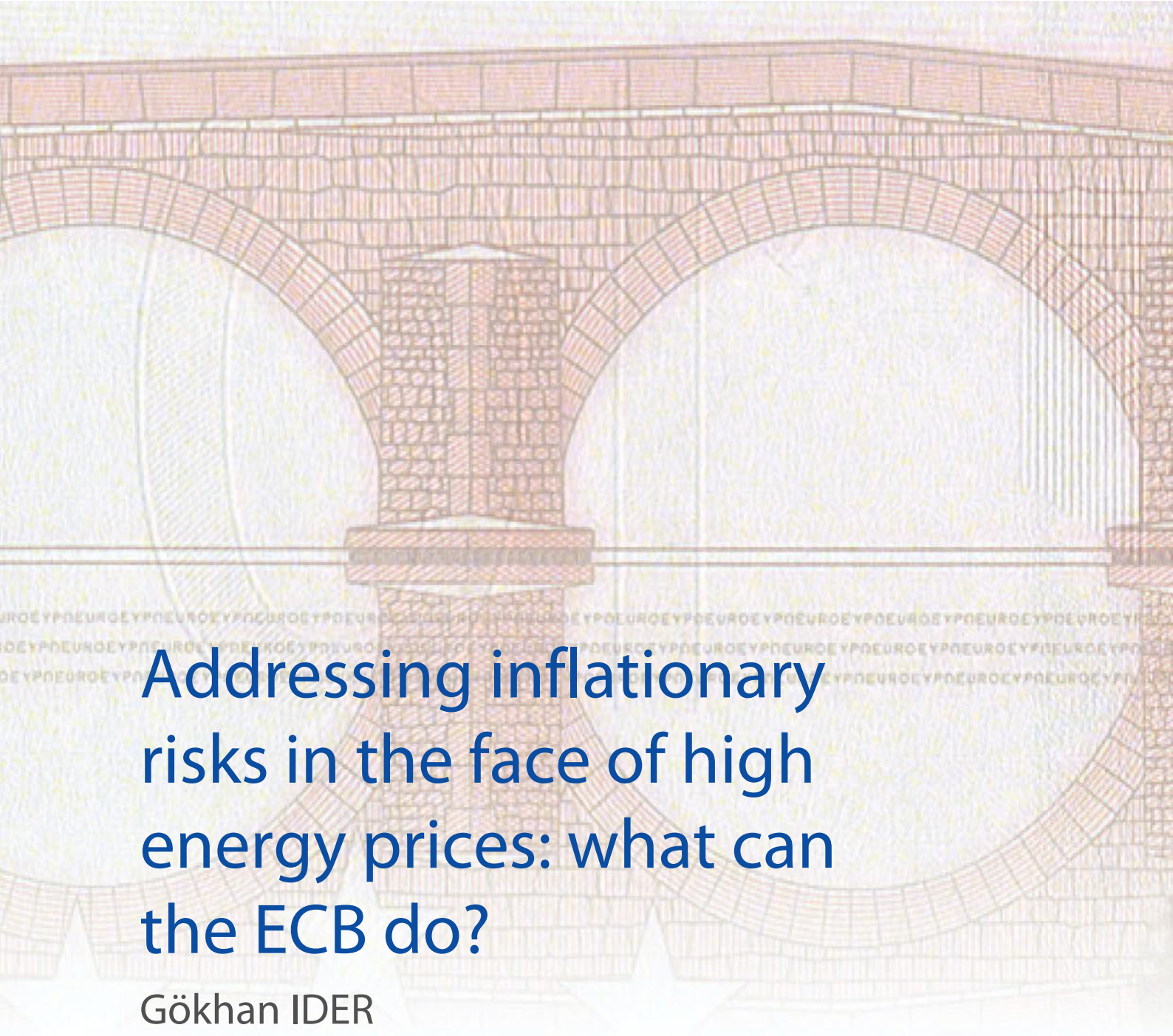

Addressing inflationary risks in the face of high energy prices: what can the ECB do?

Gökhan IDER

Alexander KRIWOLUZKY

Ben SCHUMANN

Frederik KURCZ

Abstract

Inflationary pressures in the euro area slightly eased over the last few months, mainly due to the decrease in energy prices. However, the core inflation rate still remains well above the ECB's target. A rise in inflation expectations is still a major risk to further increase in inflation, and thus should be monitored closely. We find that contractionary monetary policy by the ECB and the Fed decreases energy prices and the headline price level in the euro area.

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CONTENTS

LIST OF ABBREVIATIONS

APP	Asset purchase programme
ECB	European Central Bank
Fed	Federal Reserve
HICP	Harmonised index of consumer prices
MRO	Main refinancing operations
NEIG	Non-energy industrial goods
OIS	Overnight index swap
PPI	Producer price inflation
SOE	Small open economy
SPF	Survey of professional forecasters
US	United States
USD	US dollar
SVAR	Structural vector autoregression

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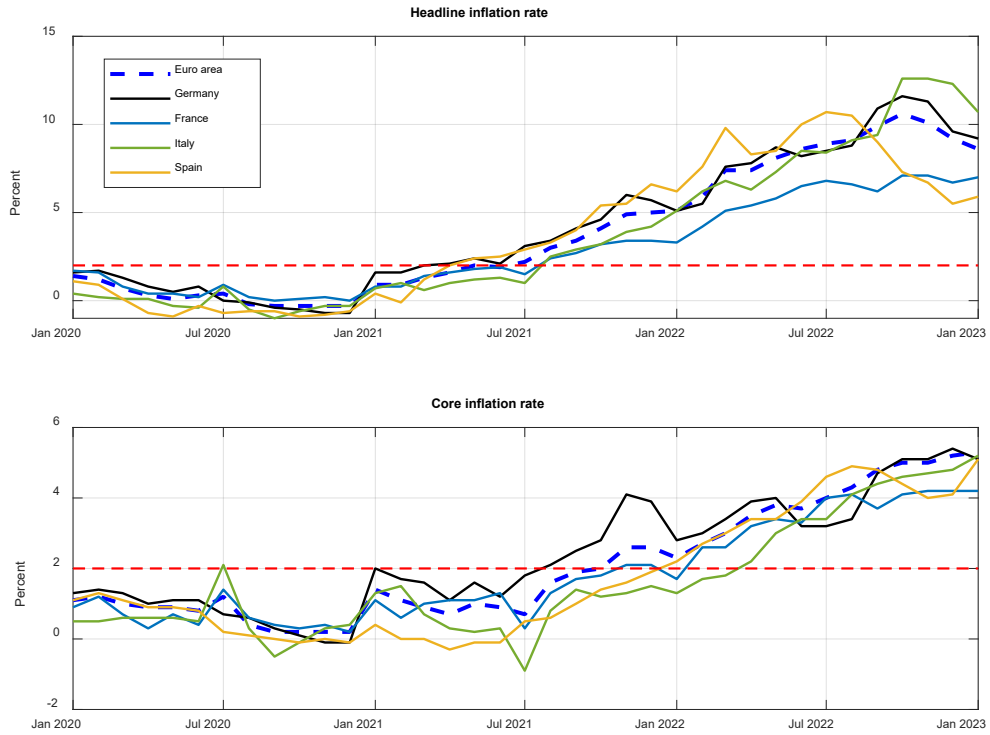
EXECUTIVE SUMMARY

- **The headline harmonised index of consumer price (HICP) inflation rate has decreased from its peak at 10.6% in October 2022 to 8.5% (estimated) in February 2023.** The main driver of the drop is the falling energy prices.
- **The core inflation rate has been steadily rising since mid-2021 and recently hit a record high of 5.6%, as estimated for February 2023, which is 3.6 percentage points higher than the ECB's 2% headline inflation target.**
- **Supply-side pressures have eased considerably after the surge in commodity prices following the Russian invasion of Ukraine.** Energy and food commodity prices are below their levels prior to the war. Global supply chain conditions improved significantly in 2022. These developments led to a large drop in producer price inflation in the euro area.
- **Household and market inflation expectations are at all-time highs but are close to the target of 2% over the medium-term.** The tightening of monetary policy by the ECB after mid-2022 seems to have curbed the rise in inflation expectations.
- **Market forecasts for euro area annual wage growth in 2023 are about 4%, close to the latest observed value in the data.** Although this level does not directly point to a wage-price spiral, this does not mean the ECB should not continue on the tight monetary policy path it set.
- **Since July 2022, in response to the rising inflation, the ECB has hiked its policy rates by 300 basis points and announced the reduction of its balance sheet.**
- **ECB can lower energy prices by raising interest rates, and this "energy-price channel" is an important transmission mechanism.** The short-term decrease in the headline consumer price index is mostly due to the fall in energy prices. This finding is contrary to the narrative that the ECB cannot decrease energy prices with its policy decisions.
- **Tightening US monetary policy has a deflationary effect on the euro area economy.** Therefore, the narrative that a stronger US dollar induced by contractionary US monetary policy has an inflationary effect on the euro area economy is not entirely accurate, as it does not consider the fall in global energy prices in response.

1. INTRODUCTION

In the past ten years, central bankers and economic policymakers have been concerned about deflation rather than inflation in the euro area. However, since the COVID-19 pandemic, the cause of concern has been reversed. Following the re-opening of the economy in 2021, inflation has picked up rapidly. The annual rate of change in the harmonised index of consumer prices (HICP) has been over 2% since July 2021, and rose to new historical highs month-after-month following the Russian invasion of Ukraine in February 2022 (see top panel in Figure 1). Since its peak in October, the inflation rate has declined slightly from 10.6% to 8.5% in February 2023, mostly due to the fall in energy prices, but remains at a much higher level than the European Central Bank (ECB)'s inflation target.

Figure 12: Inflation developments in the euro area



Source: Eurostat.

The inflationary pressures observed have been at historical levels in every Member State in the currency union, albeit with considerable differences in the headline inflation rates, which are mainly a result of the distinct characteristics of the energy markets in each country. The developments in the core inflation rate (excluding energy, food, alcohol and tobacco prices) are more homogenous across euro area Member States. Since July 2021, the core inflation rate has been steadily rising in the euro area, and hit a fresh record high of 5.6% in the flash estimate for February 2023 (see bottom panel in Figure 1). In response to the rising headline and core inflation in 2022, the ECB started to implement a contractionary monetary policy by hiking the policy rates and announcing the reduction of its balance sheet. The (flash) estimates for the headline and core inflation rates for February came in 0.3% higher than the market expectation, and this will likely increase the pressure on the ECB to further tighten monetary policy.

The debate surrounding the monetary policy response to the current inflationary pressure has been largely centred around whether the ECB has the right tools to combat an inflationary shock originating

from supply-side constraints and high energy prices. However, the data suggests that this no longer characterises the current inflationary episode experienced in the euro area. Although energy prices still stand at high levels, their contribution to inflation decreased notably and the price direction is likely to be downward rather than upward. Furthermore, commodity prices have fallen, global supply pressures have eased, and the Chinese economy has re-opened once again. All these deflationary factors are positive for the euro area economy, and the headline inflation rate dropped in recent months. Nonetheless, the core inflation rate continues its upward trend.

This paper takes a closer look at the medium-term inflation prospects in the euro area, and evaluates the main arguments for and against the tight monetary policy by the ECB. First, we examine the drivers of inflation over the last year. Second, we look at the main arguments of the ECB for implementing contractionary monetary policy. Third, we show that ECB rate hikes decrease consumer energy prices in the euro area by reducing the global energy price, contrary to assumptions made by proponents against contractionary ECB policy. Finally, we document that monetary policy tightening in the United States (US) actually lowers the consumer energy prices and the inflation rate in the euro area, contrary to the narrative around the implications of a strong US dollar (USD).

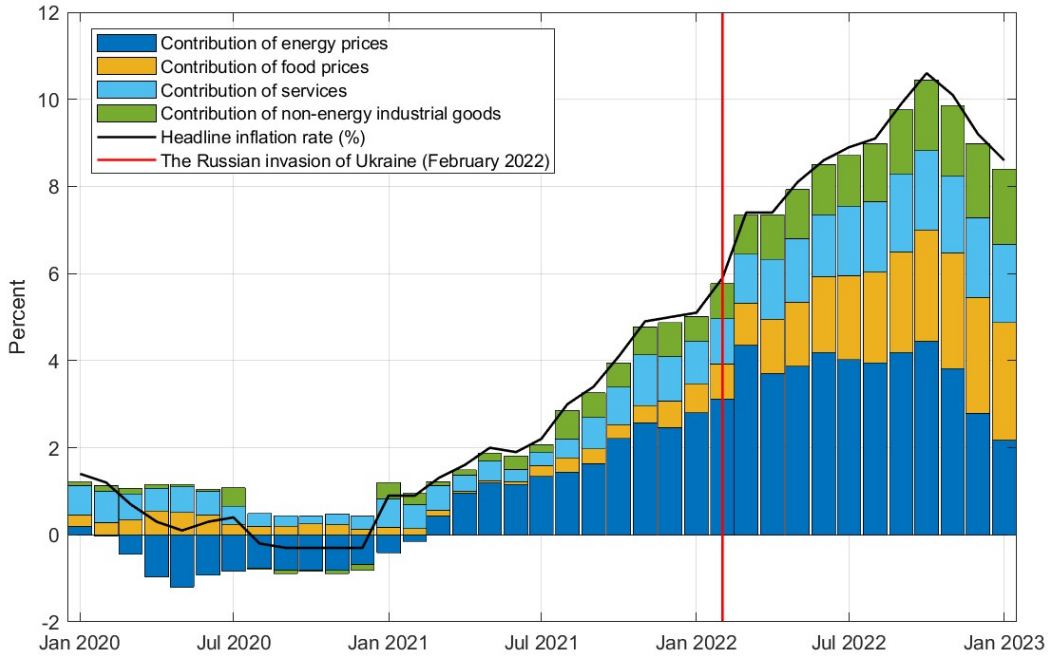
2. MEDIUM-TERM INFLATION PROSPECTS

This section provides an overview of the euro area inflation developments over the last year. The first part shows that the nature of the inflation dynamics in the euro area has begun to shift from supply- to demand-driven. The second part documents that supply-side pressures on the consumer prices in the euro area has weakened considerably in the second half of 2022, and is likely to weaken more in the medium-term. The third part looks at the main reasons why the ECB decided to implement contractionary monetary policy.

2.1. Overview of inflation developments

Initially, energy prices were the major driver of inflation in the euro area but the energy contribution to the headline inflation rate has been in decline since October following its peak after the Russian invasion of Ukraine (see Figure 2). In March 2022, the energy contribution to inflation was 4.35% when the headline inflation stood at 7.4%. This means that around 60% of the increase in the HICP was due to the rise in energy prices. However, since then the contributions of food prices, services, and non-energy industrial goods (NEIG) have increased substantially. The rise in the contribution of food prices is mainly due to the surge in food commodity prices induced by the war (see Figure 5 – FAO Food Price Index), which increased from 0.67% in January 2022 to 2.7% in January 2023.. In the same time span, the aggregate contribution of services and NEIG increased from 1.5% to 3.5%. Only the inflation rate due to services and NEIG is considerably over the ECB's 2% inflation target. The evaluation of the contributions to the headline inflation rate suggests that the narrative that the current inflationary episode is largely driven by energy prices no longer holds.

Figure 13: Contributions to the headline inflation rate in the euro area



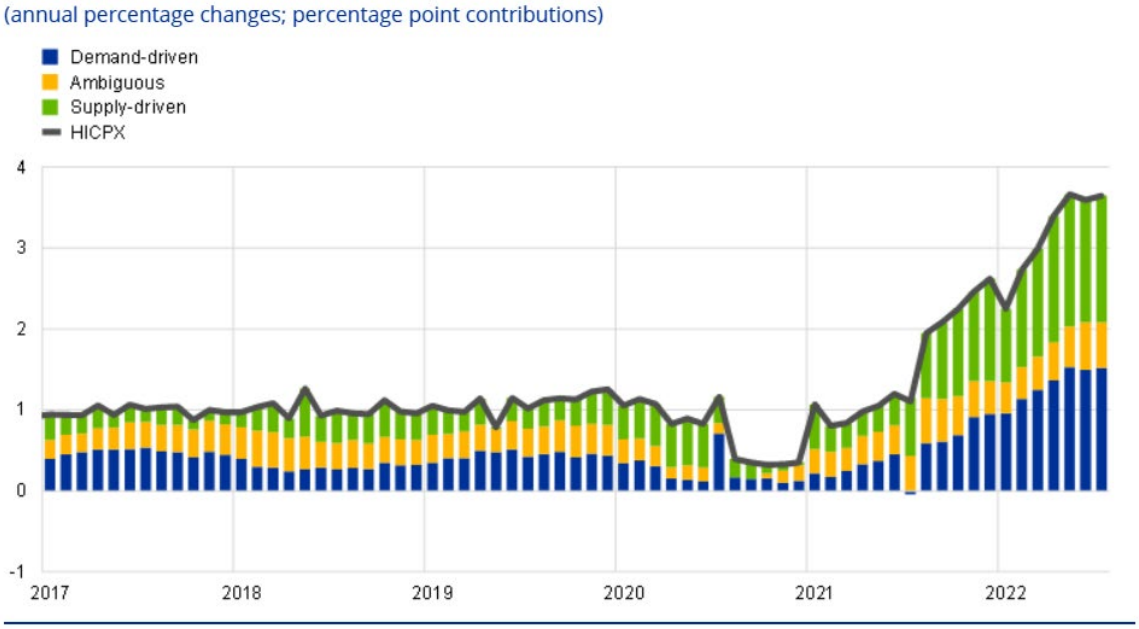
Source: Eurostat.

Notes: The vertical red line is placed to mark February 2022, the month of the Russian invasion of Ukraine.

Conventional wisdom is that monetary policy is effective against demand-driven inflationary pressures. Although the extensive contribution of services and NEIG to the headline inflation rate is an indication that not only supply-driven factors contribute to the high inflation rate, it does not directly translate to

demand-driven factors. Goncalves and Kuester (2022) show that an important share of the core inflation rate in the euro area is driven by demand factors (see Figure 3). The current demand-driven share of inflation is likely to be considerably higher than the reported value of around 1.5% for July 2022, the latest observation in their analysis.

Figure 14: Core inflation rate: decomposition into supply and demand-driven factors



Source: Goncalves and Kuester (2022).

Notes: This analysis is based on the approach developed by Shapiro (2022) for the US. The latest observation is for July 2022.

The euro area economy has been hit by a series of supply shocks, first with the pandemic and then with the Russian invasion of Ukraine. However, expansionary fiscal and monetary policy in response managed to maintain demand at a similar level to the pre-pandemic level.[23] The fiscal intervention in the euro area in response to the pandemic played an essential role in stabilising the economy against such an unprecedented shock. The effects of expansionary fiscal policy through transfers to households (e.g. direct/indirect social transfers, income-protecting measures) can materialise with a lag, especially in an environment with lockdowns where households cannot spend their disposable income and/or excess savings. This would lead to a sustained rather than a one-off inflationary impact of such policies as the economy re-opens. It is difficult to quantify the impact of expansionary fiscal policy on the euro area inflation through its positive effect on aggregate demand, however it is likely to be important. In the US, the narrative is that inflation picked up mostly due to demand-induced factors, such as the massive fiscal response.[24] Although the fiscal intervention in the euro area was smaller than in the US (in % of GDP), the announced packages were still substantial in size.[25]

As the economy re-opened after the lockdowns, the imbalance between supply and demand generated inflationary pressures in the euro area, just like in the rest of the world. Over the second half

[23] Real private consumption in the euro area in 2022Q3 is EUR 1.328 trillion, whereas it was EUR 1.330 trillion in 2019Q4 (OECD national accounts data).

[24] De Soyres, Santacreu and Young (2022) conclude that "The [US] policy was successful at boosting consumption which, together with relatively inelastic supply, may have led to supply chain bottlenecks and price tensions".

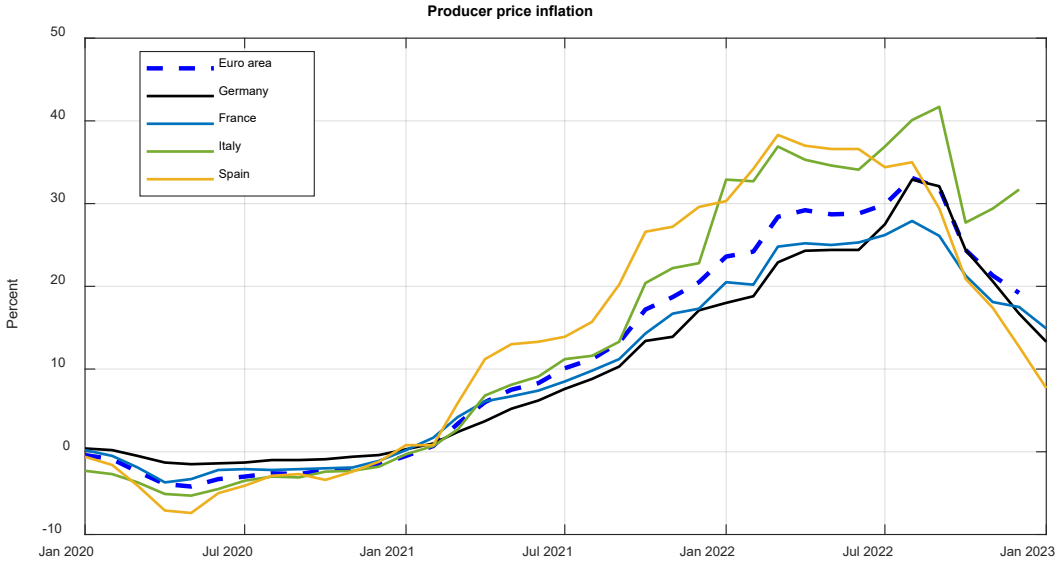
[25] According to the July 2021 (latest) update of the International Monetary Fund's fiscal monitor database of country fiscal measures in response to the COVID-19 pandemic, the additional spending made are (as % of GDP): 13.6% for Germany, 9.6% for France, 10.9% for Italy, 7.6% for Spain, 10.3% for the Netherlands, 11.7% for Austria.

of last year, as supply pressures eased and energy prices declined, the contribution of demand-driven factors to the inflation in the euro area increased. However, it is difficult to imagine this will continue as the ECB maintains the tight monetary policy path it is currently on.

2.2. Producer price inflation

The impact of supply-side constraints and energy prices passes through stronger and faster to producer prices, therefore producer price inflation (PPI) is a better measure to gauge the current importance of such factors on the underlying inflation dynamics. Figure 4 shows that PPI in the euro area declined from 33.1% at its peak in August 2022 to 19.2% in December 2022 (the latest value). This steady drop in the PPI is observed in Germany, France and Spain, but not in Italy, which experienced a sharp increase in December 2022, pulling the euro area PPI up. However, the important takeaway here is that the PPI is in a decreasing trend which is likely to continue without the absence of a new external shock.

Figure 15: Producer price inflation (total industry excluding construction)

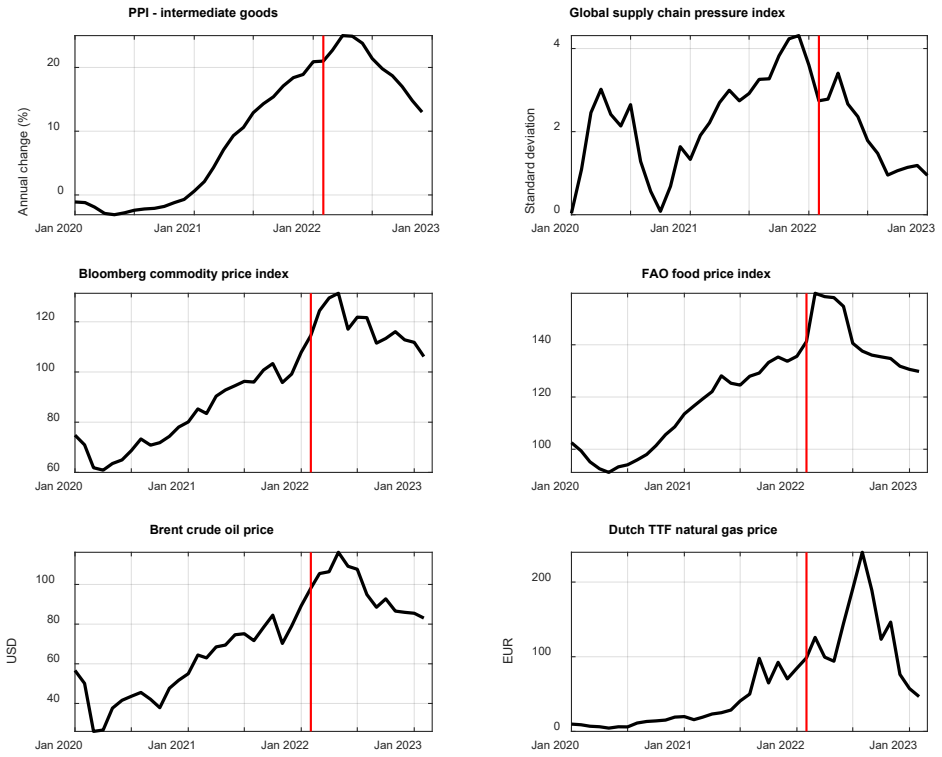


Source: Eurostat.

The PPI is, by construction, heavily influenced by commodity prices as they are inputs in the production process. The general trend in 2022 is that a surge in commodity prices was experienced after the Russian invasion of Ukraine, which was then followed by a steady decline in the prices (see Figure 5): the FAO food price index peaked in March 2022, Brent crude oil price peaked in May 2022, and the Bloomberg commodity price index peaked in May 2022.[26] Importantly, the intermediate goods price inflation peaked in April 2022. Although the global supply chain pressure index and the natural gas price did not peak in 2022Q2 as the others, they are also in a steady and notable decreasing trend. Moreover, according to the market forecasts (from the Bloomberg commodity price survey), the current decreasing trend in the Brent crude oil price and the natural gas price will continue over the medium-term.

[26] FAO food price index is a weighted price index of a basket of food commodities, and is reported by the Food and Agriculture Organization of the United Nations. Bloomberg commodity price index is a weighted price index of a basket of commodities, computed using the prices of futures contracts on 23 physical commodities in the markets.

Figure 16: Global supply chain pressures, commodity and energy prices



Source: Eurostat, Federal Reserve Bank of New York, Bloomberg, Macrobond Financial AB.

Notes: The vertical red lines are placed to mark February 2022, the month of the Russian invasion of Ukraine.

The fall in commodity prices will lead to a decrease in the headline inflation rate, this in turn will slightly lift the pressure off the ECB to implement further rate hikes. Whether this would be the right policy or not depends on the developments in the core inflation rate, which is currently substantially above the 2% inflation target of the ECB and is itself sufficient for the ECB to tighten monetary policy.

2.3. Inflation expectations and wage developments

The main reasoning ECB policymakers provide in the support of contractionary monetary policy is the risk of de-anchoring of inflation expectations. A prominent member of the ECB's Executive Board, Isabel Schnabel, stated on 27 August 2022 during her Jackson Hole speech:

> *"The second observation tilting the trade-off facing monetary policy towards more forceful action relates to central banks' credibility … We are witnessing a steady and sustained rise in medium and long-term inflation expectations in parts of the population that risks increasing inflation persistence beyond the initial shock … Policymakers should also not pause at the first sign of a potential turn in inflationary pressure, such as an easing of supply chain disruptions. Rather, they need to signal their strong determination to bring inflation back to target quickly."*

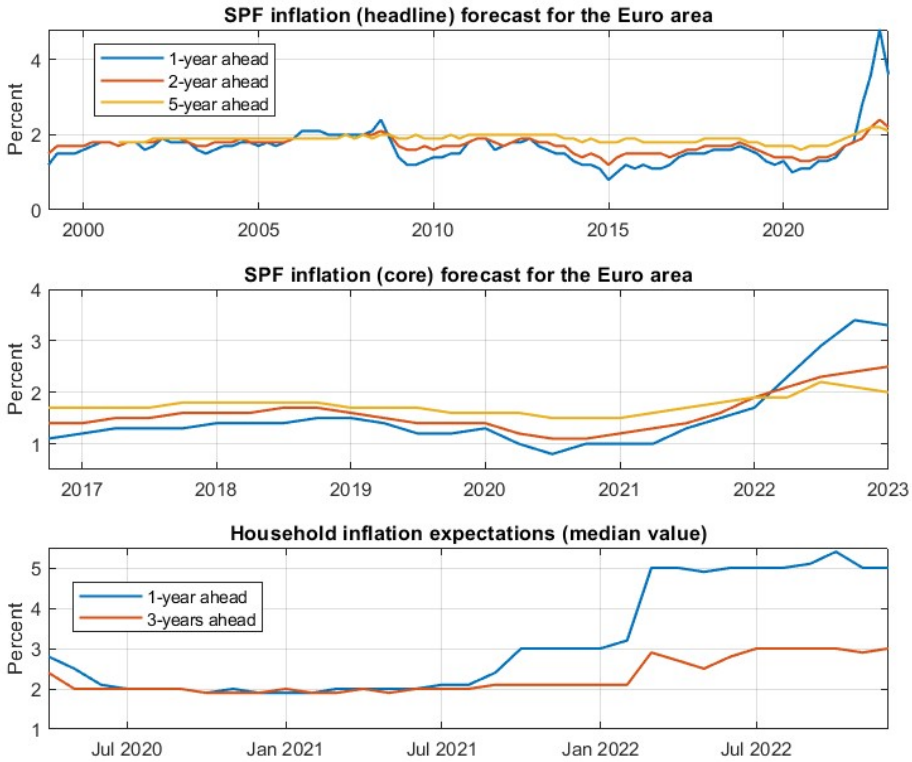
Policymakers are right to worry over rising market and household inflation expectations. If economic agents no longer trust the central bank, high inflation expectations can be entrenched, and inflation will turn out to be significantly more persistent and difficult to bring back down to the target. Moreover,

if a central bank does not react to rising inflation expectations before a significant loss in credibility, it might later render a more forceful monetary policy necessary.

Figure 6 presents the market and household inflation expectations in the euro area. There are encouraging and worrying signals for the ECB. First, the one-year ahead headline inflation forecast from the 2023Q1 survey of professional forecasters (SPF) stands at 3.6%. This is considerably higher than the inflation target, yet it dropped from a 4.8% peak in 2022Q4. Second, although 2-year (medium-term) and 5-year (long-term) headline inflation forecasts are at record highs, they stand slightly above 2%, suggesting long-term expectations are still anchored. Third, the 1-year and 2-years ahead core inflation forecasts stand well above 2%, the target for headline inflation. Fourth, household inflation expectations are more un-anchored than market forecasts (expectations). The 1-year and 3-years ahead household expectations are 5% and 3%, respectively.

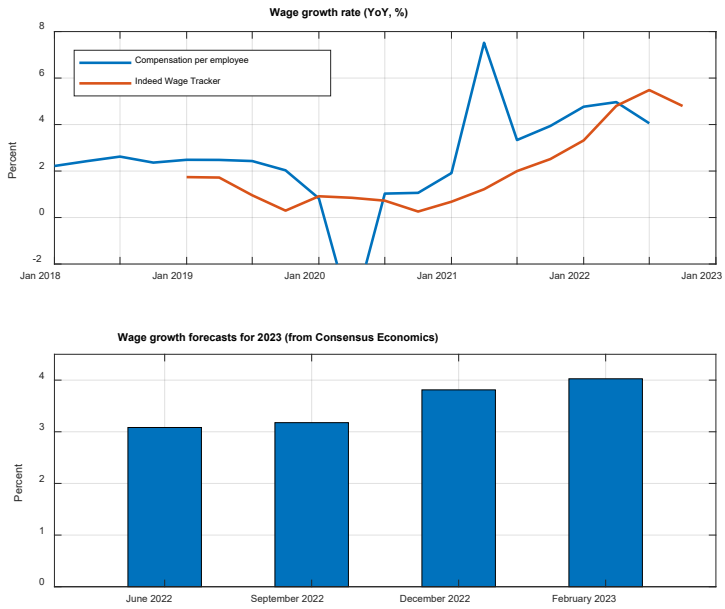
Although inflation expectations remain higher than ever before, the decline in market-based inflation expectations in 2023Q1 suggests that the contractionary monetary policy of the ECB starting in July 2022 curbed a further rise in expectations, which is critical to avoid another potential driver of persistent inflationary pressures: the wage-price spiral. If medium- and long-term inflation expectations become un-anchored, the risks of a wage-price spiral will significantly increase. As economic agents are forward-looking, they might seek further inflation compensation from their employers. This can, in turn, lead to more demand thus further price rises, and to firms increasing their prices due to the increase in labour costs, and eventually feed into a vicious circle.

Figure 17: Inflation expectations in the euro area



Source: ECB.

Figure 18: Wage growth developments and forecasts in the euro area



Source: Eurostat, Macrobond Financial AB, Consensus Economics.

Figure 7 presents the annual wage growth rate in the euro area (top panel) and the wage growth forecasts of market participants from the Consensus Economics survey (bottom panel). The two wage growth measures indicate an increase from 1-2% since the onset of 2021 to around 4-5% in mid-2022, which coincides with the rise in 1-year ahead household inflation expectations. However, the growth rate slowed down towards the end of 2022. Market-based wage growth forecasts currently stand at 4% for the end of 2023, and have been rising gradually in the last two quarters of 2023. These results point to further increases in wages but not to levels that are likely to set into motion a harmful wage-price dynamic. However, this does not mean that the ECB should not continue with its contractionary policy, as the result of such a counterfactual would most likely be rising inflation expectations, and thus wage growth expectations.

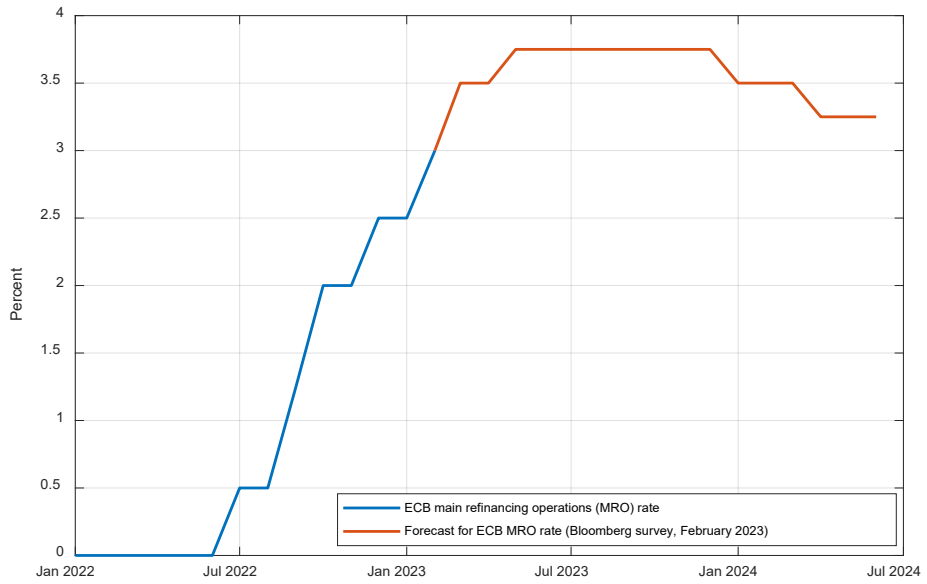
3. EFFECTIVENESS OF ECB POLICY AGAINST HIGH ENERGY PRICES

This section investigates the effects of monetary policy decisions on energy prices. In the first part, an overview of ECB monetary policy decisions over the last year is presented. The second part studies the effects of ECB decisions on energy prices in the euro area[27]. In addition, the third part presents the effects of the Federal Reserve (Fed) policy decisions on the euro area. This analysis is entirely based on the work of Ider et al. (2023).

3.1. Monetary policy decisions of the ECB

After a long period at the zero lower bound, on 21 July 2022, the ECB decided to raise the key interest rates by 50 basis points. This was the first in a series of rate hikes by the ECB: 75 basis points in September, 75 basis points in October, 50 basis points in December, and lately 50 basis points in February 2023. The current interest rate on the main refinancing operations (MRO) stands at 3%, however market forecasts indicate that the MRO rate will be raised to 3.75% by mid-2023, providing a market estimate of the terminal rate (see Figure 8). It is, however, important to note that the latest Bloomberg survey was conducted on 13 February 2023. The upside surprises in the preliminary euro area February headline and core inflation data released on 2 March 2023 might have raised the interest rate expectations in the market. In addition to the rate hikes, the ECB announced that its balance sheet related to the asset purchase programme (APP) will be reduced starting in March 2023.

Figure 19: ECB main refinancing operations (MRO) rate and market forecasts



Source: Bloomberg.

The main tool the ECB has in the fight against inflation is increasing its policy rates. A large amount of literature studies the effects of rate hikes on the economy, and it is well-established that contractionary monetary policy lowers economic activity and the price level (Gertler and Karadi, 2015; Jarocinski and Karadi, 2020; Miranda-Agrippino and Ricco, 2021; Bauer and Swanson, 2022). Therefore, it is expected

[27] The Bayesian proxy SVAR model results and the impulse response functions of the euro area are presented in Annex I.

that central banks raise the interest rate when inflation is running over its target. However, during this inflationary episode, there has been a narrative suggesting that the ECB should not raise rates since the current inflation is mainly driven by energy prices.[28] The literature is scarce on the effects of monetary policy on energy prices, therefore the rest of the paper aims to close this gap and provide empirical evidence for informed policy discussions.

3.2. Impact of ECB monetary policy on energy prices

We begin the analysis of ECB monetary policy decisions on energy prices with a high-frequency event study. This method is especially appropriate to investigate the causal effects of monetary policy on commodity prices, as the analysis focuses on a tight window around the policy announcements. This eliminates the possibility that the variation in the commodity price is confounded by other news, and yields unbiased estimates of the impact of monetary policy decisions. The focus here is on the oil price (which is traded in USD) and the natural gas price (which is traded in euros). Moreover, this analysis can shed light on the commonly made assumption that euro area energy demand, thus ECB monetary policy, cannot affect global energy prices. The implicit assumption made here is that the euro area is a small open economy (SOE) in the global energy markets, such as the oil market.

In order to study the impact of ECB monetary policy on the energy price, the following event study regression is estimated:

$$p_t = \alpha + \beta mps_t + \varepsilon_t$$

where p_t is the intraday variation in the oil price or the daily variation in the natural gas price, and mps_t is the monetary policy surprise for each ECB policy announcement on day t. The variation in the energy price is measured around the same tight window around the policy announcement in which the monetary policy surprise is measured. The monetary policy surprise is used as a proxy for a monetary policy shock, and is the intraday variation in the three-month overnight index swap (OIS) rate. Following Jarocinski and Karadi (2020), the "poor man's sign restrictions" method is applied to the surprises to purge any central bank information effects in the surprise series. The intraday variation in the oil price is the change in the ICE Brent crude oil front-month futures (LCOc1) price, which is the benchmark global spot price quoted in the financial news, and has the highest liquidity. The daily variation in the natural gas price is the change in the ICE Dutch TTF price for the 1-month and the 1-year futures contracts.[29]

Table 1 presents the event study results for the impact of ECB policy announcements on the natural gas price. Each column presents the estimates for the combination of a different Dutch TTF maturity and a different sample period. The sample starts from October 2007 due to data availability for daily natural gas futures price data. The results clearly show that contractionary monetary policy decisions by the ECB decrease the natural gas price, both in the short- and medium-term (i.e. $\hat{\beta}$ is negative and statistically significant for both the 1-month and the 1-year futures). This result is robust to the inclusion of the pandemic period in the sample (see Columns 3 and 4). The natural gas market in Europe is considered to be a local market, therefore these results are not indicative of the potential impact of ECB policy decisions on an energy commodity that is traded globally, such as the Brent crude oil.

[28] e.g. the opinion piece "Interest rate hikes are not the answer to Europe's inflation problem" by Patrick Kaczmarczyk (on the London School of Economics blog)

[29] The intraday variation in the three-month OIS rate around ECB policy announcements is provided by the EA-MPD database from Altavilla et al. (2019. The intraday variation in the LCOc1 around ECB policy announcements is computed by the authors using tick data from the Refinitiv Tick History database. Daily ICE Dutch TTF data is from Bloomberg.

Table 1: Coefficient estimate β for the natural gas price event study regressions for the ECB

	1-month TTF	1-year TTF	1-month TTF	1-year TTF
$\hat{\beta}$	-17.42 *** (4.50)	-12.32 *** (3.12)	-13.85 *** (3.92)	-13.41 *** (3.23)
R^2 (%)	2.68	2.61	1.39	2.69
Sample	2007:10 – 2019:12	2007:10 – 2019:12	2007:10 – 2021:12	2007:10 – 2021:12
N	127	127	143	143

Source: Authors' own elaboration.

Note: Daily ICE Dutch TTF data is available from October 2007. Daily change in the natural gas price is computed as the difference between the closing price of the ECB policy announcement day and the closing price of the previous day. Monetary policy surprise is the high frequency change in the three month Overnight Index Swap (OIS) rate with poor man's sign restrictions as in Jarocinski and Karadi (2020). Heteroskedasticity-consistent standard errors are reported in parentheses.

Table 2 presents the event study results for the impact of ECB policy announcements on the global oil price, the Brent crude oil price. The first column is for the longest sample the data is available for. The second column is for the sample excluding the pandemic period. The third column is for a sample that starts in January 2002. The reason for this sample addition is that in their event study analyses, in order to take into account the liquidity concerns for euro area OIS contracts prior to 2002, Altavilla et al. (2019), Andrade and Ferroni (2021), Kerssenfischer (2022) use the sample starting from 2002. The results show that contractionary monetary policy decisions by the ECB lead to a decline in the global oil price (i.e. $\hat{\beta}$ is negative and statistically significant for all sample periods). This is strong evidence against the prevalent assumption that the euro area is a SOE in the global energy market.

Table 2: Coefficient estimate β for the Brent crude oil price event study regressions for the ECB

	(1)	(2)	(3)
$\hat{\beta}$	-2.10 * (1.10)	-1.80 * (1.08)	-3.48 ** (1.14)
R^2 (%)	1.48	1.07	2.60
Sample	1999:1 – 2021:12	1999:1 – 2019:12	2002:1 – 2021:12
N	278	262	212

Source: Authors' own elaboration.

Note: Each column presents the event study regression for a different sample period. Monetary policy surprise is the high frequency change in the three month Overnight Index Swap (OIS) rate with poor man's sign restrictions as in Jarocinski and Karadi (2020). Heteroskedasticity-consistent standard errors are reported in parentheses.

The results for the high-frequency event study regressions for the global oil price and the natural gas price in Europe show that the ECB can lower energy-driven inflation by raising its policy rates. This finding is contrary to the widely-made assumption that ECB monetary policy cannot affect energy prices.

Although the method of high-frequency event study produces clean results and provides accurate information on the immediate impact of ECB monetary policy decisions on energy prices, it is not possible to make inference on the persistence of the effects. In order to study the dynamic effects of ECB monetary policy actions, a structural vector autoregression (SVAR) model for the euro area economy is set up.[30] The main findings are twofold. First, a monetary tightening by the ECB leads to a strong fall in the global oil price. This provides further evidence that the ECB can decrease the global energy price through increasing the policy rate. Second, in response to the contractionary monetary policy, the consumer energy prices (HICP-energy) decline considerably more than the HICP. The effect is fairly persistent and important for the headline inflation rate.[31]

Furthermore, counterfactual experiments are conducted to quantify the significance of "the energy-price channel"[32] of monetary policy in the euro area. Irrespective of the counterfactual method employed, the results show that the HICP-energy – and to a lower extent the HICP – would react considerably less to contractionary ECB monetary policy if the global oil price would not change in response. The impact of ECB policy on the global oil price is, therefore, found to be substantial and critical to bring down inflation back to target amidst energy-driven inflationary pressures.

The energy-price channel of monetary policy is often overlooked. A standard monetary policy model for the euro area maintains the simplifying assumption that the euro area is a SOE, which implicitly leads to the restriction that ECB monetary policy cannot affect global energy prices. The SOE assumption could potentially cause models to underestimate the impact of ECB monetary policy decisions on domestic energy prices, and thus on inflation. Moreover, the results suggest that the current narrative held by some economists that ECB policy cannot affect energy prices is based on false assumptions. This is critical when evaluating the rate hikes of the ECB, as this narrative has been the main argument against contractionary policy even prior to the Russian invasion of Ukraine which led to a sudden energy supply crunch.

3.3. Impact of US monetary policy on energy prices

The recent surge in inflation in the euro area emerged against the backdrop of inflationary pressures in the US, which led to the Fed hiking interest rates prior to the ECB. This led to a strong depreciation of the euro against the US dollar, inviting the narrative that the strong dollar will result in greater inflationary pressures in the euro area, especially through energy imports such as oil that are traded in USD. However, this narrative does not account for the fact that US contractionary monetary policy decreases global (energy) commodity prices. This is a transmission channel of spillovers of US monetary policy first documented by Degasperi, Hong and Ricco (2023). Therefore, a SVAR model, similar to the one for the euro area, is set up for the US economy.[33] In order to study the effects of US monetary policy on euro area inflation, the model is augmented with euro area HICP, HICP-energy and the industrial production index.[34]

[30] See Annex I for the detailed analysis.

[31] From the magnitudes of the responses of HICP-energy and HICP, and the fact that the expenditure weight of HICP-energy is around 10% of the aggregate consumer basket that is used to compute the HICP, it can be inferred that the decrease in HICP in the short-term is largely due to the fall in HICP-energy.

[32] Throughout the paper, the transmission of monetary policy through the energy prices is called "the energy-price channel".

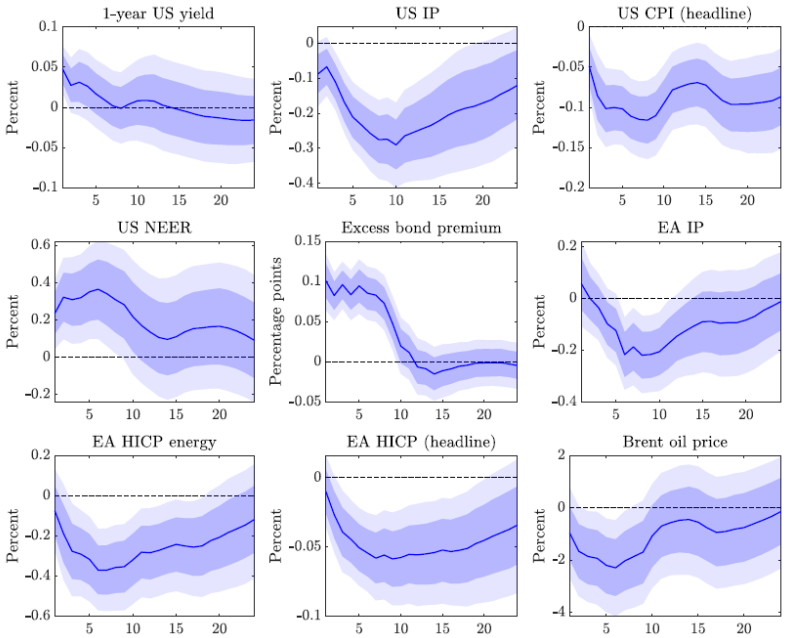
[33] The SVAR model for the US economy is estimated on a longer sample from January 1990 to December 2019. The time series for the monetary policy surprises in the US is available from an earlier date than for the ECB. The results for the US are robust to using the same sample as the euro area.

[34] See Annex I for a detailed analysis.

Figure 9 presents the estimates of the effects of a one standard deviation contractionary US monetary policy shock. In line with standard theory and the monetary policy literature, economic activity and consumer prices in the US decline, and the USD appreciates against other currencies. Importantly, for the purpose of this paper, the global oil price declines by around 2%, similar to the impact of the ECB. This leads to a fall in the consumer energy prices in the US as well as the euro area. This finding suggests that the appreciation of the USD is not the dominant channel through US monetary policy transmission to euro area consumer prices works.

The fall in euro area consumer energy prices and the headline price index is obviously not solely due to the Fed's impact on the global oil price, but also due to decreases in other import and domestic prices. However, it is clear these results indicate that a tightening in US monetary policy actually lowers inflation in the euro area, potentially reducing the pressure the ECB faces in times of high inflation. This result is not unique to this study. Breitenlechner, Georgiadis and Schumann (2022), and Degasperi, Hong and Ricco (2023) document that a tightening in US monetary policy lowers the headline price index in advanced economies. From the results, it can be inferred that the contraction in aggregate demand (global and domestic) and the fall in commodity prices dominate the impact of higher import prices.[35] This finding is particularly important for the current debate as the energy price contribution in the euro area headline inflation is declining. Contractionary US monetary policy does not only reduce US demand but also the global demand, therefore deflationary pressure on commodity prices is likely to persist in the medium-term.

Figure 20: US monetary policy spillovers to the euro area



Source: Authors' own elaboration.

Notes: Impulse response functions to a one standard deviation monetary policy shock. Point-wise posteriors means are reported along with 68% and 90% point-wise probability bands. Horizontal axis is horizon in months.

[35] Ider et al. (2023) additionally show this through counterfactual exercises. In order to gauge the importance of the global oil price response, the same counterfactual exercise (using the three available methods) undertaken for ECB monetary policy is repeated for the US. The results document that the impact of US monetary policy on global oil price is an important transmission channel of the spillover to the consumer energy and aggregate consumer prices in the euro area.

4. CONCLUSION

The supply-side factors contributing to the headline inflation in the euro area have eased considerably. The energy contribution is at a level last observed in mid-2021 (see Figure 1). The energy and food commodity prices have all declined to levels below prior to the Russian invasion of Ukraine, and global supply chain conditions significantly improved in 2022 (see Figure 5). These are considerable deflationary developments, and the headline inflation rate has steadily declined since its peak of 10.6% in October 2022. However, the core inflation rate continues its trend upward without any sign of slowing down, and currently stands 3.6 percentage points above the ECB's inflation target. Naturally, the markets expected the ECB to put an end to the loose monetary policy stance, and the ECB responded in 2022 by raising the policy rates by 300 basis points and announcing the start of the reduction of its balance sheet.

Since autumn 2021, two narratives have been circulating the debate on how the ECB should respond to rising inflation: (1) the ECB cannot decrease energy prices by increasing the interest rates, (2) the USD appreciation induced by tight US monetary policy is inflationary for the euro area economy, and thus the ECB should hike rates to protect the euro against the USD. The empirical evidence presented in this paper (entirely based on the work of Ider et al., 2023) strongly suggests that both of these narratives are incorrect: (1) the ECB can decrease energy prices by increasing the interest rates, and (2) contractionary US monetary policy is actually deflationary for the euro area economy, and one of the main channels of transmission is through the negative effect on the global energy prices.

The current headline and core inflation rates are both significantly higher than the ECB's target, and this increases the risk of de-anchoring inflation expectations that might lead to persistent inflationary pressures. Therefore, the ECB should tighten monetary policy even amidst easing supply-side pressures. The debate should not be about whether the ECB should maintain its current contractionary policy but about to what level the ECB should hike the rates. What should the terminal rate for the ECB be?

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ANNEX I: THE BAYESIAN PROXY SVAR MODEL - EURO AREA

This section studies how the effects of ECB monetary policy play out dynamically at business cycle frequency. To this end, a Bayesian proxy structural vector autoregressive (BP-SVAR) model is set up and estimated for the euro area economy (see Box 1 for details on the model).

Figure 10 presents the estimates of the effects of a one standard deviation ECB contractionary monetary policy shock for the euro area. In line with the standard theory and the monetary policy literature, industrial production and consumer prices fall significantly, and the euro appreciates against the US dollar. The main result of interest here is the sizable fall in the consumer energy price index (HICP-energy) and the global oil price. The HICP-energy falls significantly and considerably more than the headline consumer price index (HICP), particularly in the short-term. The expenditure weight of the HICP-energy is around 10% of the aggregate consumer basket that is used to compute the HICP. Therefore, it can be inferred that the short-term decline in the HICP is most likely due to the fall in the HICP-energy. An important driver of the drop in the HICP-energy is the large decrease in the global oil price in response to the contractionary monetary policy shock. The global oil price drops by 2.5% on impact, and thus should have a major contribution to the fall in consumer energy prices in the euro area.

This finding of the dynamic model provides further evidence (additional to the results of the event study) that contractionary monetary policy decisions by the ECB decrease global and consumer energy prices. Therefore, it can be concluded that "the energy-price channel" of monetary policy is important for its effects on inflation in the euro area. Building on this finding, the next step is to conduct counterfactual experiments to quantify the importance of the energy-price channel on inflation. Three different empirical counterfactual methods are utilised in this respect: the Structural Shock Counterfactual (SSC), the Structural Scenario Analysis (SSA) and the Minimum Relative Entropy (MRE).[36] These methods provide a framework to simulate a counterfactual monetary policy shock with restrictions on the impulse responses. Specifically, the imposed restriction here is on the response of the global oil price to the monetary policy shock: the global oil price does not change in response to a contractionary monetary policy shock by the ECB.

[36] Check Ider et al. (2023) for a detailed description of the counterfactual methods.

Box 1: Specification of the BP-SVAR model for the euro area economy

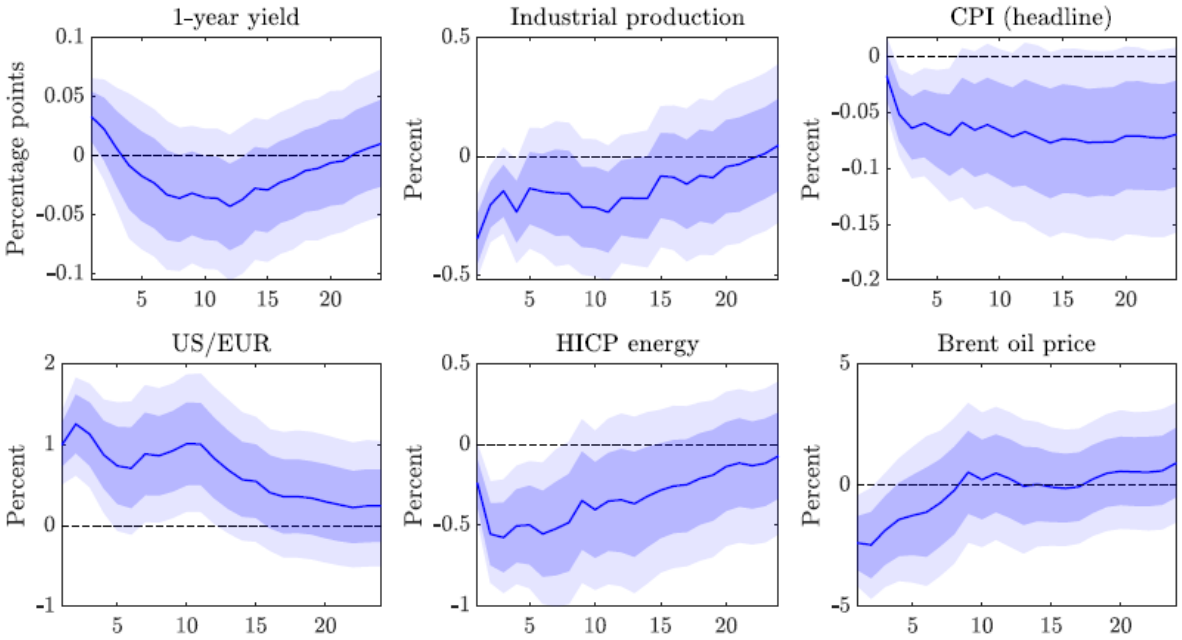
The BP-SVAR model for the euro area economy is estimated on a sample from January 1999 to February 2020, thus excluding the extraordinary volatility in the data induced by the Covid-19 pandemic. The model includes a constant, and has 12 lags of the endogenous variables as is usual for VAR models with data at monthly frequency. All variables enter the model in log-levels (x 100), except for the interest rate, the credit spread, and the proxy which enter in levels. Flat priors are used for estimating the SVAR parameters. In addition, a relevance threshold is imposed to express the prior that the proxy if informative to identify monetary policy shocks. A prior of $\gamma = 0.1$ is set, imposing a threshold that the identified structural monetary policy shocks account for at least 10% of the variance in the proxy. This is a weak requirement relative to the threshold imposed in the literature.

The model contains seven variables, and the high-frequency monetary policy surprises to identify an ECB monetary policy shock. Following a large literature on monetary policy shock identification using high-frequency data, the following variables are included in the model: an interest rate as an indicator for the monetary policy stance, industrial production as a proxy for economic activity, a measure of the price level, as well as a credit spread as a proxy for financial conditions (Gertler and Karadi, 2015; Jarocinski and Karadi, 2020; Bauer and Swanson, 2022). To this standard monetary model we add the euro-US dollar (EUR-USD) exchange rate, the global oil price and a measure of consumer energy prices.

Specifically, the model includes the 1-year constant maturity yield on the German Bund as the monetary policy indicator. As the sample contains a considerable period of time at the zero lower bound (ZLB), it is important to use an interest rate that remains a valid measure of the monetary policy stance at the ZLB. Economic activity is measured by the euro area industrial production index (excluding construction). The (headline) HICP is used as the measure the overall price level. The BBB corporate bond spread in the euro area is used to capture financial conditions. The Brent crude oil price is used as a measure of the global oil price. The energy index of the HICP is used as a measure of consumer energy prices in the euro area.

Source: Authors' own elaboration. The raw data is from EA-MPD introduced by Altavilla et al. (2019), Macrobond Financial AB, Eurostat, Energy Information Administration (EIA), and Federal Reserve Economic Data (FRED).

Figure 21: Euro area BP-SVAR model



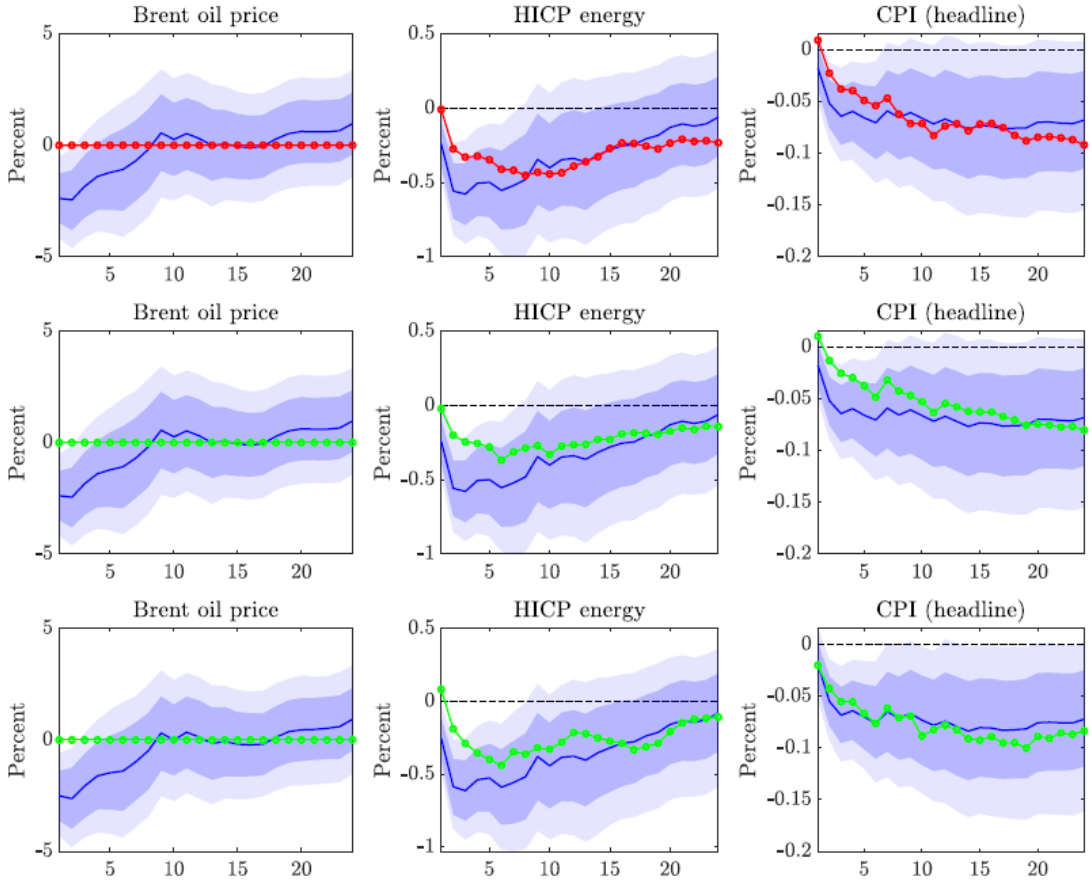
Source: Authors' own elaboration.

Notes: Impulse response functions to a one standard deviation monetary policy shock. Point-wise posteriors means are reported along with 68% and 90% point-wise probability bands. Horizontal axis is horizon in months. The impulse response for the credit spread is not reported due to spatial constraints (see Ider et al., 2023).

Figure 11 presents the results of the counterfactual exercises using the three methods defined above.[37] Irrespective of the method employed, it becomes apparent that the consumer energy prices in the euro area (HICP-energy) – and to a lower extent the headline HICP – react considerably less to a contractionary monetary policy shock if this shock would not affect the global oil price. The impact of ECB monetary policy on the global oil price is, therefore, found to be substantial, and critical to bring down inflation back to the target.

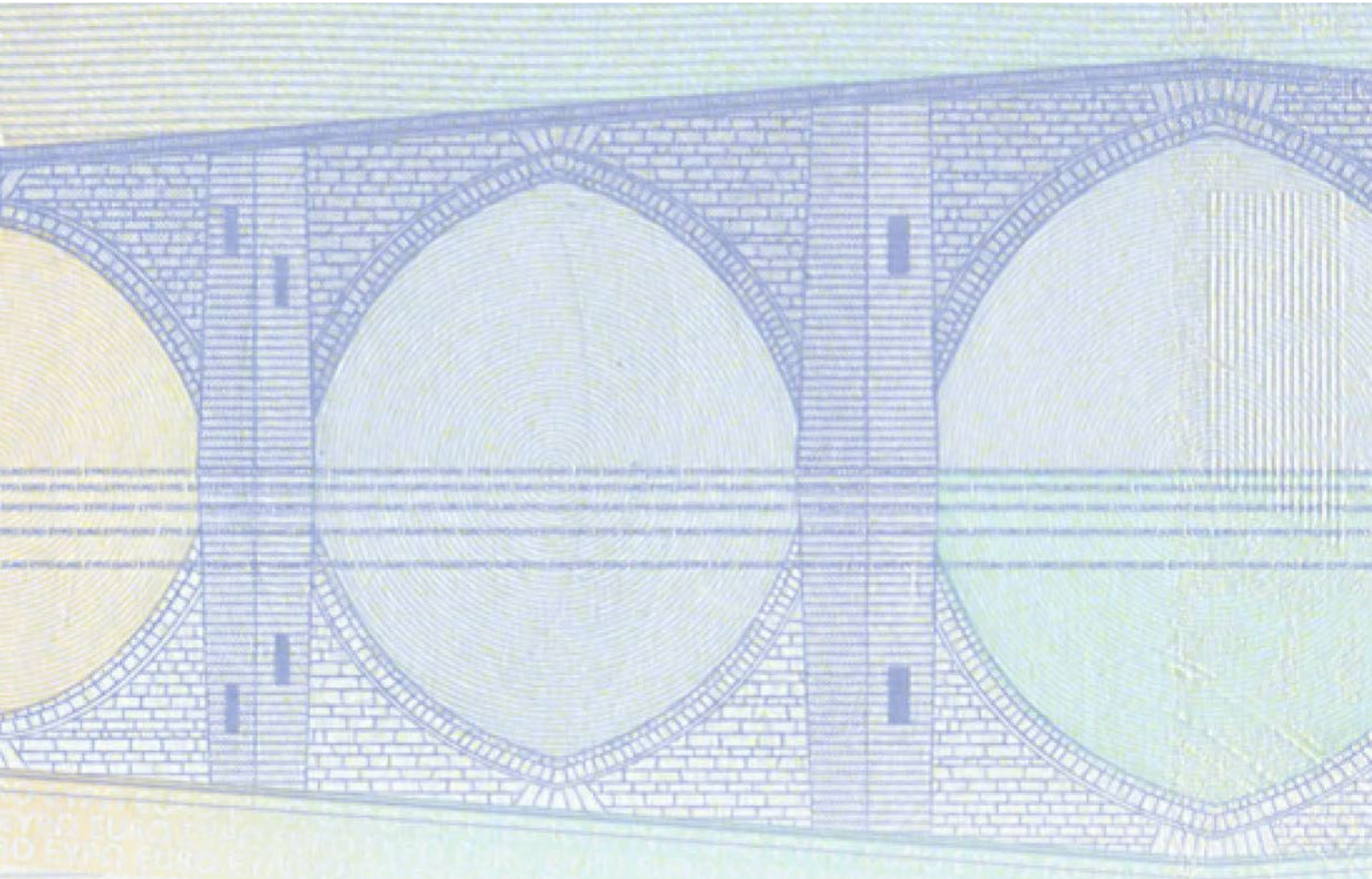
[37] Solely the impulse responses of interest are reported for two reasons: (1) the counterfactual impulse responses of the other variables in the model do not exhibit sizable differences to their baseline responses; (2) including the full set of impulse responses for the three counterfactual methods produces convoluted plots. The full set of results are reported in Ider et al. (2023).

Figure 22: Counterfactual exercise: shutting down the oil price response



Source: Authors' own elaboration.

Notes: Red lines refer to the MRE counterfactual (the first row), green lines to the SSA (the second row) and the SSC (the third row). Impulse response functions to a one standard deviation monetary policy shock. Point-wise posteriors means are reported along with 68% and 90% point-wise probability bands. Horizontal axis is horizon in months.



Out of the fog?: Inflation in an era of ECB policy reversals

Pierre SIKLOS

Abstract

The ECB has orchestrated a U-turn in monetary policy since July 2022. However, inflation remains a considerable distance away from its medium-term objective. The ECB relies too heavily on data dependence and uncertainty in communicating monetary policy to markets and the public. It also fails to acknowledge the inherent tensions between monetary and financial stability policies. The current hawkish stance is appropriate but leaves the ECB open to more credibility losses should tail risks emerge.

This document was provided by the Economic Governance and EMU Scrutiny Unit at the request of the Committee on Economic and Monetary Affairs (ECON) ahead of the Monetary Dialogue with the ECB President on 20 March 2023.

CONTENTS

LIST OF ABBREVIATIONS

AC	Monetary Policy Account (ECB)
APP	Asset purchase programme
ECB	European Central Bank
ESDC	Euro area sovereignty debt crisis
GC	Governing Council
GDP	Gross domestic product
GFC	Global financial crisis
HICP	Harmonised index of consumer prices
PEPP	Pandemic emergency purchase programme
PR	Press release (ECB)
PS	Policy statement (ECB)
QE	Quantitative easing
QT	Quantitative tightening
TLTRO	Targeted longer-term refinancing operations
TPI	Transmission protection instrument
USD	US dollar

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EXECUTIVE SUMMARY

- **July 2022 marks an end of an era ("zeitenwende") in monetary policy in the euro area.**
- Instead of "leaning against the wind" the ECB waited too long but eventually switched to becoming pre-emptive in changing the stance of monetary policy. The ECB continues to pay the price for this strategy.
- Data dependence and uncertainty are over-used terms in Governing Council press releases and press statements. This strategy further clouds the public's understanding of what drives the ECB's monetary policy.
- The current economic and geopolitical environment has some unprecedented features. However, the conditions the ECB faces are not entirely new, as sometimes claimed.
- The ECB must be more forthcoming about the destination of the current monetary policy tightening phase. This need not mean giving a precise value for the policy rate. Historical comparisons, however, can help and this paper offers one such example.
- The ECB must confront a series of "gaps" it is not always equipped to deal with. They include gaps in consumer and business confidence, gaps in inflation and long-term interest rates, and gaps in credit conditions in the euro area.
- Tail risks appear under-appreciated. These include the challenges and the prospect of another U-turn if the war in Ukraine leads to more deteriorating economic conditions.
- The ECB finds itself in the challenge of navigating monetary policy out of the fog. The good news is that ECB policy has the potential to perform effectively and restore confidence in the institution.

1. INTRODUCTION: ANOTHER "ZEITENWENDE"?

In February 2022, a mere seven months after the European Central Bank (ECB) announced the Governing Council's (GC) unanimous approval of the new policy strategy centred around a 2% symmetric inflation objective,[38] the Russian invasion of Ukraine began. Amid the continuing policy and health-related challenges around the COVID-19 pandemic, a new "shock" emerged that would roil the global economy and, arguably, the euro area economy more than others outside the single currency area. If the economic crisis occasioned by the pandemic did not merit the appellation of a "zeitenwende",[39] surely a war on the European continent would produce just such another turning point. As if this were not enough, central banks would soon experience their own "zeitenwende" and dramatically reverse course from the previous regime of interest rates remaining lower for longer.

The whipsaw in the behaviour of inflation that eventually prompted the tightening of monetary policy was there for everyone to see. The first turning point in harmonised index of consumer prices (HICP) inflation that might have raised the alarm took place in December 2020, when a very mild deflation of -0.3% turned into 0.7% inflation by January 2021[40]. We would have to wait until June 2021 for headline inflation to hit 2%. Month-to-month inflation rates, clearly more volatile than annualised rates, were nevertheless in persistently positive territory by 2021 and the monthly inflation rate hit 3.6% by May 2021[41]. Yet, at its July 2021 meeting, the GC maintained the need for a persistently accommodative stance. It took until July 2022 to formally change the course of monetary policy. Instead of "leaning against the wind" in anticipation of much higher future inflation, the ECB, as did other major central banks, chose to wait until inflation was unacceptably high before acting. Such were the early signs of the debate that would eventually rage around transitory versus permanent increases in inflation.

There were other early warning signs (e.g., see Siklos, 2022, Figure 3). Nevertheless, as Lane (2022), the ECB's Chief Economist, would exhaustively report on in November 2022, the real problem is that the ECB and the economics profession more generally are still trying to come to terms with estimating the respective shares in the surge in inflation due to supply constraint versus a rebound in demand once euro area economies began to fully re-open in earnest during 2022. Complicating matters still further were significant changes in the composition of consumption, first from services to goods as the COVID-19 pandemic persisted and back to services once pandemic restrictions eased. On top of everything was the energy price shock triggered by the war in Ukraine. Once it became clear to the monetary authorities that their credibility and institutional trust were severely threatened, they pivoted sharply neglecting to acknowledge their own role in creating the inflation problem. Suddenly, "leaning against the wind" was adopted both to reduce inflationary pressures as well as prevent the un-anchoring of inflation expectations.

Fast forward to the present, and while not exactly declaring victory, the ECB is touting its tightening stance toward the normalisation of interest rates, undefined, while continuing to pursue a "data-dependent" strategy in setting the stance of monetary policy. The failure to follow a forward-looking approach to monetary policy does not inspire confidence. Despite Lane's (2022) contention that "a proper assessment of the likely future path of inflation is best conducted in the context of a comprehensive macroeconomic projection exercise" (op.cit., p. 49), we are seeing a central bank that

[38] See the 8 July 2021 press conference held in Frankfurt announcing the results of the monetary policy strategy review, https://www.ecb.europa.eu/press/pressconf/2021/html/ecb.sp210708~ab68c3bd9d.en.html.

[39] Zeitenwende is the German expression for a turning point uttered by Chancellor Olaf Scholz on 27 February 2022, three days after Russia began to invade Ukraine.

[40] The figures are based on annualised inflation rates using monthly HICP data. Data are from the ECB's Statistical Data Warehouse, https://sdw.ecb.europa.eu/.

[41] Based on the monthly inflation rate between April and May 2021.

wants it both ways. That is, changing its mind when the facts change, not an unreasonable position given the circumstances, but failing to stand by a policy strategy that demands policy makers also to act in a forward-looking manner if they hope to credibly reach the 2% objective within a reasonable time horizon. Equally important, the ECB has not articulated why rapid tightening will be enough to reduce inflation to acceptable levels when a substantial portion of it is due to supply factors which are outside the scope of monetary policy.

As a result, financial markets and households are left navigating somewhat in the dark waiting for the ECB to provide some guidance out of the fog. The good news is that the euro area and global economies may well be more resilient to shocks than previously thought. Of course, history need not repeat itself in the event of a major new shock that will test the global economy's ability to withstand it. While acknowledging that the risks to the global economy are tilted to the negative, the latest update to the World Economic Outlook (IMF, 2023) does paint a less dire picture than just a few months ago.

Also commendable is the concerted effort by major central banks around the world to exit from ultra-low interest rates that were in place for too long. There will be another occasion to revisit not only the record of quantitative easing (QE) but to assess the symmetry of quantitative tightening (QT). For the time being, the ECB should attempt at quantifying economic resilience and incorporating alternative macroeconomic stress test scenarios while rightly insisting that the outlook must always be conditional. Nevertheless, the ECB should be more forthcoming about the destination, let's call it normalisation of monetary policy, even if we cannot be certain when or how we will get there or what normal looks like. Conditionality can be carried out successfully even if it means changing your mind when the economic environment does not develop as expected. After all, there is a war going on, and geopolitical risks that are difficult to forecast while inflation dynamics remain less well understood than we would like to.

As we mark a tragic one-year anniversary since the war in Ukraine began, the "realpolitik"[42] remains that the war Russia started seemingly shows no sign of abating. Indeed, as this is written, there may well be a new surge in fighting and more unknowns about the patience and steadfastness of the Western powers to manage the conflict. There is nothing wrong with a central bank that states it will do the best that it can and will learn from past mistakes. The latter must be acknowledged in a more fulsome manner[43]. The former requires more than humility. It requires educating financial markets and the public not only about the limits of monetary policy but the role of fiscal policy and elected governments to shoulder their responsibilities. There is a good reason economists[44] and policy makers[45,46] have, for decades, written about the critical role of the fiscal-monetary policy mix.

The rest of the paper is organised as follows. The next section explores three related issues. First, I identify gaps that will challenge the ECB's ability to reduce inflation and restore normalisation in monetary policy. I also explore the significance of persistence in inflation as this feature of the data

[42] This refers to politics based on purely practical considerations as opposed to, say, moral ones.

[43] Consider the following response by GC Board Member Isabel Schnabel in an interview with the Frankfurter Allgemeine Zeitung (FAZ) in December 2022. "Did the ECB make any mistakes during this process [in deciding to change the course of monetary policy]? We underestimated the persistence of inflation and initially did not take the signs of higher inflation seriously enough – not least because we were coming out of a phase in which the main risk had been that of too low inflation. But let's not forget that there was great uncertainty owing to the recurrent waves of the pandemic. There was concern that premature action by monetary policy might unnecessarily push the economy into another recession." The concern expressed here is not a new one but is one that central banks are expected to navigate.

[44] See e.g. Orphanides (2020), https://academic.oup.com/economicpolicy/article/35/103/461/5873157

[45] See speech by ECB Vice-President Luis De Guindos on 29 September 2022, https://www.ecb.europa.eu/press/key/date/2022/html/ecb.sp220929_1~99e5e3455a.en.html

[46] See speech by the President of the Bank of Portugal Mario Centeno on 29 September 2022, https://www.bis.org/review/r221003f.htm

presents a significant roadblock that may further threaten the credibility of the ECB. Overall, the conclusion reached is that the medium-term outlook is cloudy. That said, there are some silver linings in the outlook. Section 3 explores the tensions inherent in the narrative that the ECB is portraying to the public. Sadly, the central bank will not be able to successfully navigate through all tensions. However, it can attempt to mitigate their effects. Questions about the ECB's communication and some suggestions for improvement are also made. The paper concludes with a summary and a reminder of unresolved questions about the future of monetary policy the ECB will have to confront.

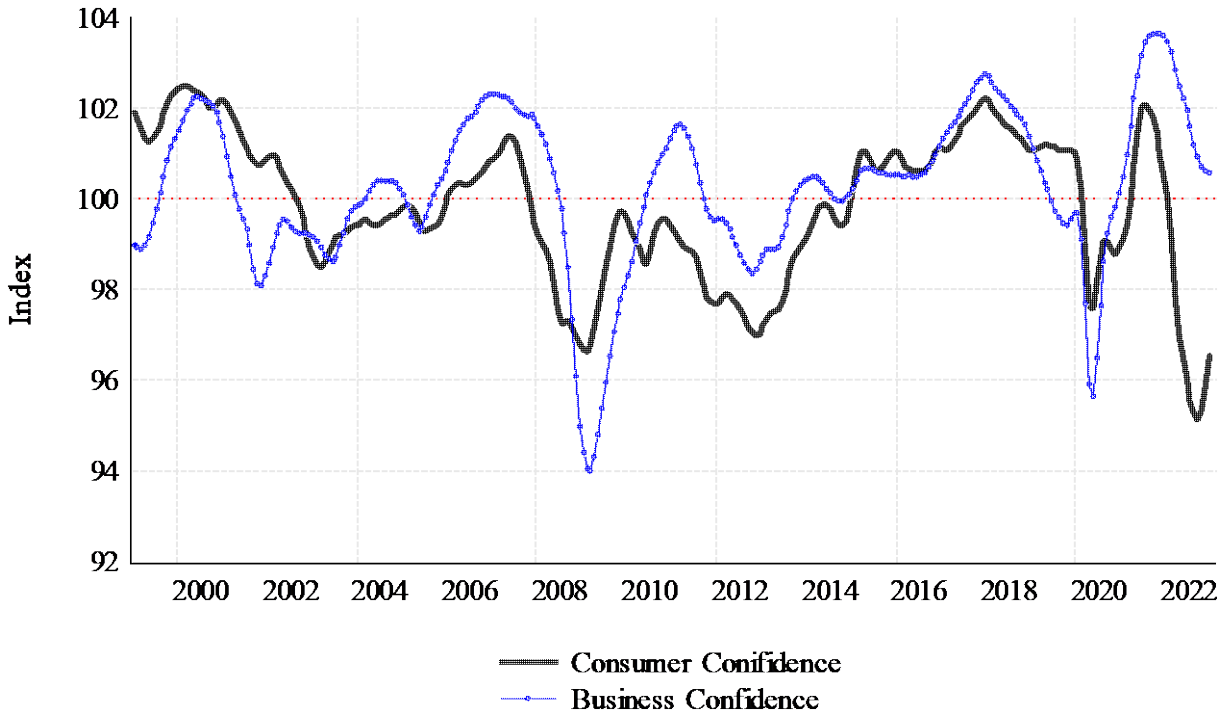
2. THROWING COLD WATER ON OPTIMISM?

2.1. Mind the gaps

To some extent, the mood in early 2023 is hopeful. Inflation has begun to recede since its peak in October 2022 when headline inflation reached 10.6% in the euro area. Since then, the inflation rate has fallen to 8.6% by the end of January 2023[47]. The latest GC decision[48] (2 February 2023) has not yet claimed victory over inflation and instead has chosen to double down on its determination to raise policy rates to assist in the return to its 2% medium-term objective as soon as possible. Finally, although energy prices have moderated since their peak in 2022, they remain, in some cases, considerably elevated relative to pre-pandemic levels[49].

If the foregoing developments represent the tailwinds that will lead to a return both to low and more stable inflation, together with a normalisation of interest rates, there are plenty of headwinds standing in the way. These can be broadly divided into two parts, namely factors over which the ECB has some influence, and ones that generate shocks the ECB must respond to and on which it likely has no influence whatsoever on. This section deals with the first set of factors which are expressed in the form of gaps to be defined below. The next section deals with the factors that are likely to cloud the outlook for the foreseeable future.

Figure 23: Euro area consumer and business confidence indicators



Source: OECD Main Economic Indicators.

[47] The source for these figures is the same as listed in footnote 3.

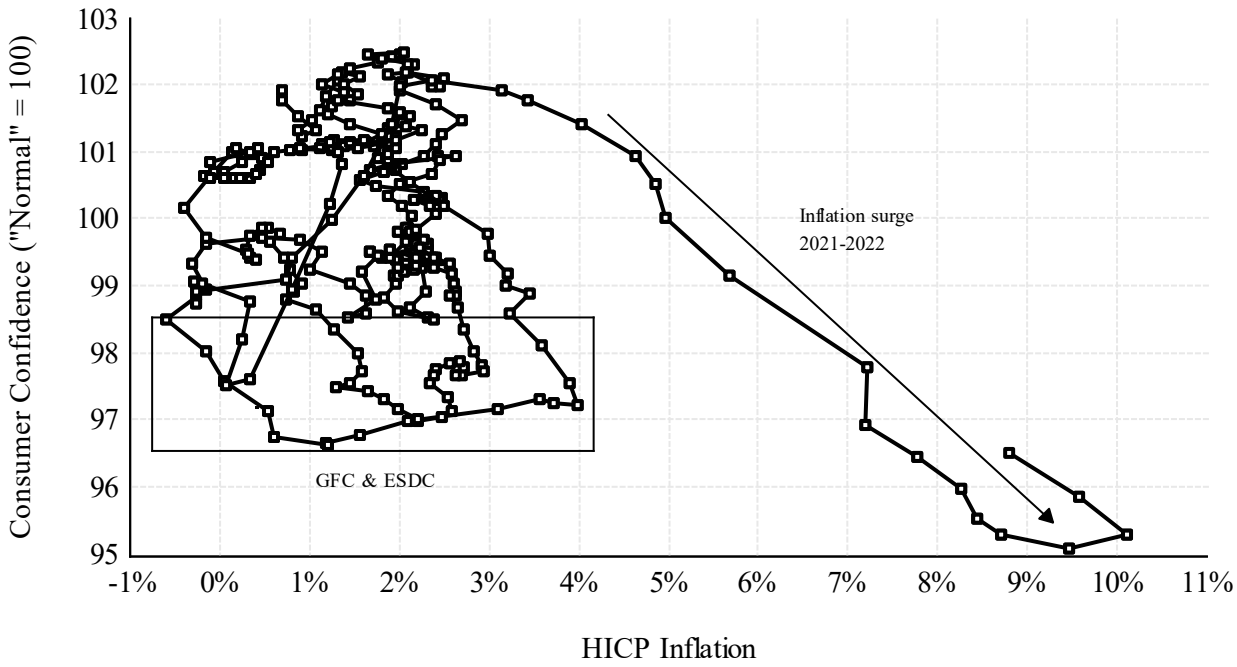
[48] See press release: https://www.ecb.europa.eu/press/pr/date/2023/html/ecb.pr230202~1a4ecbe398.en.html

[49] For example, West Texas Intermediate price per barrel was USD 76 at the end of December 2022 and stood at USD 60 per barrel in December 2019. Global Natural Gas prices for the EU were USD 29 per million metric BTU in December 2022 but USD 5 in December 2019. Alternatively, Henry Hub natural gas prices were USD2 .2 in December 2019 but USD5.5 in December 2022. Data are FRED (Federal Reserve Bank of St. Louis) Database, https://fred.stlouisfed.org/.

Notes: 100 is the "long-term average". An indicator above 100 represents a rise in consumers' confidence about future economic conditions, and vice-versa when the indicator is below 100.

Figure 1 plots two measures of economic sentiment, namely the Organisation for Economic Co-operation and Development (OECD)'s consumer and business confidence indicators. What is most striking about the indicators shown in Figure 2 is when and how much they diverge from each other, that is, the gap between consumer and business sentiment about the future[50]. Most of the time, since the ECB was created, movements in the indicators generally parallel each other. Notice, however, that there are three notable exceptions. The first one, of course, is the global financial crisis (GFC) of 2008-9, with the gap persisting through much of the euro area sovereign debt crisis (ESDC) of 2010-13. There is another temporary but noticeable gap when the pandemic erupts in early 2020. In each of these cases, even when there is a gap the confidence indicators almost always point in the same direction, namely in the direction of a downbeat view of the future. However, beginning in 2022, while business confidence sees better economic conditions in the future, consumer confidence is at the most pessimistic level since the launch of the common currency.

Figure 24: Consumer confidence and inflation in the euro area



Source: See Figure 1 for consumer confidence. HICP annualised inflation, constructed from monthly data, is from the ECB's Statistical Data Warehouse, https://sdw.ecb.europa.eu/.

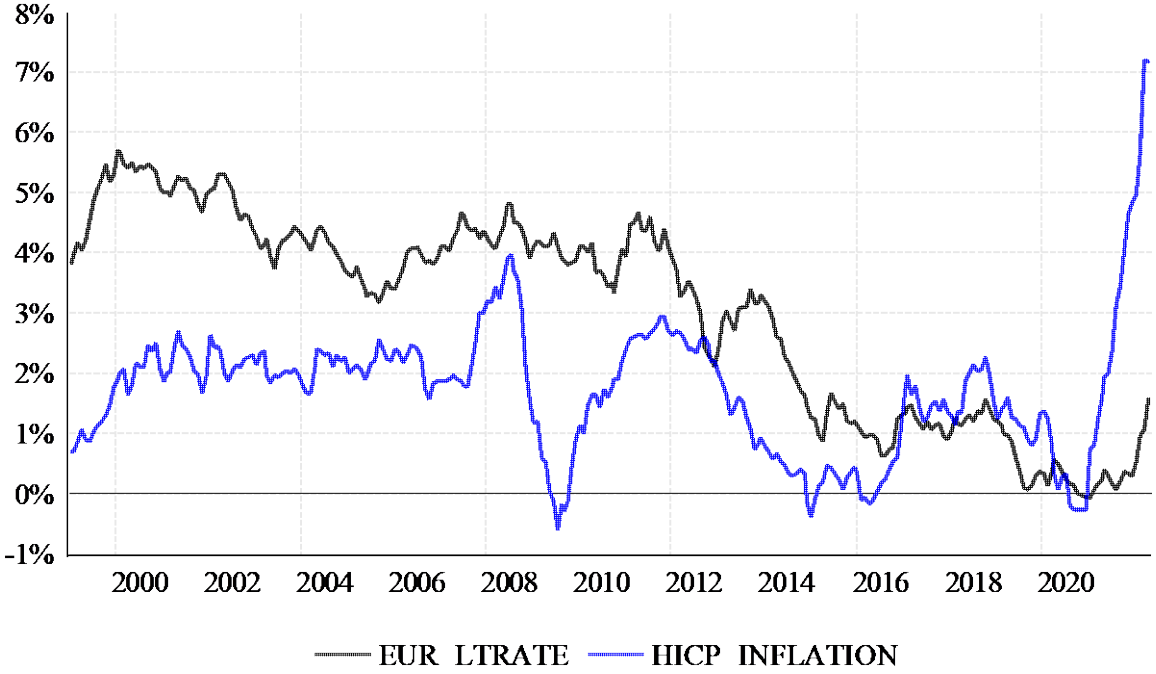
Notes: The rectangular box highlights the periods of the GFC and ESDC. HICP inflation is annualised rate of change in prices estimated as 100 times the fourth order log difference in the level of HICP.

There is a start towards a convergence of sorts in the two indicators, but it is, of course, unclear whether the two will meet above or below the dividing line between optimism and pessimism. If the indicators end up below 100 in the coming months this will test the public and politicians' patience with the ongoing tightening of monetary policy, calling into question the current hawkish tone of the central bank. Figure 2 plots consumer confidence against inflation. What stands out is how sharply and quickly confidence in the outlook deteriorated once inflation begins to surge in 2021-22. Indeed, the drop in confidence is remarkable especially when it is compared to the GFC and ESDC periods.

[50] The source of the divergence is, of course, the shifting balance between demand and supply factors that generate inflation. See, for example, Pasimeni (2022), and Di Giovanni et. al. (2022).

A second gap is the one seen in Figure 3 which shows the interest rate on long-term bonds in the euro area and HICP inflation since the single currency was introduced. Normally, the textbook description of movements in long-term interest rates is that, if they are seen as an average of sorts of short-term interest rates, higher expected inflation will raise the yield on long-term bonds, and vice-versa. This is a distilled version of the so-called expectations hypothesis of the term structure. An alternative interpretation is that if forward-looking financial markets perceive the ECB's commitment to reduce inflation not to be credible, then long-term yields will rise. Normally, the gap between the two lines provides a measure of the real interest rate, although one must also consider that, since there exist a variety of risks in holding long-term instruments, an unobserved risk premium is also part of the equation. Nevertheless, the patterns shown since 2020 represent a classic illustration of an inflation scare[51].

Figure 25: Inflation and the long-term interest rate in the euro area



Sources: for HICP_INFLATION is same as in Figure 2. EUR_LTRATE is the 10-year benchmark yield on government bonds. Data are from FRED (Federal Reserve Bank of St. Louis Economic Database), series https://fred.stlouisfed.org/series/IRLTLT01EZM156N.

Notes: see note to Figure 2.

In any event, by the middle of 2021, the gap between the two lines, which had been mostly negative since mid-2016 (i.e. suggestive of a negative long-term real interest rate), becomes wider. Despite the very recent decline in inflation (difficult to see from the monthly data at the end of the sample), there are no signs that financial markets have yet been persuaded that inflation expectations will decline as sharply as inflation has risen. Hence, the ECB's credibility is being questioned. To be sure there are other indicators but, as illustrated in Table 1, also the European Commission, and it is not the only institution, is not especially optimistic about inflation even in 2024, while growth prospects look poor in 2023 and

[51] The classic inflation scare idea, namely that long-term inflation expectations become un-anchored from a central bank's inflation objective is usually associated with Goodfriend (1993). Georgarakos et al. (2023) have recently admitted, relying on the ECB's Consumer Expectations Survey, that medium-term expectations have become less well anchored. The near future will inform us whether these will have breached the threshold from less well anchored to unanchored.

are middling at best for 2024[52]. Indeed, the downward revisions in growth for 2023 and the large upward revisions for the same year in the European Commission's forecasts suggest a companion gap to the one displayed in Figure 3.

Table 3: Economic forecasts: Select euro area Member States and the euro area

	2020		2021		2022		2023		2023		2024	
	G	INF	G	INF	G	INF	G	INF	G	INF	G	INF
Germany	1.0	1.2	1.0	1.4	4.6	2.2	1.7	1.7	-0.6	7.5	1.4	2.9
Spain	1.5	1.1	1.4	1.4	5.5	2.1	4.4	0.7	1.0	4.8	2.0	2.3
France	1.3	1.3	1.2	1.3	3.8	2.1	2.3	1.4	0.4	4.4	1.5	2.2
Italy	0.4	0.8	0.7	1.1	4.3	2.1	2.3	1.4	3.8	8.7	0.3	6.6
Netherlands	1.3	1.4	1.3	1.5	3.3	2.2	1.6	1.5	0.6	4.2	1.3	3.9
Euro area	1.2	1.2	1.2	1.3	4.3	2.2	2.4	1.4	0.3	6.1	1.5	2.6

Sources: European Commission Economic Forecast, Autumn 2019, Autumn 2021, and Autumn 2022 editions. See https://economy-finance.ec.europa.eu/economic-forecast-and-surveys/economic-forecasts_en. The forecasts are for the calendar year in question. The two forecasts for 2023 are from two consecutive editions of source listed above. The Autumn 2019 edition (pre-covid) is used to show forecasts for 2020, 2021; the Autumn 2021 edition is used for 2022, 2023 forecasts and the Autumn 2022 edition is used for the second set of 2023 and the 2024 forecasts.

Note: G is the annual growth in real GDP; INF is the annualised HICP inflation rate.

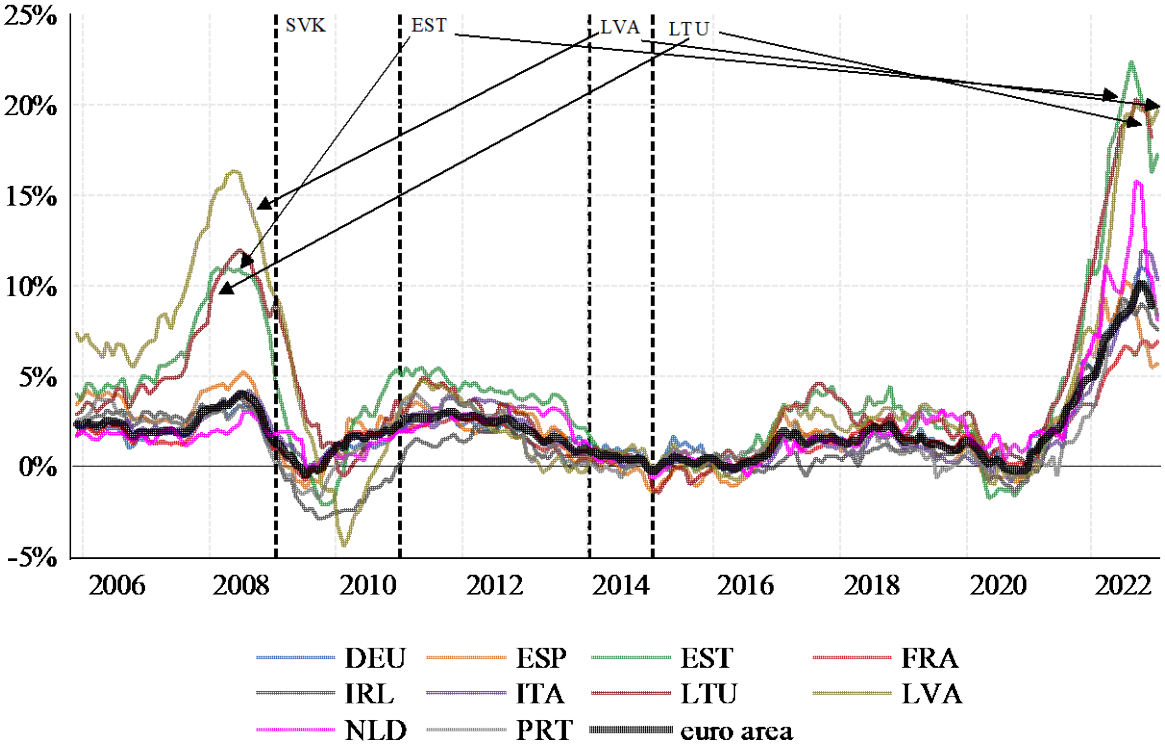
Figure 4 illustrates the gap in inflation rates between euro area Member States. The gap between inflation in the Baltic states and much of the rest of the euro area is at levels last seen well before Estonia, Lithuania, and Latvia adopted the euro. Indeed, the inflation gap, or spread, is significant because it remains large even as inflation shows early signs of declining, as shown in Figure 4. Of course, the response is that the ECB can only carry out a single monetary policy. The problem, however, is not one that involves only monetary policy, at least not immediately. Instead, it is potentially a political problem for the ECB and may even become a financial stability problem not that different from the mini crisis faced in 2020 when the spread between German and other yields, especially the Italian ones, rose sharply. ECB President Lagarde's reaction ("The ECB is not here to close spreads"[53]) was well known, as was the ECB's U-turn shortly thereafter ("We will absolutely fight fragmentations in markets"; Clinch, 2020). Since inflation has a way of showing up in interest rates, this is also a gap worth considering[54].

[52] The Winter 2023 edition of the European Commission's forecasts improvement but these are marginal at best. https://ec.europa.eu/commission/presscorner/detail/en/ip_23_707. The ECB's own projections could also have been used to make a similar point. See, https://www.ecb.europa.eu/mopo/strategy/ecana/html/table.en.html.

[53] See Press Conference after the 12 March 2020 Governing Council meeting https://www.ecb.europa.eu/press/pressconf/2020/html/ecb.is200312~f857a21b6c.en.html.

[54] Gern et. al. (2022) in a recent Monetary Dialogue paper also investigate inflation gaps noting the poor position of Baltic states. That said, the authors' conclude that gaps in core inflation do not appear out of the ordinary. Blot et. al. (2022) in the same Monetary Dialogue series of papers reach a similar conclusion. Even if this is the case the political economy problem noted here potentially remains. Elected governments may well ask what are the benefits of a single monetary policy that permits large variations in inflation without some political mechanism that mitigates the economic impact of such divergences.

Figure 26: Selected inflation rates in the euro area



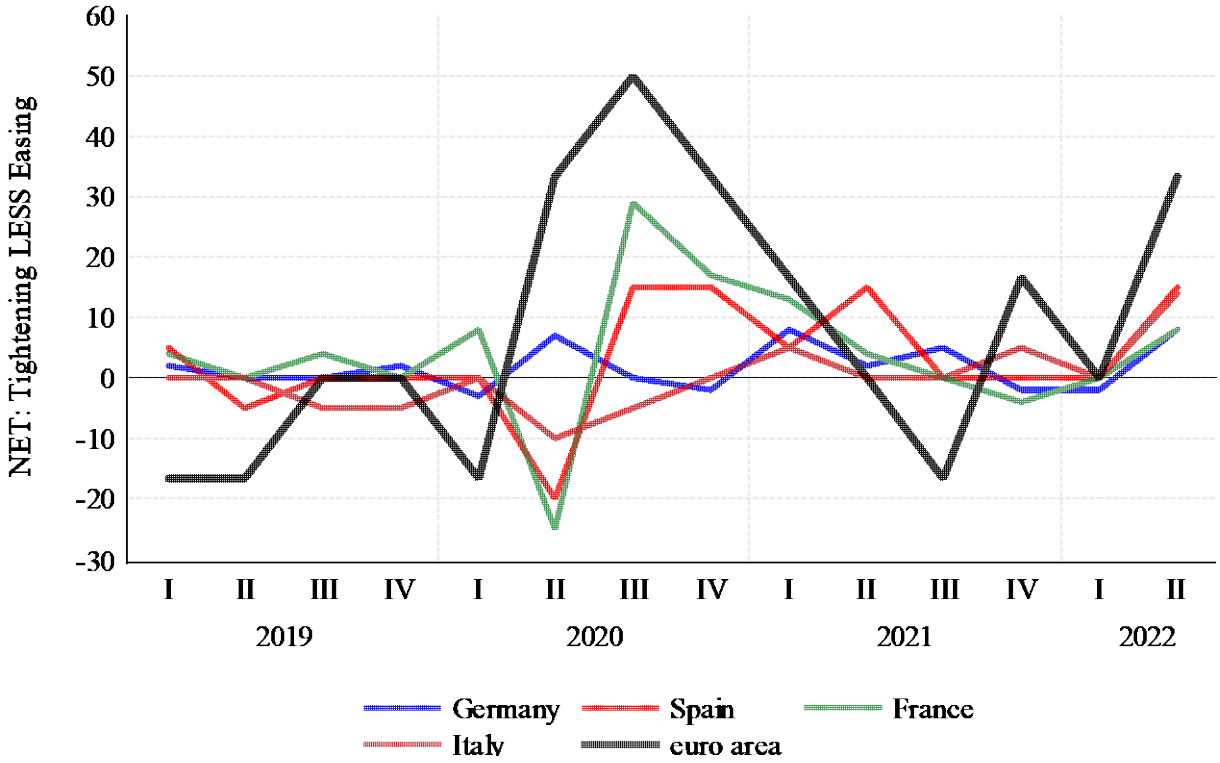
Source: Same as for Figure 3.

Notes: HICP inflation is calculated as explained in the note to Figure 3. The three letter ISO-code identifies the countries examined. DEU=Germany, ESP=Spain, EST=Estonia, FRA=France, IRL=Ireland, ITA=Italy, LTU=Lithuania, LVA=Latvia, NLD=The Netherlands, PRT=Portugal. The vertical dashed lines show the year the euro was introduced in the countries shown in the Figure.

Yet another gap is illustrated in Figure 5 which shows the forward-looking (i.e. 3 months ahead) expectation on the part of senior loan officers about whether they perceive a tightening or loosening of credit conditions. The data in Figure 5 represent an overall measure of net conditions for all enterprises in Germany, Spain, France, Italy, and the euro area[55]. Conditions were reasonably neutral before the pandemic erupted in 2020 and tightened sharply during the first two quarters of the same year everywhere. The tightening in the euro area as a whole was however especially sharp. Germany was the only exception. Thereafter, the pandemic emergency purchase programme (PEPP) undoubtedly contributed to loosen lending conditions to enterprises. However, as inflation's grip tightened in 2021, net conditions rose sharply in all countries shown beginning in 2022. Yet, the rise is most pronounced in the single currency area. The combination of tightening and QT is likely to lead to more tightening of lending conditions. The net tightening indicator for the euro area is already approaching levels reached when the pandemic raged and is already close to levels attained during the ESDC. Only the era of the GFC dwarfs by a wide margin the data shown in Figure 5.

[55] Several other similar surveys exist such as ones covering major forms of lending to households, as well as ones that distinguish between supply and demand for loans. After some neglect the critical importance of these surveys is now widely accepted by academics and central bankers. See, for example, Filardo and Siklos (2020) for recent international evidence.

Figure 27: Bank Lending Survey: Overall for enterprises



Source: ECB Bank Lending Survey, ECB Statistical Data Warehouse, https://sdw.ecb.europa.eu/.

Notes: The data show the 3-months ahead expectation of bank senior loan officers. Those who believe conditions will be looser provide a negative value while positive values signal tightening. The NET value is the difference between net tightening and loosening expectations.

While the gaps discussed above need not mean that the fight against inflation will ultimately be unsuccessful, they do suggest multiple threats. The ECB is, by Treaty, considerably more autonomous than other major central banks but it can only use moral suasion to keep fiscal policy from further complicating the task of inflation control. Furthermore, even if the principal task of the ECB is inflation control, it cannot ignore a major downturn if it were to emerge. As Table 1 illustrates, the margin between low, but positive, growth and negative or recessionary growth is a small one.

Unfortunately, beyond the immediate threats from the gaps discussed in this section, there are other short- to medium-term threats to inflation and the economic outlook more generally. I turn to those next.

2.2. The outlook is cloudy

It comes as no surprise that the ongoing war in Ukraine is the short- to medium-term issue that most clouds the outlook. From a purely economic perspective, the war creates conditions for more domestic spending. Some of this is in the form of military spending. According to the World Bank's Development Indicators, military spending as a percent of GDP has fluctuated relatively little in the EU since at least 2007 when it reached 1.45%, while the same figure for 2021, before war in the Ukraine began, was 1.53%. In the case of the United States, the same figures are, respectively, 4.08% (2007) and 3.48% (2021)[56]. In the case of Ukraine, the US Council on Foreign Relations estimates that almost USD 23 billion

[56] The World Bank Development Indicators can be found at https://databank.worldbank.org/source/world-development-indicators.

(equivalent to approximately EUR 21.8 billion) has been sent by the US in military aid while essentially the same amount has been sent in various other forms (i.e., humanitarian and financial assistance; see Masters and Merrow, 2022). In contrast, the EU's military aid is relatively smaller so far, with up to EUR 18 billion committed through macro-financial assistance for non-military purposes in 2023[57]. Comparisons between the two are difficult since the military is largely the sovereign responsibility of Member States. However, assuming existing pressures on EU governments remain, additional fiscal strains from military expenditures are likely. It may not be an arms race as such, but rather a race that tests supply chains as NATO more generally applies moral suasion to maintain, if not increase, support for the war effort in Ukraine. Whether these developments delay the return to low and stable inflation is unclear. Even if expenditures as a percent of GDP to support Ukraine, remain small, one uncontrollable factor is how business and consumer sentiment will respond to the continuation of the war. Furthermore, potential reconstruction costs are likely to be considerable[58].

At the time of writing (March 2023), there is renewed hope that the end of China's zero COVID-19 policy will usher in potentially more global growth either in the form of expansion in trade or the stimulus provided by greater openness in travel and commercial arrangements with the outside world. However, it is unlikely that a stimulus program will have positive global spillovers of the magnitude that the global economy benefited from during the GFC. China has its own serious economic challenges beyond the adjustment to living with COVID-19. This is not the place for an analysis of China's potential contribution to global growth in 2023. However, it suffices to say that a combination of geopolitics and domestic economics will severely limit how much added global growth will come from China. The former is linked to ongoing economic tensions between the US and China; the latter is explained by the suddenness and infancy of the ending of the zero COVID policy. On the geopolitical front the movement toward "friendshoring"[59], although only in its infancy, is likely to continue. The resulting fragmentation of trade relationships will take years to emerge and its economic impact to be properly understood. Domestically, constraints on growth through infrastructure and real estate are also likely to place limits on domestic growth. The good news is that the outlook by most professional and institutional forecasters, including central banks, is still mainly guided by the remnants of the zero COVID-19 policy[60]. Hence, the outlook on this score is not overly optimistic. Of course, this point of view can change as 2023 progresses. Instead, the challenge is preventing policy makers and forecasters from relying on the past behaviour of Chinese policy makers as a guide to the likely positive impact on global growth from China's actions. Regarding inflation we are similarly likely to see little impact in the short-run for the reasons already stated, that is, at first the effects from China's reopening are likely to be muted.

There is at least one more issue that looms large in the medium to longer term and it is one that also impacts countries outside the euro area, namely productivity. Alan Greenspan, former Chair of the Federal Reserve's Open Market Committee (FOMC), made a "great call" (Meyer, 2004) by predicting that the rise in US productivity in the 1990s, explained in large part by technical chain in information technology, would permit faster economic growth without triggering higher inflation. Based on the measure of growth in total factor productivity (TFP), that is, how much output is generated based on

[57] See the press release following the 20-21 October 2022 European Council meeting: https://ec.europa.eu/commission/presscorner/detail/en/ip_22_6699.

[58] See, for example, the following two reports by the CEPR: https://cepr.org/publications/books-and-reports/rebuilding-ukraine-principles-and-policies and https://cepr.org/publications/books-and-reports/blueprint-reconstruction-ukraine.

[59] This is the principle whereby supply chains are focused on trade between countries that are political, military or economic allies.

[60] For example, see the blogpost by the IMF's Managing Director Kristalina Georgieva, https://www.imf.org/en/Blogs/Articles/2023/01/16/Confronting-fragmentation-where-it-matters-most-trade-debt-and-climate-action/

inputs into production, there has been a slowdown in recent years in many parts of the euro area[61]. Whereas productivity growth on this score has risen in countries such as Germany, growth has been slow to negative for several years in France and the Netherlands. Even in Germany, TFP growth turned negative by 2019. Indeed, negative TFP growth has been a regular feature in another major economy of the euro area, namely Italy. One bright spot has been Spain[62]. In contrast, the US has usually done persistently better[63]. Higher productivity growth is critical since it offers one way to escape the low growth of recent years with the added bonus that it does not threaten the necessary disinflation from current high rates.

Finally, some mention ought to be made about labour market issues. The sharp rise in inflation has naturally led to higher wage demands but it is far too early to conclude that a wage-price spiral is in the offing. On the one hand, job vacancies are rising, ostensibly because of a combination of demographic factors (e.g. retirements) and continuing adjustment to the post-pandemic work life that includes, where appropriate, some balance between work from home and office work[64]. While central banks have been tempted to speak about wage increases fuelling higher inflation, leading to a backlash[65], it is also the case that real wages have not performed well. Indeed, real wages have declined in several countries. If the transmission mechanism of monetary policy works as expected, then the ECB is better off staying out of the fray and let tighter monetary policy via interest rates and QT do the necessary work. Discretion in this case is the better part of valour especially since cost-push inflation ideas, except possibly in the UK, were discredited long ago[66]. I briefly return to wage growth developments in the next section.

Clearly, there exist a variety of forces that impinge on the ECB and the fiscal authorities' ability to reduce inflation. Some are policy-related, as argued in the previous section, and can be influenced by ECB policy. Others are more medium- to longer-term influences on inflation that are outside the remit of the ECB. Before returning to the ECB's communication since the adoption of a more hawkish tone and tightening of monetary policy, I conclude with some discussion about what can be said on the dynamics of inflation, and the link between headline or HICP inflation and some of its most important constituents.

2.2.1. Inflation, its persistence, and its drivers

A good deal of the controversy over whether policy makers responded too late to the surge in inflation before making a U-turn from ultra-easing to rapid-tightening centred around the behaviour and signals sent by inflation. But which inflation rate? When inflation is low and stable policy makers could focus on headline and core inflation measures as these tend to converge towards each other over time. When the ECB and other central banks did step in to tighten monetary policy, a search began for clues among the various components that make up headline inflation, especially when what appeared to take place

[61] The analysis the follows is based on data up to 2019 from Feenstra et. al. (2015). The data can be downloaded from www.ggdc.net/pwt.

[62] Another potential bright spot is that labour productivity in the euro area, that is real GDP per hours worked, has been recovering quickly, though by the end of 2022 levels remain near or just below ones attained before the GFC or at the start of the ESDC. This interpretation is based on data obtained from the ECB Statistical Data Warehouse.

[63] As might be expected, there exists more than one way to estimate TFP growth. For example, for the US, quarterly estimates of TFP growth published by the Federal Reserve Bank of San Francisco (that relies on a different methodology) finds TFP growth turned negative in 2022. The data can be obtained from https://www.frbsf.org/economic-research/indicators-data/total-factor-productivity-tfp/.

[64] Data from FRED reveals, since approximately 2000, a positive trend in job vacancies in, for example, Germany, France, and Spain. See, respectively https://fred.stlouisfed.org/series/LMJVTTUVDEM647S, https://fred.stlouisfed.org/series/LMJVTTNVFRM647S, and https://fred.stlouisfed.org/series/LMJVTTUVESM647S.

[65] Arguably, the clearest example of central banks asking workers to limit wage demands in order to lessen the chances of a wage-price spiral are the comments made by Andrew Bailey, Governor of the Bank of England, in 2022 in a BBC interview. See Gilchrist (2022).

[66] See the early survey by Laidler and Parkin (1975) on demand-pull versus cost-push explanations of inflation.

in commodity and energy markets began to spread into the rest of the economy. Lane's (2022) exhaustive analysis is a good example of the pivot away from analyses of the macro dimensions of inflation to its potential micro determinants. Of course, many of these developments can be explained by the early stand the ECB and other central banks took that the initial post-pandemic inflation surge was expected to be transitory. When it emerged that inflation would remain elevated for some time, economists and other observers went back to an old question, namely how persistent is inflation?[67]

Table 2 considers a very simple but widely used series of tests dealing with the time series properties of various measures of inflation. It should be noted that there are many more indicators that could have been used and other models that could be specified to model inflation. Sadly, the profession is still working with incomplete theories of inflation[68].

The first set of tests asks how the various indicators of inflation are influenced by their immediate history. The simplest way to model this view is to assume that this year's inflation rate is determined by last year's inflation rate and a residual that is unexplained and, hence, assumed to be zero in average[69]. There are at least three striking conclusions from the first two columns of test results.

First, other than for energy-related inflation rates, there is a very high degree of persistence in various versions of headline and other indicators of HICP inflation that exclude food, energy, both, or focus on goods, services, and so on. Indeed, in a couple of cases (viz., processed food, HICP excluding energy) there is the hint of explosive behaviour (the estimated coefficient is greater than one) although, in practice, it is unlikely[70].

Second, inflation persistence is subject to breaks, that is when the relationship between current and past inflation changes temporarily. Indeed, in more than half of the cases shown, the break occurs late in the sample, namely in September 2020, while an earlier break is detected in energy prices in July 2020. Given how these tests are constructed[71], it would have taken months for a data-dependent central bank to confirm the timing of the breaks. An added complication is that inflation persistence disappears in a couple of cases, namely HICP excluding food and energy prices (i.e. an indicator of core inflation) and in HICP for industrial goods, again excluding energy prices.

Third, all energy inflation indicators (i.e., HICP energy, Global Natural Gas prices, Henry Hub natural gas prices, West Texas Intermediate (WTI) crude and Brent crude prices), while highly persistent and significantly less than the others shown in Table 2, are not subject to any breaks. Nevertheless, the overarching message of the Table is that inflation in its various guises, remains highly persistent even if we allow for interruptions due to large shocks (e.g., COVID-19).

[67] There is a long history associated with empirical investigations of the properties of prices. See, for example, Burdekin and Siklos (1999) who also cite the antecedents to their empirical analysis.

[68] Tarullo (2017), a former Federal Reserve Governor, is one of several central bankers who lamented the absence of a "working theory of inflation". Policy makers occasionally must make pragmatic decisions about how to think about expectations, beyond how theories and models conceive them to be formed, and in part also because they also need to evaluate how responsive the public will be to policy actions and communication.

[69] And its volatility is also assumed to be finite.

[70] Separate testing is required to reach a more definitive result (not shown) although explosive behaviour in these prices is highly unlikely. In addition, some estimates can be sample specific.

[71] Explanations and discussion are beyond the scope of this paper.

Table 4: Inflation persistence and the inflation process in the euro area: some estimates

Inflation indicator	Persistence		Stationarity	
	Timing of break	Parameter estimate (std. error)	Timing of break	Test statistic (p-value)
HICP - Headline	2020.09	0.97 (.02) 0.99(.03)	2021.12	-3.85(.21)
HICP - Food	None	1.03 (.03)	2022.02	-3.17(.58)
HICP - Processed Food	None	1.05 (.03)	2022.03	-3.62(.32)
HICP - Goods	2020.09	0.97 (.02) 0.98 (.03)	2021.12	-4.11(.12)
HICP – ex Energy	2017.04, 2020.09	0.98 (.02) 1.05(.02)	2022.03	-2.87(.75)
HICP – excl. Food & Energy	2017.04, 2020.09	0.98(.02) 0.09(.22)x	2021.06	-2.51(.90)
HICP – Services	2020.09	0.97(.02) 1.02(.02)	2022.06	-1.82(.99)
HICP – Industrial Goods excl. Energy	2016.07, 2020.09	0.94(.02) -0.35(.13)x 0.99(.04)	2022.03	-2.85(.76)
HICP - Energy	2020.07	0.85(.04) 0.72(.09)	2020.11	-4.87(.01)
Global – Natural Gas	None	0.83(.05)	2020.07	-6.95(.00)
Henry Hub Gas	None	0.75(.04)	2000.12	-7.15(.00)
West Texas Intermediate Crude	None	0.79(.06)	2020.04	-6.54(.00)
Brent Crude	None	0.78(.05)	2019.11	-6.29(.00)

Sources: European Commission Economic Forecast, Autumn 2019, Autumn 2021, and Autumn 2022 editions. See https://economy-finance.ec.europa.eu/economic-forecast-and-surveys/economic-forecasts_en.

Note: G is real GDP growth, INF is HICP inflation. Growth rates are annualised. The benchmark model used is an autoregressive model of order one (i.e., AR(1)). The location of breaks is based on the so-called Bai-Perron test (Bai and Perron, 1998). We limit the number of breaks to a maximum of 3, trim the sample by 10% so that no breaks can be found at the first and last 10% of the sample, impose a significance level of 1% to ensure that only major breaks are identified, and limit the breaks to ones that are temporary (i.e., innovation outliers trigger breaks). Tests for stationarity are so-called Dickey-Fuller unit root tests also subject to a single break. The Vogelsang and Perron (1998) test is used with the min-*t* statistic criterion used to choose the dating of the break. x means that the estimated coefficient is statistically insignificant.

Since levels of persistence in various inflation measures are very high, it is reasonable to ask whether it is more meaningful for policy makers to instead consider *changes* in inflation. Why? The persistence measures suggest the possibility that the statistical properties of the process driving inflation have changed over time. The breaks found in the data so far also point in this direction. Accordingly, the last

two columns of Table 2 display a test that asks whether a process that satisfies the desired property just outlined is better described by considering changes in inflation instead of the level of inflation instead[72]. The message from Table 2 is clear: all indicators of inflation are processes that have changed over time while energy inflation is the appropriate metric. This conclusion holds even if we allow for a break in the data. It should be noticed, however, that the break occurs very late in the sample whenever it is found except for energy prices where the break takes place in 2019 or in 2020.

What can we conclude? While the ECB might be excused for relying on data dependence before deciding on tightening monetary policy, the very high degree of persistence ought to have tempered the resort to temporary or transitory to describe the dynamics of inflation. Moreover, since the changes in the process describing inflation rates occur late in the sample, this can help explain why the ECB waited too long before changing the course of monetary policy. Nevertheless, the delay in responding to the forces that were underway also reinforces a point made earlier. Data dependence has its place, but a successful central bank first and foremost must be forward-looking. The ECB seems to have failed this test, admittedly a very difficult one to carry out.

Observers can, of course, argue that there are drawbacks to the tests presented above. Indeed, as is the case with all statistical test, there are limitations[73]. Accordingly, Table 3 presents a different set of tests. Since most, if not all, of the inflation indicators are related to each other, I next ask how some of the key indicators of inflationary pressure are related to each other in a statistical manner. Stated differently, if there exists a combination of inflation indicators that best describes how headline inflation evolves over time, what would it look like? Table 3 shows the factor loadings, that is the statistical relationship between the chosen indicators of inflation. The estimates are predicated on the assumption (supported by other testing not shown) that one can better understand the inflation process by extracting a single factor, we shall call it the inflation factor, that combines the individual components[74].

Table 3 indicates first, as did Table 2, that the inflation process experiences substantial changes over time. Second, that the relationship between core and headline inflation as well as the link between inflation in services and HICP inflation has also experienced substantial changes over time. The samples are chosen based on historical events. The first column provides the results for the full sample. The second column for the period before the GFC. The third column combines the GFC and ESDC periods while the last column is the period after the worst of the ESDC has passed until just before the COVID-19 shock.

Note the loadings on HICP excluding food and energy for the full sample and the sub-samples shown. Clearly, the full sample results are largely driven by the post-GFC and ESDC samples. Similarly, the loading for HICP food and HICP services also experience large changes over time. Food plays a lesser role in the inflation factor pre-GFC while core inflation (i.e., HICP excluding food and energy) and HICP services depresses the inflation factor. Both these loading change sharply thereafter. Since the GFC and ESDC, all loadings have been positive, an indication that all the components of inflation considered contribute positively to explaining the inflation factor. Exercises such as the one reported in Table 3 are not uncommon. What is far less common is to examine how the relationship in question evolves over time. If this is not done, policy makers will make incorrect inferences about the dynamics of inflation.

[72] In more technical terms I am enquiring whether the various inflation measures are stationary in levels or in first differences. If the levels are non-stationary but first differences are stationary, the series in question is said to contain a unit root.

[73] Obvious limitations include the following: the tests are univariate (i.e., depend on inflation alone), the first set of tests imposes restrictions on the number and timing of breaks, while the last set of tests is limited to only one break.

[74] In technical terms this means extracting the first principal component from the inflation rates shown in Table 3.

And once again, as before, a strategy that relies excessively on data-dependence also increases the risks of policy errors.

Table 5: What drives inflation in the euro area: a factor analysis perspective

Inflation indicator	2000.04-2022.12	2000.04-2008.05	2008.06-2013.02	2014.01-2019.12
	Factor loadings			
HICP – Headline	1.000	0.892	1.000	1.000
HICP – Food	0.842	0.365	0.810	0.791
HICP – Goods	0.991	1.000	0.988	0.992
HICP – excl. Food & Energy	0.862	-0.379	0.499	0.330
HICP – Services	0.712	-0.386	0.333	0.344
HICP - Energy	0.547	0.443	0.321	0.594
Number of observations	277	102	67	72

Sources: European Commission's Economic Forecast, Autumn 2019, Autumn 2021, and Autumn 2022 editions. See https://economy-finance.ec.europa.eu/economic-forecast-and-surveys/economic-forecasts_en.

Note: Sub-samples were selected based on arguments discussed in the main body of the paper. Factor loadings are estimated via principal components (Ahn-Horenstein method) using maximum likelihood and restricting the number of factors to one.

3. THE ECB'S WAR ON TWO FRONTS: THE NARRATIVE

It is worthwhile considering the decisions made by the GC since June 2022 as these may provide additional clues about the effectiveness of monetary policy in the current environment. In what follows, the analysis is not based on treating text as data, which has become commonplace[75]. Instead, I rely on my own interpretation of the underlying tensions that exist between the aims of monetary policy and the desire to maintain financial system stability, based on the press release (PR), and policy statement (PS) that accompany each GC's policy rate decision together with the subsequent account of each meeting[76]. The aim is to provide constructive criticism of the ECB's approach to policy making.

Of course, there are other candidates for tensions emerging as monetary policy is tightened. The inherent tensions between monetary and fiscal policy, among others to be discussed below, are not new but are likely exacerbated in crisis or near crisis conditions. The Governor of the Bank of England, Andrew Bailey, neatly summarised the essence of some of the challenges central banks face when "events" - get in the way - in the case he cited the set of fiscal policy decisions made by the UK government in the autumn of 2022:[77] "There may appear to be a tension here between tightening monetary policy as we must, including so-called Quantitative Tightening (QT), and buying government debt to ease a critical threat to financial stability. This explains why we have been clear that our intentions are strictly temporary, and have been designed to do the minimum necessary." (Bailey, 2022). While there is no doubting that the Governor's intentions are clear, the record of central bank interventions since 2008 also suggest that the definition of "temporary", much like the "transitory" label applied to inflation, is elastic. Indeed, as we now see almost everywhere where QE has been implemented, there are often reasons to prolong the policy even if the net benefits are unclear. The same forces that motivated the present rapid rise in policy rates in the euro area and in other industrialised economies are fragile and can easily lead to another U-turn. There is little indication that the ECB is prepared for this eventuality.

Another challenge for central banks is that government interventions and support of energy markets, as well as other forms of income support, however necessary and well intentioned, will create distortions of their own which may suppress inflation in a manner the ECB is unable to predict. For example, one can imagine a surge in demand if the economic and policy uncertainty triggered by the war in Ukraine is, one hopes, quickly removed. Of course, this risks increasing inflationary pressures. The ECB has stated that it is determined to keep interest rates at restrictive levels until "we see that inflation (…) is going back to our target of 2% in a timely and durable manner"[78]. However, the interpretation of restrictive is in relation to very recent monetary history and not in terms of the usual metrics of positive real interest rate levels. Moreover, durability is a function of the inflation outlook and, as explained below, only once since June 2022 has the ECB's PR explicitly referred to the direction of change in inflationary expectations in numerical terms.

[75] In other words, I do not apply the growing number of techniques being deployed ranging from simple word counts to machine learning methods to analyse the content of documents.

[76] Monetary policy decisions, and related documents, can be found at:

https://www.ecb.europa.eu/press/pressconf/press_conference/html/index.en.html. One has to click on the calendar to obtain the documents associated with each policy rate decision.

[77] Or, as Andrew Hauser, Executive Director for Markets at the Bank of England put it delicately, the pursuit of QT led to an incident that "has a surprise new chapter." While rightfully celebrating how the Bank of England responded to debacle associated with the government's "Growth Plan", Hauser does not dwell on the fact that the same government swiftly abandoned its plan, thus eventually relieving pressure on the central bank.

[78] From the Bloomberg interview with Isabel Schnabel given on 15 February 2023. See https://www.ecb.europa.eu/press/inter/date/2023/html/in230217~936be841f2.en.html.

The argument made below is that, despite the earnest belief on the part of GC members that they have the policies in place to resolve a conflict between monetary policy and financial stability, this tension cannot always be resolved. Other things equal, the implication is that inflation will remain higher for longer and that policy rates will not be sufficiently restrictive especially if the war in Ukraine, and geopolitical risks more generally stand in the way, or monetary and fiscal policies work at cross-purposes. The risks of both eventualities becoming a reality cannot be ignored.

The aforementioned tensions are also reflected in the ECB's over-emphasis, otherwise known as central bank "speak", on the concepts of data-dependence and uncertainty to explain its actions. There is the added tension stemming from a desire to bring inflation down to the ECB's medium-term objective of 2% as quickly as possible, via policy rate rises and QT, while recognising that the economic and financial stresses that are created are unevenly distributed across the single currency area. As a result, the ECB is once again hostage to the moral hazard problem of stating its determination to reduce inflation but not convincing markets that it can or will do so at all costs if the euro area economy deteriorates too quickly and significantly.

Table 4 forms the basis of the main arguments outlined below. Since June 2022 the GC has met six times. July 2022 marks the beginning of the U-turn towards tighter monetary policy.

Table 6: Selected content in GC policy announcements: June 2022 to February 2023

Dates of GC decision	Monetary policy	Financial stability	Tension(s) between the two
9 June 2022	○ Data dependence; mentioned in PS; ○ Conditions are in place for the economy to grow; ○ Forward guidance (FG): Expresses an intention to begin raising the policy rate at the next meeting and raise them in future in a sustained manner; ○ War in Ukraine remains a downside economic risk while upside risks to inflation remain; ○ Wage growth is moderate and expectations are contained; ○ Neither PR nor PS mention the exchange rate.	• High volatility across all main asset classes; • Uncertainty permeates financial markets; • Financial conditions have worsened since December 2021; • Turning point reached in borrowing conditions.	▪ Have yet to be explicitly recognised or acknowledged.
21 July 2022	○ Data dependence mentioned in PS but not war in Ukraine; ○ PR increases by 50 not 25 bps, as previously expected;	• TPI is subject to conditionality; • Substantial tightening of financial conditions although they remain favourable.	▪ How do you square the circle of TPI with MP tightening and conditionality? ▪ Figure 5 highlights tension surrounding financial conditions.

	○ FG: more to come as normalisation of interest rates to continue ○ TPI introduced to blunt impact of policy rate increases; ○ Risks to inflation have intensified; ○ Fiscal policy mentioned but no pushing back; ○ Only the PS mentions the exchange rate.		
8 September 2022	○ Data dependence mentioned as is war in Ukraine; ○ 75 bps rise in the policy rate frontloads MP tightening; ○ FG: More PR rises to come ○ Fiscal policy should be temporary and targeted; ○ Ukraine not mentioned in PS; ○ Only the PS mentions the exchange rate.	• Financial conditions becoming tighter; • Interest rates are highly volatile.	▪ How to balance a steeper PR rise path with contributed downside economic risks? ▪ How to square continued data dependence with a promise of more MP tightening to come? ▪ Tightening amid belief that supply shocks are the main drivers of inflation; ▪ Tension between MP and fiscal policy surfaces.
27 October 2022	○ Meeting-by-meeting approach to GC decisions ○ 75 bps rise in PR; ○ FG: more PR rises to come. Ukraine not mentioned; ○ Risks to inflation on the upside and downside to the economy; ○ Inflation will exceed the 2% target for an extended period of time; ○ Repeats call that fiscal measures should be temporary and targeted; ○ Only the PS statement mentions the exchange rate.	• Changes to TLTROIII; • Credit standards have tightened; • Scarcity of good collateral	▪ Need to reduce inflation while preventing downside risks from materialising; ▪ No indication about how the two are to be calibrated; ▪ Tension between MP and fiscal policy a continuing threat.
15 December 2022	○ Data dependence in PS not war in Ukraine; ○ 50 bps rise in PR;	• Global financial conditions ease; • Rebound in appetite for risk;	▪ Protecting growth prospects risks negatively reacting to loss of confidence

	○ FG: revisions to outlook signal future PR increases. Upside risks to inflation continue; ○ Suggests cost-push factors at play; ○ Fiscal policy warning not in PS; ○ Only the PS mentions the exchange rate.	• Interest rate expectations conflict with domestic economic developments; • Financial stability environment deteriorated since June 2022.	(financial markets and consumers); ▪ Easing of financial conditions risks adding inflationary pressures; ▪ Intentions of ECB at variance with financial market expectations.
2 February 2023	○ Data dependence continues but no mention of war in Ukraine; ○ 50 bps rise in PR; ○ FG: stay the course in raising PR. First signs of a possible pause; ○ China rebound is introduced as a factor; ○ Wage growth seen in a positive light; ○ Repeats call that fiscal measures should be temporary and targeted; ○ Neither the PR nor the PS mention the exchange rate.		▪ Economic recovery expectations conflict with further promises of MP tightening but no clear destination; ▪ Wage commentary may not square with inflation expectations; ▪ Does the war not leave open unspecified risks of a U-turn?

Source: https://www.ecb.europa.eu/press/pressconf/press_conference/html/index.en.html.

Note: Author's interpretation based on content of monetary policy decisions, namely the press release (PR), the policy statement (PS; excluding the Q&A), and monetary policy account (AC). TPI is the ECB's transmission protection instrument.

There is little doubt that the written material provided at the conclusion of each GC meeting is rich in content. And there is also no doubt, as pointed out above, that tensions between monetary and financial stability policies, on the one hand, and monetary and fiscal policies, on the other, cannot always be avoided. Nevertheless, as the column in Table 4 labelled "Tension(s)" indicates, there is considerable lack of clarity about:

1. The extent to which upside risks to inflation conflict with downside economic risks. Considering the ongoing debate over the shape of the Phillips curve and occasionally contradictory evidence on this score, it would be helpful if markets and the public knew better policy makers' stance on the question;
2. There is an absence of clarity about tail risks. Notably, as seen from Table 4, concerns stemming from the impact of the war in Ukraine seems to have dissipated greatly since June 2022. Does the GC know something markets do not? Or, is it a matter of "out of sight, out of mind" in an effort to prevent the un-anchoring of inflation expectations and keep the focus on the need to reduce inflation as quickly as possible?
3. There seems to be little or no recognition that the oft-mentioned high interest rate volatility phenomenon in the accounts of the GC meeting may partly be traced to the lingering doubts

about how far and how fact the ECB will go in raising the policy rate. Furthermore, pre-pandemic there was consensus among policy makers and academics that monetary policy ought not to surprise markets, unless it is absolutely essential. This strategy appears to have been shelved for the time being without a clear explanation. Regarding the destination for the policy rate, while GC and EB Board members are understandably reluctant to provide a precise policy rate level, they can easily provide some historical context.

For example, the period from 2000 to 2006 saw average HICP inflation of 2.13%, i.e. very close to the current medium-term objective and relative stability[79], while the policy rate averaged 2.94% over the same period[80]. For the period July 2022 to February 2023, the mean ECB policy rate is 1.57%[81]. The output gap was close to zero during the 2000-2006 period[82]. With real rates still very much negative[83], the ECB must be hoping that inflation will fall far more quickly than the policy rates required to generate an appropriate equilibrium level for the real interest rate. In any event, policy makers can use the period 2000-2006 to draw parallels, if any, or contrasts with the current environment. To simply state that the current inflation environment is different is not enough when the last decade and a half has brought both exceptionally low and high inflation rates. Financial markets and the public respond to convincing and credible narratives.[84]

One additional contribution to the occasionally exaggerated emphasis of the ECB on how "unprecedented" the current environment is can be gleaned from Figure 6. Averaging policy rates from seven advanced economies, the top portion of the Figure suggests that only the steepness of recent policy rate increases is unusual, at least since 1999. Indeed, the 2000-2006 period highlighted above also contains large global swings in policy rates. The bottom portion of Figure 6 shows the sum of policy rate changes for the same seven economies. Once again, the suddenness and, to a lesser extent, the size of policy rate changes stands out. This is a reflection of the synchronised increases. However, when accumulated over time, the series of persistent, though smaller, policy rate increases from 2004 to 2006 far exceeds what central banks have done since the summer of 2022. The main difference is that monetary policy tightening was less synchronous back then.

4. ECB commentary about fiscal policy coming into conflict with monetary policy is vague and unhelpful. No hints are given about what temporary support means (until the end of the war? The return to 2% inflation?) nor who are the most vulnerable. When the Maastricht Treaty was created and the Stability and Growth Pact was negotiated, the concern was about the overall fiscal stance (i.e. deficits and debt) and not the composition of fiscal policy.

5. Finally, although Lane (2023) highlights the exchange rate is a "key metric of financial conditions" and a "material drive of economic activity and inflation", none of the PR since June 2022 mentions this factor. One has to look at the PS for some commentary. While the role of the exchange rate is mentioned in 4 of 6 GC decisions, one can wonder why it is not mentioned

[79] With a standard deviation of 0.24%.

[80] In addition, an estimate of the average natural rate of interest (Holston et al., 2017) over this period is 2.11% (standard deviation of 0.28%) very close to the hypothesised value in standard specifications of the Taylor rule.

[81] With a standard deviation of 0.97%.

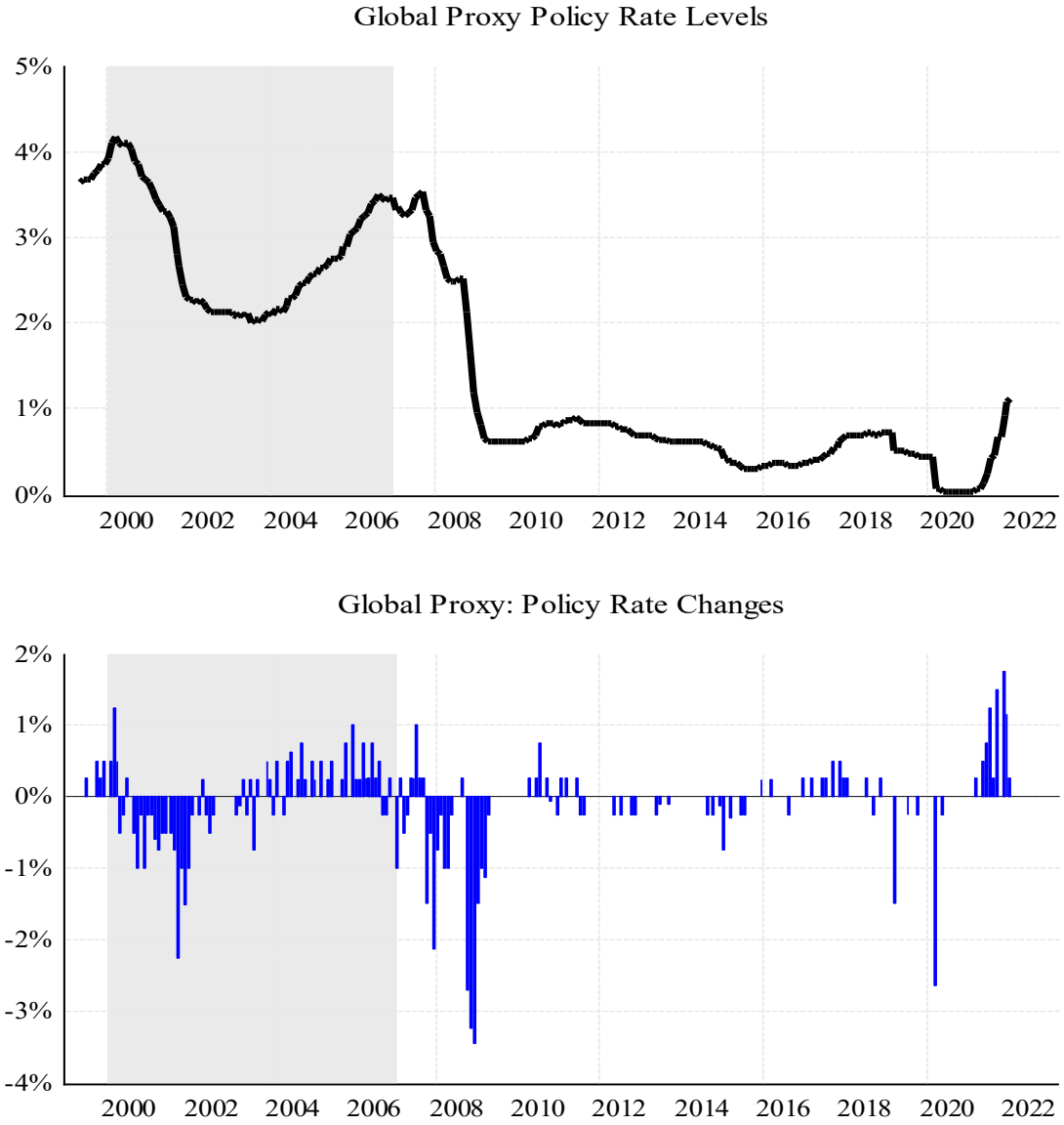
[82] With a mean of 0.15% and a standard deviation of 0.48% (Holston et al., 2017).

[83] The average current real policy rate for the July to December 2022 period is -7.86% (standard deviation is 0.87%). This is down from a peak of -8.86% reached in October 2022.

[84] The classic reference is Shiller (2019).

more often in the PR. If the exchange rate is as important as claimed, one might have expected this consideration to play a more prominent role in the PR[85].

Figure 28: Global policy rates and policy rate changes



Source: BIS, https://www.bis.org/statistics/cbpol.htm?m=2679 and author's calculations.

Notes: Monthly policy rates from the USA, the euro area, Canada, United Kingdom, Japan, Switzerland, and Korea. Policy rates are averaged to produce the top figure. The bottom graph aggregates monthly changes in policy rates. A positive value means rising policy rates; negative values signal a decrease. The height of the bars indicates how synchronous policy rate changes are.

[85] Perhaps the effective downplaying of the exchange rate owes something to the fact that a plot of the EUR/USD nominal exchange rate since 1999 does not suggest that the recent depreciation stands out from earlier episodes of depreciation.

4. CONCLUSION

The economic and geopolitical events over the past year have been nothing short of remarkable. The remit for this edition of the Monetary Dialogue asks papers to identify the impact of the war in Ukraine and its spillovers on inflation and core inflation in the euro area, and to comment on the overall effectiveness and outlook for monetary policy over the medium-term.

After reviewing the policy challenges faced by the ECB, having analysed some of the components driving headline and core inflation, a critical analysis of the narratives implicit in GC decisions was presented.

Two broad policy conclusions can be drawn from the analysis of the preceding sections. They are:

(a) The ECB is no longer "behind the curve". Indeed, it can be argued that the switch from "wait and see" to "leaning hard against the wind" has been nothing short of dramatic. That said, various indicators examined also suggests that markets have doubts about how far the ECB will go and what constitutes policy normalisation. The gap between how monetary policy was conducted in June 2022 and the message conveyed by the GC in February 2023 is large. Unfortunately, and this applies to other central banks in advanced economies, the distance to achieving a stable and predictable inflation rate of 2% is a long one.

(b) Given (a), the ECB must be relying on its capacity to warn markets of its determination to tighten policy even further if it perceives medium-term inflation expectations becoming un-moored. This means that any policy rate change must contain the threat of an even larger change in the future and explains the most hawkish tone of the last press releases (and subsequent speeches). Unfortunately, this attitude can and does collide with the ECB's over-emphasising data dependence and uncertainty as checks against a potential U-turn.

Beyond the broad conclusions just described, there are three other lessons for policy to be drawn from the analysis in this paper. More specifically, there continues to be unresolved tensions between monetary policy and financial stability policy. The high inflation rates currently being experienced and the steps taken to date to reduce inflationary pressures come on the heels of many years of lower for longer policy rates. The series of crises since 2008 has led major central banks, including the ECB, to intervene in financial markets hoping to provide the healing time necessary for economies to resume healthy growth rates. As these "controls" are being removed, it can hardly be surprising that a more fragile financial system can come into conflict with the need to severely tighten monetary policy.

The war in Ukraine raises yet another tension, this time arguably with greater import for monetary policy, namely that fiscal policy, already loosened considerably due to the COVID-19 pandemic, is also proving challenging to be normalised.

Finally, the ECB's communication strategy has exaggerated how unique the current economic environment is. It appears unable to draw sufficiently on historical lessons to create a more credible narrative for markets and the public to fully comprehend both the dangers that lie ahead and what policy destination it is striving for. Supply shocks are not new, sadly neither are major geopolitical conflicts, nor is a fiscal policy under considerable stress from the accumulated effects of recent shocks. The ECB risks continuing to convey the wrong message to the public. Instead of making it crystal clear that it can only do so much, that reliance on policy cooperation with the fiscal authorities is essential[86], and that data dependence is necessary but not sufficient, it risks reacting to changes in expectations

[86] Given the ECB's constitutional position (i.e. its autonomy), it appears that the many (sovereign) fiscal authorities in the euro area and the central bank talk over rather than to each other. This raises potential governance questions that are outside the scope of the paper.

instead of shaping them. To be sure there are risks to shifting to a more forward-looking view when tail risks remain significant. However, this seems the only way to convince the public that current monetary policy strategy would lead to a dim future if the ECB does not remain ahead of the curve.

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The direct and indirect impact of the war on inflation

Christophe BLOT

Jérôme CREEL

François GEEROLF

Abstract

The paper explores the possible direct and indirect impacts of the Russian war in Ukraine on different measures of inflation in the euro area. It notably shows that the core inflation index is sensitive to energy and food prices, and questions its reliability for policy decisions. Finally, we discuss medium-term inflation prospects and the effectiveness of monetary policy measures.

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CONTENTS

LIST OF ABBREVIATIONS

APP	Asset purchase programme
ECB	European Central Bank
EU	European Union
GDP	Gross domestic product
IEA	International Energy Agency
HICP	Harmonised index of consumer prices
LNG	Liquefied natural gas
HWWI	Hamburgisches WeltWirtschafts Institute
MwH	MeggaWatt Hour
US	United States
USD	US dollar
y-o-y	Year-on-Year

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EXECUTIVE SUMMARY

- **The Russian invasion of Ukraine has led to a substantial increase in the prices of energy and food since the start of this war**, as Russia and Ukraine were major suppliers of energy and food for European countries.
- **However, energy and food prices were already increasing substantially before the start of the war**, perhaps for speculative reasons, but also more importantly because of the reopening of the economy following the COVID-19 pandemic. It is not easy to evaluate quantitatively how much is due to the war compared to alternative given the lack of a "clean" counterfactual. Despite the difficulty of constructing such a counterfactual, we endeavour on this exercise.
- **We show that the contributions of energy and food prices on headline and core inflation should not be overstated.** Had no rise in energy and food prices occurred, headline and core inflation would still have risen sharply.
- **Nevertheless, we show that increases in energy and food inflation lead to increases in headline inflation and core inflation.** Core inflation also depends on energy and food inflation through input-output linkages, automatic indexations of goods and services prices, and automatic indexations of wages. Core inflation is not a "clean" measure of aggregate demand, but also depends on supply shocks.
- **There are opposing forces influencing inflation dynamics, but downward pressures on inflation should eventually dominate.** In the medium-term, inflation has yet to diffuse through input-output linkages (producer prices) and automatic indexations of goods, services and wages, which tend to make inflation persistent. Similarly, price shields that have been put in place will be made less generous going forward, which could contribute to making inflation higher. At the same time, energy and food inflation is coming down quickly, as pressures on the natural gas supply, in particular, have substantially eased in the last few weeks. Overall, this force should dominate and inflation should come down.
- **Monetary policy measures are probably rather ineffective in slowing down inflation in the euro area**. Inflation is likely not mainly demand-driven, and second-round effects are so far relatively absent in the euro area. However, interest rate increases probably are effective in boosting the euro, reducing imported prices, and exporting some inflation to the euro area's main trading partners.

1. INTRODUCTION

The Russian invasion of Ukraine that started on 24 February 2022 and the related energy crisis have had a substantial effect on the euro area economy and inflation.

The prices of energy and food have increased substantially since the start of the invasion in all European countries due to this war, as Russia was a major supplier of energy. The sheer expectation of future shortages (especially in natural gas) has contributed to a significant increase in energy prices. The price of food has also gone up: directly, because Russia and Ukraine are major producers of agricultural products as well as indirectly because energy is an important input for the production and transportation of food. Energy and food inflation has further led to an increase in other prices, at least through the input-output structures (energy and food being input to the production of many goods and services), automatic indexations of many goods and services, and automatic indexations of wages.

Even though the positive effect on inflation of the Russian invasion of Ukraine is certain, knowing precisely how much of the inflation we currently experience is due to this invasion, and how much is due to other factors (reopening of the economy after COVID-19, supply bottlenecks, excess demand, etc.) is harder to assess. The reason is that the Russian invasion occurred at a moment when the economy was only starting to recover from the COVID-19-related economic shocks. In this paper, we attempt to shed some light on this debate. Drawing on a counterfactual exercise, we show that inflation would probably have been on a rising trend in 2022. Thus, while the war has fuelled inflation, it may not be the only cause. Prices of energy and agricultural goods had already increased in 2021, which would have still contributed to inflation in 2022 and beyond. It remains, however, uncertain whether some of these price increases were due to strategic behaviour by some actors in advance of the Russian invasion of Ukraine. Besides, inflation in the euro area has also been driven by other supply factors, as illustrated by Abbai et al. (2022). Moreover, demand factors have certainly played a role, although to a lower extent than in the United States (US) (see Ball et al., 2022). As exemplified by the recent assessment of Gonçalves and Koester (2022), both supply- and demand-driven components have impacted core inflation.

In this paper, we also spend some time examining some important drivers of fluctuations between headline and core harmonised index of consumer prices (HICP) inflation and show that the interpretation is harder than what is often being argued. For example, we show that core inflation is not a good measure of demand pressures *per se*: even core inflation tends to rise for mechanical reasons after an increase in energy and food prices, and so it is a mistake to view core inflation as a "clean" measure that central banks should attempt to target.[87]

Our analysis also allows us to anticipate the medium-term outlook for inflation. We argue that on the side of financial markets, existing monetary policy measures have overall been successful in slowing down the flow of credit and increasing its cost (particularly for homeowners and governments). Whether monetary policy has been successful in slowing down inflation is more subject to debate, although one might argue that slowing down demand might in the end exert lower pressure on energy prices.

[87] Core inflation is measured by the overall index excluding energy, food, alcohol and tobacco, as provided by Eurostat.

2. THE IMPACT OF THE RUSSIAN INVASION OF UKRAINE

2.1. Context

Even though not all restrictive measures were lifted in 2021, the world economy recovered from the deep recession of 2020. Growth has been characterised by a buoyant demand, notably for goods and therefore increasing energy demand. Energy prices started to increase and the monthly average market price for Brent crude oil went from USD 27 in April 2020 to USD 86 in January 2022. While the monthly average market price of gas was generally less volatile than the oil price, it rose in 2021 and reached a first peak at EUR 112.5 per megawatt-hour (MwH) in December 2021[88]. The rise notably stemmed from a reduction in imports from Russia.

The shock was amplified from February 2022 onwards. Within a few weeks, all energy prices went up. Oil prices reached a peak in June 2022. The price of gas exceeded EUR 300 per MwH during a few days in August 2022 and has decreased since then. The monthly average price in August settled at EUR 236, 1.8 times higher than the level observed in January.

The geopolitical situation has certainly contributed to this dynamic as Russia is an oil and natural gas producer. Uncertainty was acute for gas compared to the oil market. On the one hand, the European Union (EU) was heavily dependent on Russian gas, which accounted for 45% of EU natural gas imports in 2021 according to the International Energy Agency (IEA). On the other hand, the infrastructure needed to transport the gas or liquefied natural gas (LNG) made it very difficult to substitute between suppliers and redirect flows in the short run. The fear of shortages and the incapacity to substitute imports from Russia in the short run triggered an unprecedented shock to the price of gas on European markets. Finally, electricity prices also soared due to the alignment with the marginal cost of production of energy[89].

2.2. The direct effect on the energy and food sub-indices of the HICP

The war has reinforced the growing inflationary pressures that started to materialise in 2021. According to Eurostat, headline inflation in the euro area was already above the 2% inflation target at the beginning of 2022. The year-on-year (y-o-y) increase in prices reached 5.1% in January 2022. It has doubled since then reaching a peak at 10.6% in October 2022, with a significant contribution of energy prices of 4.5 percentage points (p.p) against 2.7 p.p. in January (Figure 1).

Since energy and food prices already increased in 2021, it would be misleading to consider that the rise of inflation in 2022 is entirely due to the geopolitical and economic situation resulting from the Russian invasion of Ukraine.

In order to disentangle the effect of past increases in the price of oil, gas, electricity and agricultural goods from the effect of the outbreak of the war, we simulate counterfactual scenarios where we assume that the raw prices of energy and food goods have been constant since February 2022. Thus, we explore whether the share of inflation stemming from the rise of raw prices of energy and food goods observed in 2022. To that end, we first estimate equations relating the energy and food indices of the HICP for the euro area to the prices of oil, electricity, coal, and food products measured by the Hamburgische WeltWirtschaftsInstitut (HWWI)'s overall food and wheat indices.[90] Those equations are

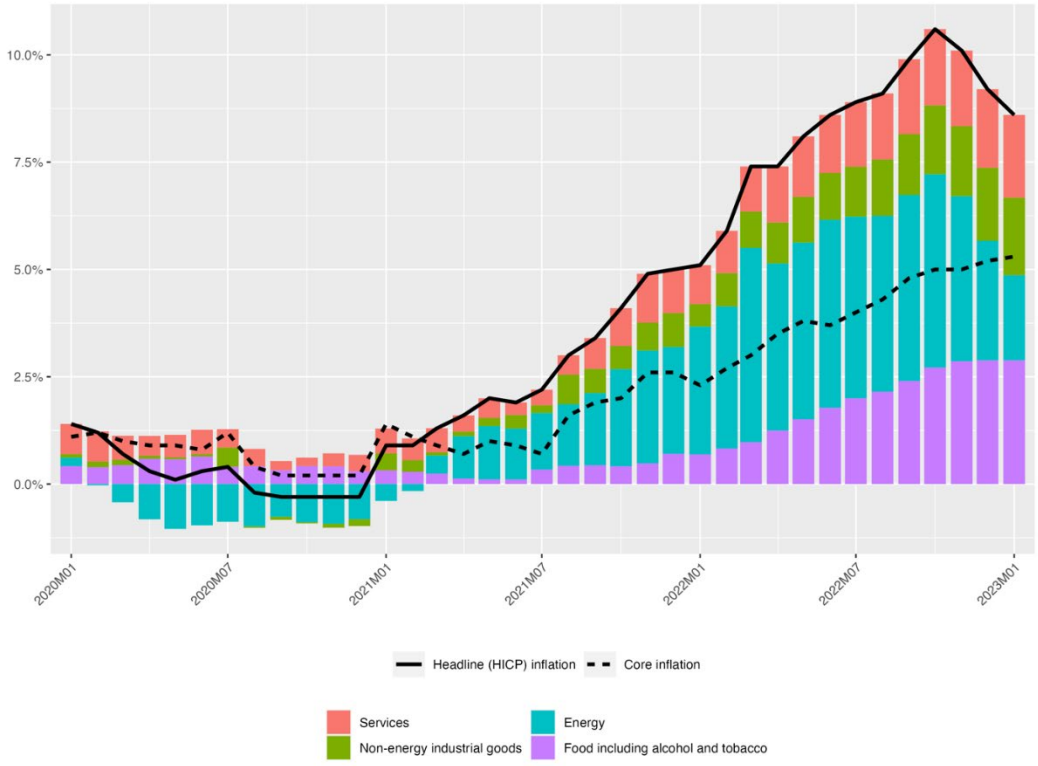
[88] From 2011 to 2019, the price of gas, measured by the Dutch TTF price of natural gas, fluctuated between EUR 11 and EUR 28.

[89] The correlation between the price of gas in the European market and the price of electricity is 0.97.

[90] As the price of gas is strongly correlated to the price of electricity, it is not considered in the equations since the data are available for a shorter time period.

estimated from May 1999 to December 2021 and are then used to compute the counterfactual scenarios for energy and food indices of the HICP from February 2022 onwards, where we set the price (in EUR) of oil, electricity, coal, wheat and the HWWI-Food index at their January 2022 level. The results of those estimations are shown in the Table 1 of the Annex.

Figure 29: Inflation and contributions to the inflation rate in the euro area



Source: Eurostat, authors' own elaboration.

Thus, we make the implicit assumption that all the changes in oil, electricity, coal, wheat and HWWI-food prices can be attributed to the invasion of Ukraine[91]. This is certainly an extreme hypothesis since these prices are highly volatile, so it is hard to imagine that they would have remained fixed had Russia not started the war. Given the hypothesis of constant prices of energy and food prices, the equations enable to provide a simulation of the energy and food components of the HCPI. The comparison between the observed sub-indices and the counterfactual provides some insights on the contribution of oil, gas, coal, electricity, wheat and HWWI-food prices to the inflation observed in 2022. The counterfactual scenario for the headline inflation rate is calculated from the counterfactual sub-indices for energy and food and by assuming that the core inflation (excluding energy and food products) has not been affected by the changes in the prices of oil, gas, electricity, coal and food products.[92] In this counterfactual scenario, the inflation of the energy index would have been more than 10 p.p. lower than observed inflation from May to October (Figure 8 in the Annex), respectively 1.5 p.p. lower since June for the counterfactual food index *vis-à-vis* the observed inflation (Figure 9 in the Annex). As the

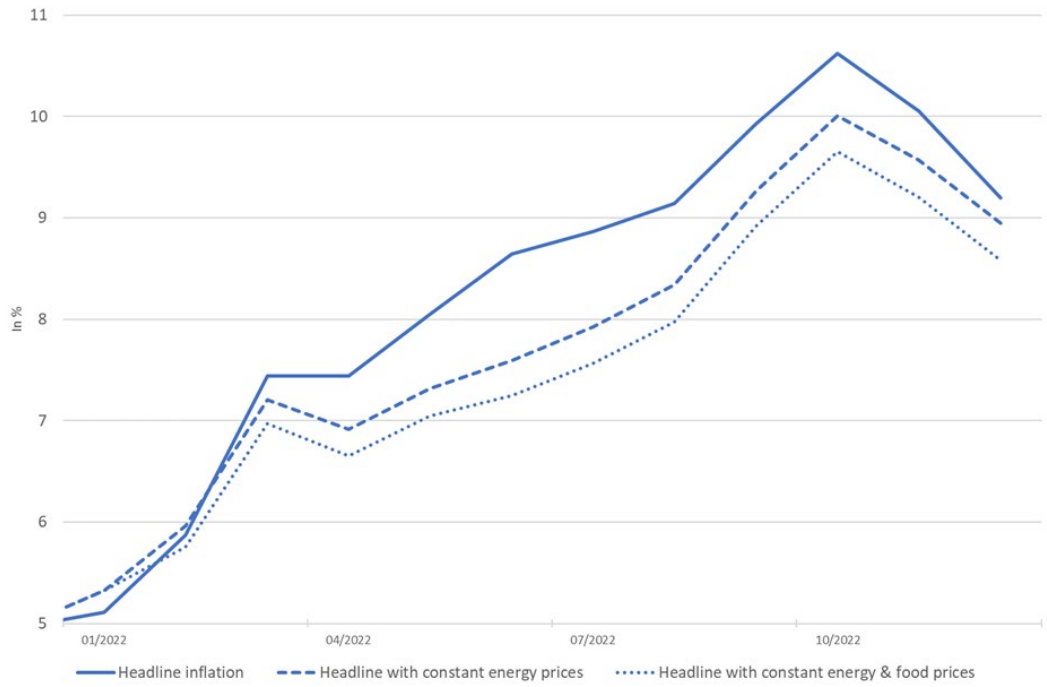
[91] Actually, the counterfactual scenario for the energy and food components of the HICP is computed in two steps. First, the models are used for out-of-sample forecasts with the observed raw prices of energy and food goods. This out-of-sample forecast for 2022 provides the baseline scenario according to our models. The counterfactual sub-indices are then given by the comparison of the out-of-sample forecast of the model estimated with constant prices and the baseline scenario.

[92] We remove this assumption later on.

prices of oil, gas, electricity and coal receded in the autumn of 2022, the difference between the observed energy index and the counterfactual index declined. This is not the case for the comparison relating to the food index. In December 2022, the food inflation in the euro area would have been 1.7 p.p. lower with constant raw energy and food product prices.

Sub-components of inflation, like those relating to energy and food, are certainly important, but headline inflation is key to assessing the impact of prices on households' purchasing power and on the real costs for firms. It is also key to anticipate future monetary policy shifts. Drawing on the monthly weights of energy and food products in the computation of headline inflation, we can provide some evidence of their overall contribution to inflation. The scenario with constant raw energy and food products would have led to lower inflation than the observed one in 2022 (Figure 2). The maximum difference (1.4 p.p.) would have been reached in June. In December, the difference was 0.6 p.p. This simulation shows that headline inflation would have increased and reached 9.7% in October even at constant prices for energy and food products.

Figure 30: The dynamic of headline inflation at constant oil, electricity, coal and food prices



Sources: Eurostat, HWWI, Refinitiv Eikon, authors' calculations.

Therefore, the rise of inflation in 2022 is not only related to the potential consequences of the war on energy and food prices but is also due to the past increases of 2021. Due to base effects and because core inflation increased in 2022, headline inflation would have increased under any circumstances in 2022.

These results are mostly illustrative of the past dynamics of inflation and therefore indicate that, even without a war, headline inflation would have certainly risen sharply. We acknowledge that building a counterfactual scenario without the Russian invasion of Ukraine remains hazardous as there are many alternative paths for the raw prices of energy goods and food products. Prices might have been higher or lower than the level observed after February 2022. Hence, we do not claim that the impact of the war can be fully captured by our hypothesis of constant prices. Rather, we argue that a lower increase in the prices of energy and food products would not have prevented a sharp rise in HICP inflation.

2.3. Transmission to other sub-indices of inflation

Another limit of the former exercise is that it considers that core inflation – all other sub-indices of the HICP excluding energy, food, beverage and tobacco – has not been affected by the rise of prices of energy and food products. We now relax this hypothesis and provide an assessment of the effect of energy and food prices on other sub-components of the HICP. The increase in raw energy and food prices may indeed progressively be passed-through other prices as those items enter as intermediate products in the production of other final products. The effect may not be instantaneous because firms may revise their prices slowly (e.g. to remain competitive) and they may also delay the transmission by cutting mark-ups (e.g. also to remain competitive).

To assess the transmission on other consumer prices, we estimate an equation related each item of the HICP at the 3-digit level Classification of Individual Consumption According to Purpose (COICOP) to 12-month moving average of the y-o-y change in oil prices (in EUR), electricity and HWWI-food index.[93] The equation and the results of the estimations are detailed in the appendix (See Table 2 and Table 3).

Consistently with the previous analysis, the prices of energy and food products influence the food sub-indices (items CP011 and CP012 respectively) as well as the item "electricity, gas and other fuels sub-indices" (CP045), which include food and energy items.[94] The changes in the oil price also appear to pass-through to "goods and services for routine household maintenance" (item CP056), "transport services" (CP073) and "personal care" (CP121). At the same time, the price of electricity has a significant and positive impact on "maintenance and repair of the dwelling" (CP043), "water supply and miscellaneous services related to the dwelling" (CP044), on 3 out of 6 items of "furnishings, household equipment and routine maintenance of the house" (CP05), "health" (CP06). "Other major durables for recreation and culture" (CP092) and "newspaper & books" (CP095). Regarding the transmission of raw agricultural goods prices, we also find some items for which a positive correlation is identified.

These results suggest that the Russian war in Ukraine may also have had some effects on inflation beyond its direct impact on food and energy sub-indices. The counterfactual can therefore also be calibrated by considering for each sub-index the difference between a baseline scenario – built from the out-of-sample dynamic forecast for 2022 – and the scenario with constant oil, electricity and HWWI-food prices. The diffusion – excluding items for which the effect of these prices is already embedded in the energy and food sub-indices – might have accounted for around1.5 p.p. of additional inflation on average since May 2022 (Figure 3). At constant prices for energy and food products, and taking diffusion to core inflation into account, inflation in the euro area would have reached a peak at 7.8% in October (instead of 10.6%) and would have receded below 7% in December. Considering the direct and indirect effects, inflation in the euro area would have been 3 p.p. lower in June 2022. Considering the recent reduction in energy prices, the difference would now be mitigated, as energy prices now converge towards those in the counterfactual scenario.

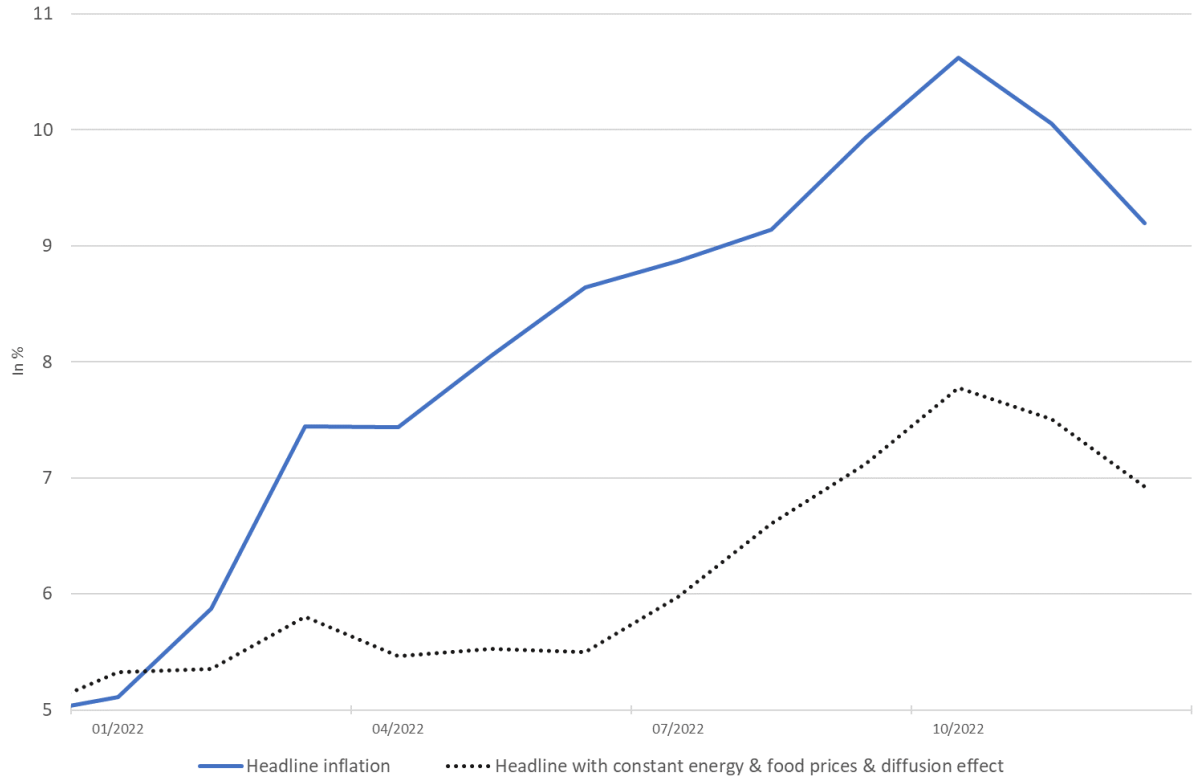
Drawing on the recent dynamics of energy prices, our analysis suggests that not only the inflation driven by energy but, to a lesser extent, the food sub-indices are also expected to decline in 2023, as it has already been observed since October. Due to some delays in the transmission, the slowdown of

[93] The 3-digit decomposition of the HICP includes 42 items. See https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:COICOP_HICP for details. However, due to missing data for some items, we estimate the effect of energy and food prices on 36 sub-indices representing 97.5% of the total index. For health items, we have considered the aggregate index at the 2-digit level.

[94] See at end of the Annex for the details on the COICOP classification.

energy prices should also be transmitted to the other items of the HICP, therefore contributing to an acceleration in the decline of HICP inflation.

Figure 31: The dynamic of headline inflation at constant oil, electricity, coal and food prices – with a diffusion effect



Sources: Eurostat, HWWI, Refinitiv Eikon, authors' calculations.

2.4. Principal component analysis

As the former analysis has shown, energy prices may have direct effects not just on headline inflation, but also on core inflation. Therefore, core inflation is not a good measure of underlying potential inflationary pressures which may spread beyond the energy and food sector. Indeed, energy and food may have effects on core inflation through various mechanisms which one would like to ideally wash out when evaluating whether inflationary pressures have become more widespread.

First, as was mentioned previously, through the input/output table: energy but also food show up in core inflation because both are an input for the production of other goods and services. Energy, and more importantly natural gas (the price of which has increased substantially for a few months), are used almost in all sectors. Many manufacturing sectors use natural gas extensively, both as material (for example in the chemical sector) but also as an energy source. Therefore, many goods prices might increase if firms are able to pass on these higher costs to customers (other firms, or final consumers). In the service sectors, energy is used extensively for heating but also for transportation.

Second, in many European countries, there remains some direct indexation of wages. In few countries, this indexation is general (such as in Belgium), but in many countries, minimum wages are somewhat indexed to inflation. As a consequence and depending on the share of workers who are on minimum wages as well as the sectors which employ minimum wage earners, one may expect inflationary pressures to spread through this mechanism. The restaurant sector, for example, which relies heavily

on workers earning minimum wages, will be impacted twice by the increase in the price of food: first, through input-output tables because food is an important input for them and, second, through the increase in minimum wages.

Third, some automatic indexation of goods and services exists in many countries. For example, rents are sometimes indexed on headline inflation – with however some discretion on the part of governments and landlords to apply these increases mechanically. In France, the prices of tolls on highways is also indexed on inflation.

In order to disentangle these mechanisms, one might want to investigate further the behaviour of inflation through a principal component analysis approach performed on 2-digit COICOP classification with 12 components. The objective here is to highlight more precisely the contribution to the variance of different sub-indices of inflation on other sub-indices. It permits to gauge more precisely the direct and indirect impacts of prices on energy and food products on other components of the HICP. It helps extracts more information on the volatile determinants of core inflation (whose computation is based on the – false – idea that it is not sensitive to volatile prices).

The original COICOP classification is slightly changed because more volatile components of inflation appear only at the 3-digit level: for example, energy is present both in housing costs (CP04) and those related to transportation (CP0722) although they have very similar determinants. Thus, for the principal component analysis it makes sense to put them together[95].

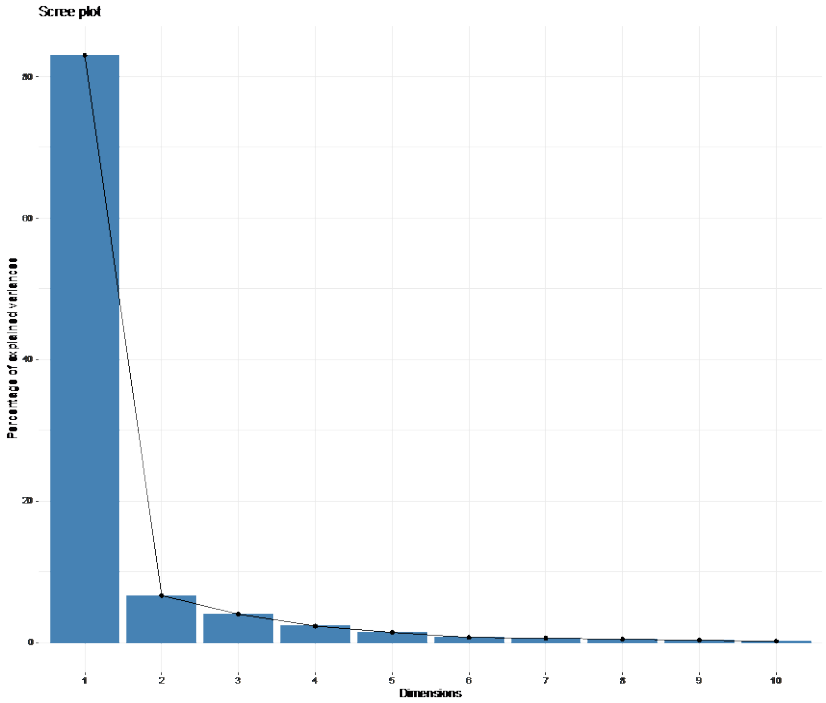
Figure 4 illustrates the amount of information retained by each principal component, as measured by the percentage of the explained variance of inflation by each. This percentage is large for the first principal components and becomes larger for the next principal components (see Table 4 in and Table 5 the Annex for the exact numbers). In our example, the first principal component explains more than 80% of the variance.

Figure 5 shows what the principal component mostly correlates with, and more importantly how the first two principal components explain the different time series. The distance between the origin and the arrow measures how well a given inflation series is explained by the first two principal components. Which direction the arrows are pointing measures which of the two dimensions explains the time series best. This graph shows that the first dimension is overwhelmingly representing the importance of energy (NRG), and that the second dimension overwhelmingly corresponds to food (CP01). Interestingly however, it should be noted that *all* items actually correlate with these first two components, and that these correlations are intuitive: CP10 corresponding to education correlates mostly with food, certainly because of the price of restaurants for children, while CP11 corresponding to restaurants and hotels also correlates with food (but also with energy), as accommodation and restaurants use energy and food as important inputs.

This analysis therefore complements our earlier estimates and shows that the core inflation is not disconnected from the volatile prices of energy and food and that it is of utmost importance to refine the computation of a *genuinely* core (or free-from-volatile-prices) inflation index that the ECB would be better able to control and target (see Blot et al., 2016).

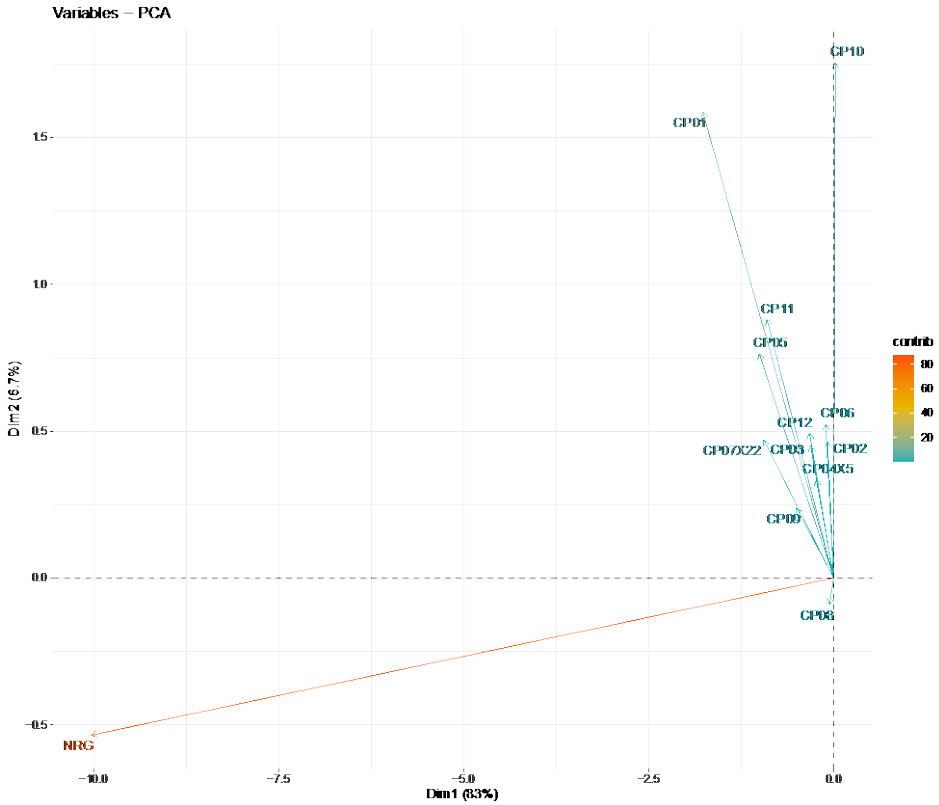
[95] Box 1 in the Annex explains more in detail the methodology for the principal component analysis, with some additional figures.

Figure 32: Percentage of explained variance by the principal components



Sources: Eurostat, authors' elaboration.

Figure 33: Correlation plot with the first two principal components



Sources: Eurostat, authors' elaboration.

3. MEDIUM-TERM INFLATION PROSPECTS AND EFFECTIVENESS OF EXISTING MONETARY POLICY MEASURES

3.1. Medium-term inflation prospects

Assessing the medium-term inflation prospects in the euro area is challenging because the geopolitical and economic environment is very uncertain, so the evolution of the main factors driving inflation either directly or indirectly, mainly energy and food, remains unknown at this stage. However, there has recently been a strong decline in energy prices, particularly for natural gas. This implies that there should be not only a slowing down of inflation pressures (if prices had reached a high "plateau" and stayed there, this would already be deflationary) but that energy could become a deflationary force in the next few months. This force clearly should lead inflation to drop in the next few months.

At the same time, as we discussed in sections 2.3 and 2.4, there are some elements of inflation persistence: the input-output table which implies that production prices may respond to input prices with some delay, various indexations of both goods and services and wages, which (depending on institutional details) have not been completely built in.

Also, price shields which have been put in place by governments will be made less generous going forward, which could contribute to make inflation higher in the next few quarters.

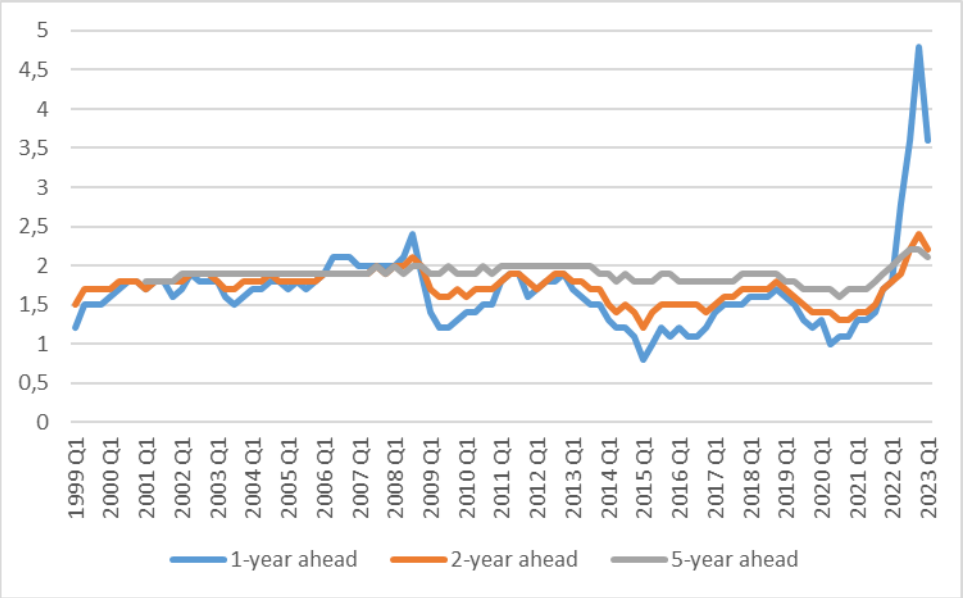
It remains that so far, potential second-round effects have been rather muted (see e.g. Blot et al., 2022) so our assessment is that one may as well abstract from them when assessing the inflation outlook, at least for now.

3.2. Effectiveness of existing monetary policy measures

The rise in the HICP inflation rate has finally triggered a sharp rise in the ECB policy rates. Since July 2022, the rate on main refinancing operations has increased by 3 p.p. and it will rise by 0.5 p.p. more in March 2023, following Ms Lagarde's statement in February 2023[96]. After the ECB decided to end net asset purchases under its asset purchase programme (APP) as of 1 July 2022, the policy stance has clearly shifted towards contraction. While some may argue that *real* interest rates remain negative (if inflation expectations follow closely actual inflation, which is usually not the case at a more than 2-year horizon, see Figure 6), the *change* in real interest rates since July 2022 is positive. Has this policy been effective so far?

[96] See remarks from 2 February 2023 press conference
https://www.ecb.europa.eu/press/pressconf/2023/html/ecb.is230202~4313651089.en.html

Figure 34: Inflation expectations at different horizons



Source: Survey of Professional Forecasters (ECB)

3.2.1 Effectiveness on financial variables

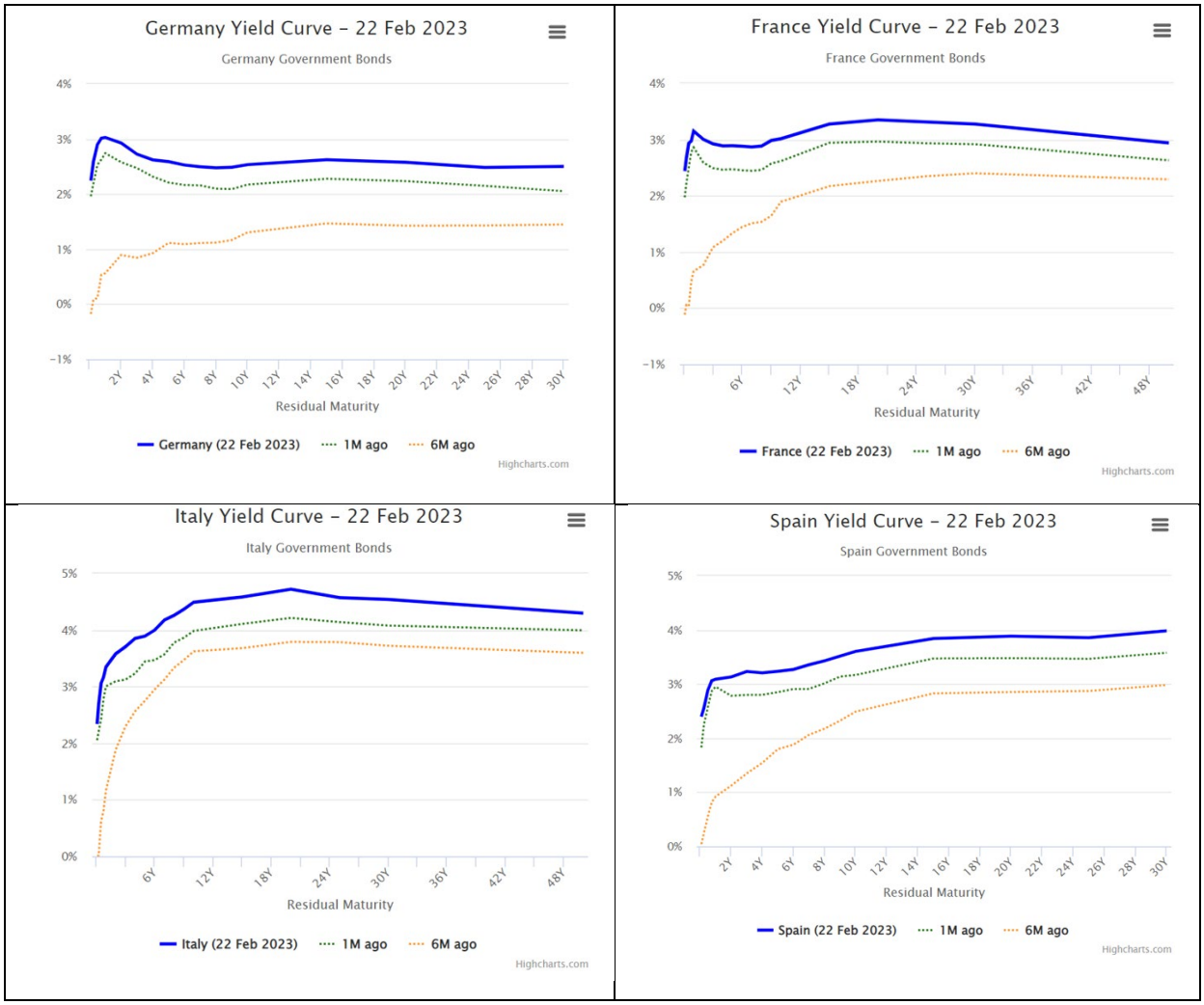
Clearly, for credit flows (volumes) as well as the costs of financing (prices), the effectiveness of monetary policy measures is undisputed. The yield curve has moved up and bank lending rates have increased as well. To spare space, we only report the data for the yield curve of 4 euro area countries in Figure 7. Over the last 6 months, the rise has been quite substantial.

Overall, there has been a sharp increase in the cost of credit for households, governments, and corporations alike in the wake of recent hikes in interest rates. House price growth is slowing down in many countries and, in some countries, house prices are even declining. All of this is signalling that monetary policy is having substantial effects on finance and on households.

Regarding volumes, information from the latest euro area bank lending survey (2022Q4)[97] point to a decrease of loan demand by firms and a strong decline of loan demand by households that is attributed to higher interest rates and uncertainty. Credit standards, that involve increased funding costs, higher risk perceptions and declining risk tolerance, are also reported to have tightened.

[97] See survey at https://www.ecb.europa.eu/stats/ecb_surveys/bank_lending_survey/html/ecb.blssurvey2022q4~e27b836c04.en.html

Figure 35: Yield curve, government bonds



Sources: worldgovernmentbonds.com and Highcharts.com

3.2.2. Is monetary policy effective in slowing down inflation?

Whether such monetary policy measures are effective in slowing down inflation is more subject to question. Monetary policy can work through to the extent that lower demand implies also less demand for energy. This is the conclusion that may stem from the analysis of Gonçalves and Koester (2022) as they report a growing contribution of demand factors to core inflation during 2022. However, the indirect effects of monetary policy, through expectations and wage growth, are less certain.

It is important to remember that a rise in the price of energy is not just a supply shock (as is often assumed) but rather is also a drag on purchasing power and consumer demand. Consistent with this, consumer demand has recently been quite anaemic if we keep in mind that some euro area countries are still recovering from the economic and social consequences of the pandemic, the *former* crisis. This is the case for Spain, whose real GDP is on 2022-Q4 still 0.9% below 2019-Q4 according to Eurostat. It is also, to a lower extent, the case for Germany, whose real GDP is very slightly below its 2019-Q4 value. Moreover, consumer confidence is low according to the OECD Consumer Confidence Index[98].

[98] See OECD Consumer Confidence Index at https://data.oecd.org/leadind/consumer-confidence-index-cci.htm

4. CONCLUSION

The Russian invasion of Ukraine and the related energy crisis have undoubtedly had a significant impact on the euro area economy and inflation. Yet, the extraordinary circumstances and the simultaneity of different shocks make it challenging to say how much of the inflation is due to the reopening of the economy after COVID-19 and how much is due to the war. Despite attempting to shed some light on this debate, we deem it too complicated to give a precise quantitative answer to this question.

In the current uncertain environment, policy makers should perhaps err more on the side of caution. Energy and food prices spill over to core inflation through input-output tables, automatic indexations of goods and services, and automatic indexations of wages. An increase in core inflation is not necessarily a sign that monetary policy should be more restrictive. This indicator needs to be complemented with others for a full diagnosis.

Although energy and food shocks are often interpreted as "supply shocks", and so would seem to warrant a substantial decrease in aggregate demand to bring demand in line with supply, it is important to remember that an increase in energy and food prices comes together with a significant reduction in households' purchasing power. In such a context, an increase in policy interest rates might be unwarranted.

Finally, there is little monetary policy can do to mitigate the losses in purchasing power coming from a deterioration in the terms of trade. Monetary policy might potentially help with second-round effects, but thus far, these second-round effects through a "wage-price spiral" and de-anchoring of inflation expectations have been rather muted.

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ANNEX: TABLES, FIGURES AND BOXES

Table 7: Explaining the energy and food components of the HICP

	Δenergy	*Δfood*
Δenergy / Δfood (t-j)	0.0811**	0.2590***
	[0.039]	[0.078]
Δoil (t)	0.1180***	
	[0.007]	
Δoil (t-j)	0.0720***	
	[0.007]	
Δelectricity (t-j)	0.0025*	0.0012**
	[0.001]	[0.000]
Δelectricity (t-k)	0.0019*	
	[0.001]	
Δcoal (t-j)	0.0186**	
	[0.008]	
Δhwwi-food (t-j)		0.0069**
		[0.003]
Δwheat (t-j)		0.0046**
		[0.002]
Δvix (t)	0.0087***	0.0015
	[0.002]	[0.001]
Unemployement gap		-0.0707**
		[0.035]
Constant	0.0782	0.1240***
	[0.051]	[0.022]
N	265	268
r2	0.7355	0.15

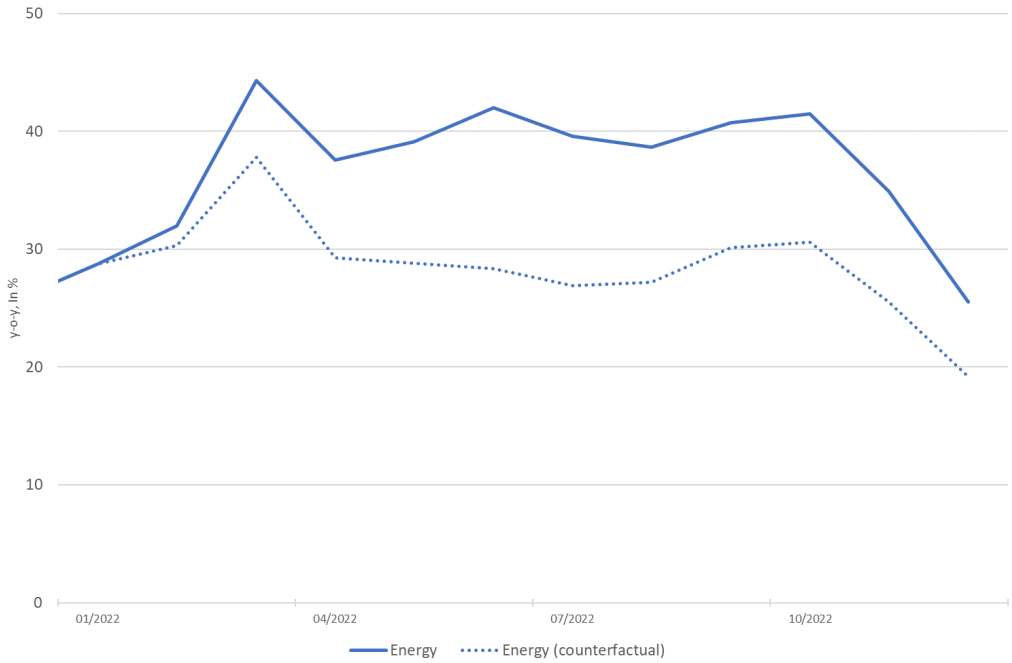
Standard errors in brackets

$^{*}p<0.1, ^{**}p<0.05, ^{***}p<0.01$

Source: Eurostat, authors' estimations.

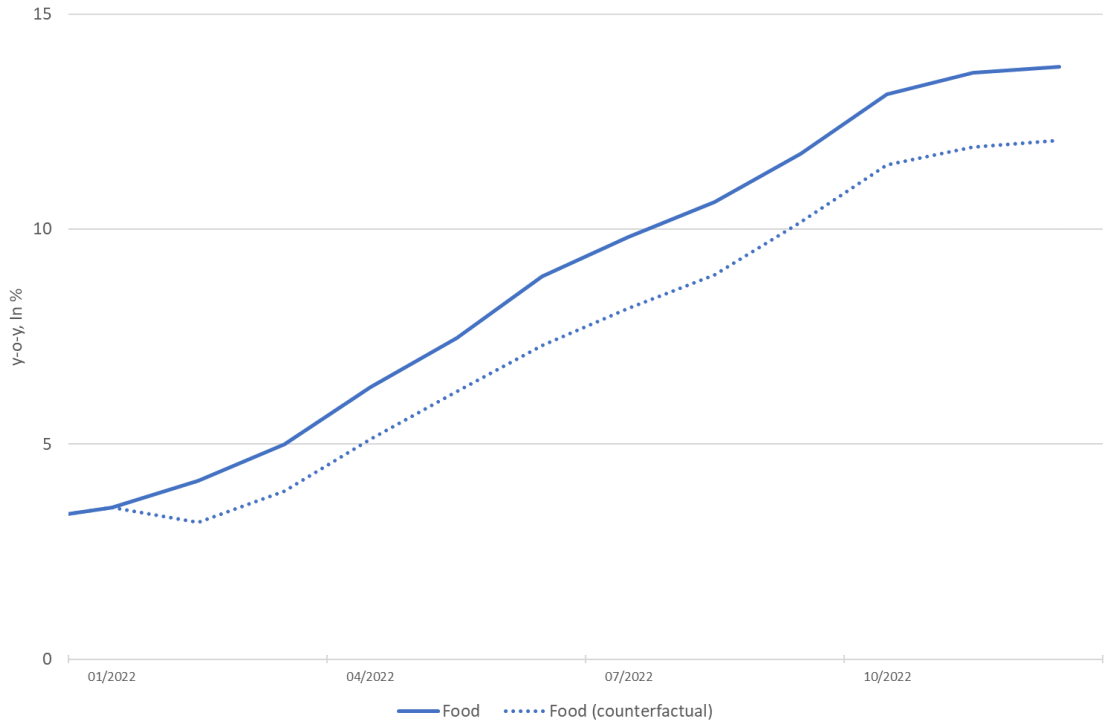
Note: Note: the sample for estimation is May 1999 / December 2021. The price of oil and wheat are expressed in euros and the unemployment gap is the cyclical component of the unemployment rate estimated with a Hodrick-Prescott filter.

Figure 36: The dynamics of energy inflation, a comparison between observed inflation and a counterfactual at constant oil, electricity, coal and food prices



Sources: Eurostat, HWWI, Refinitiv Eikon, authors' calculations.

Figure 37: The dynamics of food inflation, a comparison between observed inflation and a counterfactual at constant oil, electricity, coal and food prices



Sources: Eurostat, HWWI, Refinitiv Eikon, authors' calculations.

Table 8: The impact of energy and food prices on the HICP sub-indices (From COICOP data CP011 to CP06)

	Food and non-alcoholic beverages		Alcoholic beverages and tobacco		Clothing and footwear		Housing, water, electricity, gas and other fuels				Furnishings, Household equipment and routine maintenance of the house						Health
	cp011	cp012	cp021	cp022	cp031	cp032	cp041	cp043	cp044	cp045	cp051	cp052	cp053	cp054	cp055	cp056	cp06
ma12oil (t)	0.0041***	0.0029***	0.0003	-0.0031	-0.0019	-0.0004	0.0001	0.0003	-0.0007	0.0158**	-0.0004	-0.0004	-0.0012**	-0.0014*	-0.0003	0.0010**	-0.0042*
	[0.001]	[0.001]	[0.001]	[0.004]	[0.003]	[0.003]	[0.000]	[0.001]	[0.000]	[0.006]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.000]	[0.002]
ma12electricty (t)	-0.0012	-0.0011	0	0.0013	-0.0001	0.0012	-0.0001	0.0014**	0.0009***	0.0014	0.0010**	0.0003	0.0011**	0.0009	0.0006	0.0002	0.0034*
	[0.001]	[0.001]	[0.001]	[0.003]	[0.003]	[0.002]	[0.000]	[0.001]	[0.000]	[0.004]	[0.000]	[0.001]	[0.000]	[0.001]	[0.001]	[0.000]	[0.002]
ma12hwwi-food (t)	0.0039	0.0092***	0.0038**	-0.0038	0.0092	0.0006	0.0001	0.0019*	-0.0006	0.0220**	0.0032**	0.0122***	0.0025**	0.0047***	0.0029*	0.0020**	-0.0031
	[0.003]	[0.003]	[0.002]	[0.005]	[0.009]	[0.008]	[0.000]	[0.001]	[0.001]	[0.009]	[0.001]	[0.003]	[0.001]	[0.002]	[0.002]	[0.001]	[0.003]
dvix	-0.0023	-0.0004	0.0001	-0.0011	-0.0006	0.0022	0.0001	-0.0002	-0.0003	-0.001	0.0005	0.0020*	0.0001	0.0008	-0.0002	0.0001	0.0003
	[0.002]	[0.001]	[0.001]	[0.002]	[0.002]	[0.002]	[0.000]	[0.000]	[0.000]	[0.003]	[0.000]	[0.001]	[0.000]	[0.001]	[0.000]	[0.000]	[0.001]
Unemployment gap	-0.2063***	-0.0669*	-0.0588*	-0.0069	-0.0373	-0.0959	-0.0064	0.0018	0.0236	0.4204**	0.0014	0.0357	-0.0136	-0.0134	-0.0036	-0.0522**	-0.0792
	[0.064]	[0.036]	[0.033]	[0.096]	[0.145]	[0.132]	[0.010]	[0.023]	[0.020]	[0.177]	[0.028]	[0.064]	[0.028]	[0.035]	[0.030]	[0.023]	[0.058]
cp0ij(t-1)	0.9029***	0.9037***	0.9572***	0.9258***	0.2649**	0.5350***	0.9769***	0.9732***	0.9910***	0.9089***	0.9457***	0.8138***	0.9521***	0.9352***	0.9515***	0.9511***	0.9492***
	[0.022]	[0.018]	[0.016]	[0.038]	[0.127]	[0.094]	[0.013]	[0.014]	[0.011]	[0.031]	[0.029]	[0.040]	[0.020]	[0.021]	[0.024]	[0.011]	[0.053]
Constante	0.1584***	0.0834***	0.047	0.3981**	0.3979***	0.3609***	0.0349*	0.0465	0.0167	0.1124	0.0537	0.0892**	-0.0314	0.0746**	0.0233	0.0515***	0.0818
	[0.046]	[0.024]	[0.029]	[0.163]	[0.098]	[0.102]	[0.020]	[0.031]	[0.024]	[0.093]	[0.039]	[0.037]	[0.019]	[0.038]	[0.023]	[0.017]	[0.069]
N	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260
r2	0.9283	0.9647	0.9421	0.8621	0.0875	0.2926	0.9521	0.969	0.9785	0.9519	0.9241	0.8026	0.9143	0.9195	0.9291	0.9693	0.8856

The table shows the results of the estimation of the following equation, estimated from May 1999 to December 2021, for each item of the HICP at the 3-digit level:

$$\pi_t^i = \rho.\pi_t^i + \alpha_1.ma12oil_t + \alpha_1.ma12elec_t + \beta.ma12hwwi_t + \theta.ugap_t + \phi.\Delta vix_t$$

where π_t^i stands for the year-on-year (y-o-y) inflation rate for the item (i). $ma12oil_t, ma12elec_t$ and $ma12hwwi_t$ are the 12-month moving average of the y-o-y change in oil prices (in euros), electricity and HWWI-food index.[99] $ugap_t$ captures the effect of activity on inflation measured by a Hodrick-Prescott filter on the unemployment rate. Finally, Δvix_t measures the effect of financial uncertainty.

Standard errors in brackets. * p < 0.1, ** p < 0.05, *** p < 0.01.

Sources: Eurostat, authors' estimations.

[99] The diffusion of prices for raw energy and food products to other items of the HICP may not only take several months but may also differ across the items. Including moving averages instead of several lags of energy and food prices enables to reduce the number of parameters to be estimated.

Table 9: The impact of energy and food prices on the HICP sub-indices (From COICOP data CP071 to CP127)

	Transport			Postal services	Recreation and culture						Education	Restaurants and hotels		Miscellaneous goods and services					
	cp071	cp072	cp073	cp081	cp091	cp092	cp093	cp094	cp095	cp096	cp10	cp111	cp112	cp121	cp123	cp124	cp125	cp126	cp127
ma12oil (t)	0.0003	-0.008	0.0055*	-0.0037*	-0.0027**	-0.0034**	-0.0002	0.0006	-0.0011*	-0.0024	0.0017	0.0003	0.0003	0.0006*	0.0019	-0.0008	0.0002	0.0004	-0.0001
	[0.001]	[0.007]	[0.003]	[0.002]	[0.001]	[0.002]	[0.001]	[0.001]	[0.001]	[0.012]	[0.001]	[0.000]	[0.003]	[0.000]	[0.001]	[0.001]	[0.001]	[0.002]	[0.001]
ma12electricty (t)	0.0007	-0.0006	-0.0006	0.0021	0.0009	0.0040***	0.0013	0.0001	0.0009**	0.0069	-0.0021	0.0003	0.004	0.0003	-0.0002	0.0001	0.0002	0.0002	0.0005
	[0.001]	[0.004]	[0.002]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.000]	[0.007]	[0.001]	[0.000]	[0.003]	[0.000]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
ma12hwwi-food (t)	0.0008	-0.0061	0.0157**	-0.0043	0.0002	0.0009	0.0044**	0.0013	0.0009	0.0108	-0.0018	0.0003	-0.0021	0.0008	0.001	0.0023	-0.0007	-0.0049	0.0011
	[0.001]	[0.010]	[0.007]	[0.003]	[0.003]	[0.003]	[0.002]	[0.001]	[0.001]	[0.020]	[0.003]	[0.001]	[0.007]	[0.001]	[0.005]	[0.002]	[0.002]	[0.005]	[0.001]
dvix	-0.0007	-0.0088*	-0.0026	0.0003	-0.0009	-0.0001	0.0002	-0.0003	-0.0002	-0.0051	0.0005	0.0001	-0.0044*	0.0003	0.0021*	0.0004	-0.0012	0.0023	-0.0011
	[0.000]	[0.005]	[0.003]	[0.001]	[0.002]	[0.001]	[0.001]	[0.001]	[0.001]	[0.008]	[0.002]	[0.000]	[0.002]	[0.000]	[0.001]	[0.001]	[0.001]	[0.002]	[0.001]
Unemployment gap	0.0447	0.161	-0.0302	-0.0234	0.062	-0.0019	-0.0152	-0.0206	-0.0405	-0.9505*	-0.018	-0.0543***	-0.1624	-0.0412***	-0.0301	0.0344	-0.0405	-0.0605	-0.0348
	[0.031]	[0.215]	[0.147]	[0.068]	[0.054]	[0.061]	[0.041]	[0.027]	[0.033]	[0.516]	[0.127]	[0.014]	[0.186]	[0.015]	[0.068]	[0.050]	[0.045]	[0.090]	[0.030]
cp0ij(t-1)	0.9969***	0.9964***	0.7715***	0.8935***	0.9916***	0.8474***	0.8506***	0.9136***	0.8929***	0.4566***	0.9500***	0.9733***	0.7977***	0.9691***	0.9701***	0.9486***	0.9222***	0.9457***	0.9445***
	[0.026]	[0.032]	[0.048]	[0.044]	[0.011]	[0.099]	[0.032]	[0.036]	[0.031]	[0.104]	[0.034]	[0.015]	[0.053]	[0.010]	[0.020]	[0.040]	[0.024]	[0.031]	[0.025]
Constante	0.003	0.1785	0.4417***	0.3067**	0.0036	0.2274*	0.0964***	0.1621**	0.2290***	1.1640***	0.1086	0.0554*	0.4234***	0.0250*	0.0514	0.1304	0.1550***	0.1161	0.1033**
	[0.031]	[0.127]	[0.131]	[0.130]	[0.076]	[0.134]	[0.035]	[0.074]	[0.072]	[0.267]	[0.076]	[0.030]	[0.129]	[0.013]	[0.049]	[0.108]	[0.053]	[0.080]	[0.048]
N	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	252	260	260	260
r2	0.9095	0.8849	0.7136	0.8773	0.9789	0.724	0.7781	0.854	0.8145	0.2691	0.9039	0.9822	0.6933	0.9794	0.9634	0.9218	0.9046	0.9087	0.903

The table shows the results of the estimation of the following equation, estimated from May 1999 to December 2021, for each item of the HICP at the 3-digit level:

$$\pi_t^i = \rho.\pi_t^i + \alpha_1.ma12oil_t + \alpha_1.ma12elec_t + \beta.ma12hwwi_t + \theta.ugap_t + \phi.\Delta vix_t$$

where π_t^i stands for the year-on-year (y-o-y) inflation rate for the item (i). $ma12oil_t, ma12elec_t$ and $ma12hwwi_t$ are the 12-month moving average of the y-o-y change in oil prices (in euros), electricity and HWWI-food index.[100] $ugap_t$ captures the effect of activity on inflation measured by a Hodrick-Prescott filter on the unemployment rate. Finally, Δvix_t measures the effect of financial uncertainty.

Standard errors in brackets. * p < 0.1, ** p < 0.05, *** p < 0.01.

Sources: Eurostat, authors' estimations.

[100] The diffusion of prices for raw energy and food products to other items of the HICP may not only take several months but may also differ across the items. Including moving averages instead of several lags of energy and food prices enables to reduce the number of parameters to be estimated.

Box 2: Methodology: data transformation

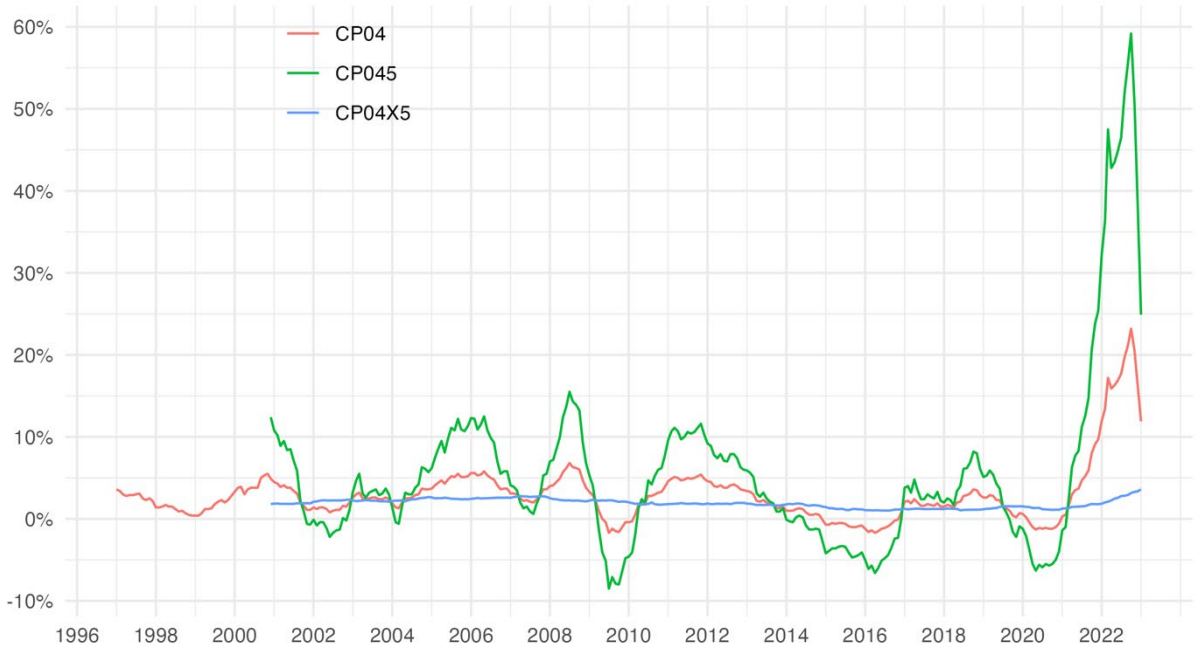
For readability of the results, performed a principal component analysis on the 2-digit classification (12 items composing the HICP). However, some components such as CP04 (Housing, water, electricity, gas and other fuels) and CP07 (Transport) contain some more volatile components such as CP045 (electricity, gas and other fuels for households), and CP0722 (fuels and lubricants for personal transport equipment) which should be analysed separately from the rest.

Therefore, before we perform the principal component analysis, we first create an alternative CP04 category named CP04X5 (CP04 excluding CP045) and another named CP07X22 (CP07 excluding CP0722), for which we compute inflation rates which are not given by Eurostat, using yearly component weights, as well as inflation for sub-indices.

We then group CP045 and CP0722 in a separate NRG sub-index, which we add as a 13th item composing the HICP, and keep CP04X5 and CP07X22 outside. Note that NRG sub-index already exists in the Eurostat database, while CP04X5 and CP07X22 do not. One could have chosen to group CP01 (Food and non-alcoholic beverages) and CP02 (Alcoholic beverages, tobacco and narcotics) into a food sub-index, so we would then have 12 sub-categories. Doing so does not meaningfully alter the results qualitatively and quantitatively.

Source: Authors' own elaboration.

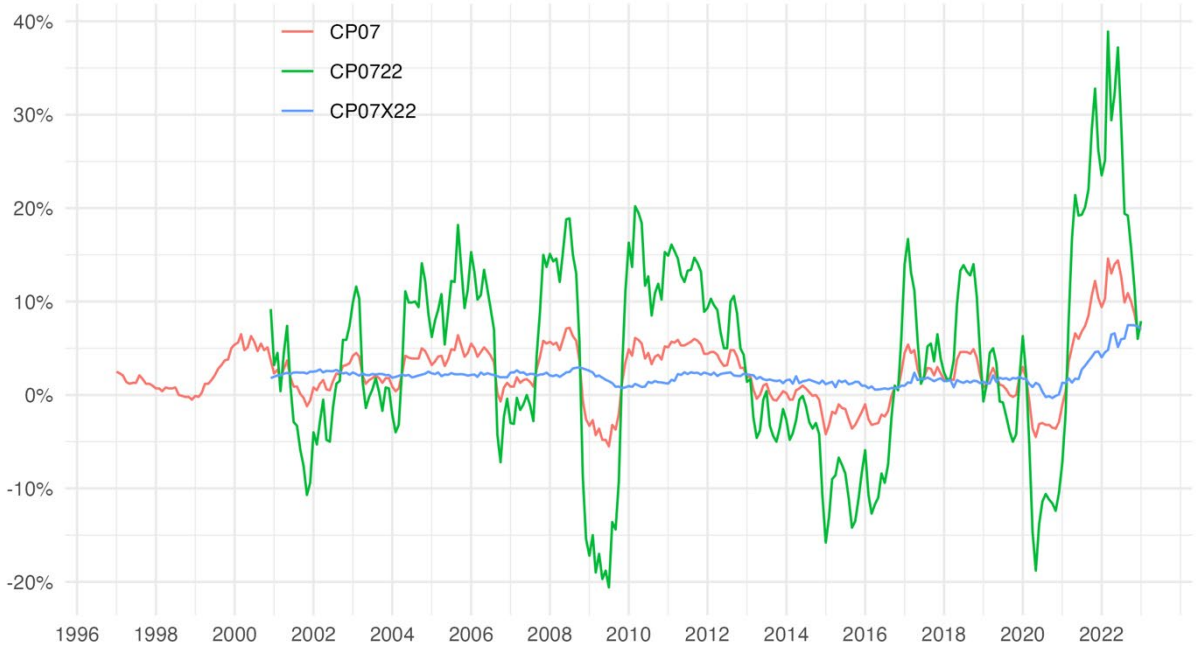
Figure 38: Construction of CP04X5



Sources: Eurostat, authors' calculations.

Note: CP04X5 is constructed by excluding CP045 (Electricity, gas and other fuels) from CP04 (Housing, water, electricity, gas and other fuels).

Figure 39: Construction of CP07X22



Note: CP07X22 is constructed by excluding CP0722 (Fuels and lubricants for personal transport equipment) from CP07 (Transport).

Table 10: Table of eigenvalues, variance, cumulative variances

	eigenvalue	variance.percent	cumulative.variance.percent
Dim.1	107.18	83.04	83.04
Dim.2	8.59	6.65	89.7
Dim.3	5.17	4	93.7
Dim.4	2.99	2.32	96.02
Dim.5	1.84	1.43	97.45
Dim.6	0.93	0.72	98.17
Dim.7	0.8	0.62	98.78
Dim.8	0.62	0.48	99.26
Dim.9	0.43	0.33	99.59
Dim.10	0.23	0.18	99.77
Dim.11	0.17	0.13	99.9
Dim.12	0.09	0.07	99.97
Dim.13	0.03	0.03	100

Sources: Eurostat, authors' own elaboration.

Table 11: Table of coordinates for the first 10 principal components (3 omitted)

	Dim.1	Dim.2	Dim.3	Dim.4	Dim.5	Dim.6	Dim.7	Dim.8	Dim.9	Dim.10
NRG	–10.04	–0.54	0.32	0.1	0.04	–0.01	0.01	0.01	–0.02	0
CP01	–1.77	1.59	–1.13	0.03	–0.36	0.25	0.3	0.28	–0.12	–0.01
CP02	–0.08	0.47	0.77	–0.86	–0.27	0.11	0.36	–0.41	–0.18	–0.08
CP03	–0.31	0.45	–0.17	–0.26	0.21	–0.87	0.27	0.11	0	–0.04
CP04X5	–0.23	0.34	0.21	–0.01	0.01	0	–0.03	–0.11	0.17	0.05
CP05	–1.01	0.76	–0.47	–0.21	0.06	0.02	–0.04	–0.21	0.21	0.24
CP06	–0.11	0.52	0.98	–0.89	–0.28	0	–0.31	0.44	0	0.1
CP07X22	–0.95	0.47	–0.25	–0.2	0.02	–0.08	–0.2	–0.13	0.2	0.03
CP08	–0.05	–0.09	–0.3	–0.67	1.14	0.27	0.1	0.11	–0.05	–0.01
CP09	–0.5	0.24	–0.71	–0.2	0.02	–0.17	–0.47	–0.23	–0.42	0.09
CP10	0.02	1.76	1.1	0.86	0.44	0	–0.06	–0.03	–0.13	0.01
CP11	–0.9	0.88	–0.28	–0.24	0.03	0.02	–0.33	–0.1	0.2	–0.35
CP12	–0.33	0.49	0.05	–0.1	0.02	0.02	0.13	–0.13	0.18	0.15

Sources: Eurostat, authors' own elaboration.

Box 2: 3-digit COICOP classification

FOOD AND NON-ALCOHOLIC BEVERAGES – CP01
- CP011 - Food
- CP012 - Non-alcoholic beverages

ALCOHOLIC BEVERAGES AND TOBACCO – CP02
- CP021 - Alcoholic beverages
- CP022 - Tobacco

CLOTHING AND FOOTWEAR – CP03
- CP031 - Clothing
- CP032 - Footwear

HOUSING, WATER, GAS, ELECTRICITY AND OTHER FUELS – CP04
- CP041 - Actual rentals for housing
- CP043 - Regular maintenance and repair of the dwelling
- CP044 - Other services relating to the dwelling
- CP045 - Electricity, gas and other fuels

FURNISHINGS, HOUSEHOLD EQUIPMENT AND ROUTINE MAINTENANCE OF THE HOUSE – CP05
- CP051 - Furniture, furnishings and decorations, carpets and other floor coverings and repairs
- CP052 - Household textiles
- CP053 - Household appliances
- CP054 - Glassware, tableware and household utensils
- CP055 - Tools and equipment for house and garden
- CP056 - Goods and services for routine household maintenance

HEALTH – CP06
- CP061 - Medical products, appliances and equipment
- CP062- Outpatient services
- CP063 - Hospital services

TRANSPORT – CP07
- CP071 - Purchase of vehicles
- CP072 - Operation of personal transport equipment
- CP073 - Transport services

COMMUNICATIONS – CP08
- CP081 - Postal services
- CP082/3 - Telephone and telefax equipment and services

RECREATION AND CULTURE – CP09
- CP091 - Audio-visual, photographic and information processing equipment
- CP092 - Other major durables for recreation and culture
- CP093 - Other recreational items and equipment, gardens and pets
- CP094 - Recreational and cultural services
- CP095 - Newspapers, books and stationery
- CP096 - Package holidays

EDUCATION – CP10

RESTAURANTS AND HOTELS – CP11
- CP111 - Catering services
- CP112 - Accommodation services

MISCELLANEOUS GOODS AND SERVICES – CP12
- CP121- Personal care
- CP123 - Personal effects n.e.c.
- CP124 - Social protection
- CP125 - Insurance
- CP126 - Financial services n.e.c.

CP127 - Other services n.e.c.

24 February 2023 marked one year since the start of the Russian invasion of Ukraine. Before the war, starting in 2021, the euro area was experiencing inflationary pressure attributed to supply-side factors, in particular to pandemic-related supply chain disruptions. The war in Ukraine amplified inflationary pressures through energy and food prices, later feeding into goods and services inflation. Later in 2022, the relative contribution of demand-side factors became more prominent. With the recent easing of energy prices, headline inflation is slowing down while core inflation continues to increase.

Four papers were prepared by the ECON Committee's Monetary Expert Panel, analysing current inflation dynamics and the inflation outlook.

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