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# Inflation dynamics and monetary policy in the euro area

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IN-DEPTH ANALYSIS

Requested by the ECON committee

Monetary Dialogue Papers, March 2023



# Inflation dynamics and monetary policy in the euro area

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*Supporting monetary policy scrutiny*



Economic Governance and EMU Scrutiny Unit (EGOV)  
Directorate-General for Internal Policies  
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# Inflation dynamics and monetary policy in the euro area

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## **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.

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## LIST OF ABBREVIATIONS

<b>APP</b>	Asset purchase programme
<b>CPI</b>	Consumer price index
<b>ECB</b>	European Central Bank
<b>Fed</b>	Federal reserve system
<b>GDP</b>	Gross domestic product
<b>HICP</b>	Harmonised index of consumer prices
<b>NAIRU</b>	Non-accelerating inflation rate of unemployment
<b>PEPP</b>	Pandemic emergency purchase programme
<b>RRF</b>	Recovery and Resilience Facility
<b>UK</b>	United Kingdom
<b>US</b>	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 aggregated 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%.<sup>1</sup> 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 threetimes 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*,"<sup>2</sup> 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 meeting. Despite the ambiguous responses offered by President Lagarde during the last press

<sup>1</sup> 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."

<sup>2</sup> "To err is human, but to persist is diabolical."

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.

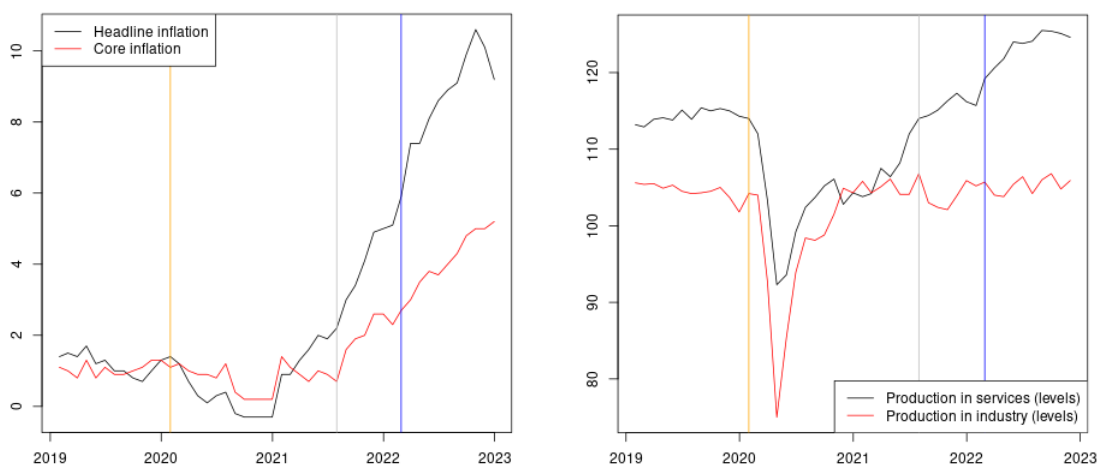
The remaining part of the paper is structured as follows. Section 2 retraces some aspects of the macroeconomic and price dynamics characterising the peak of the COVID-19 pandemic, the rebound phase, and the war in Ukraine period. Section 3 delves deeper into the empirical data, focusing on inflation 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).

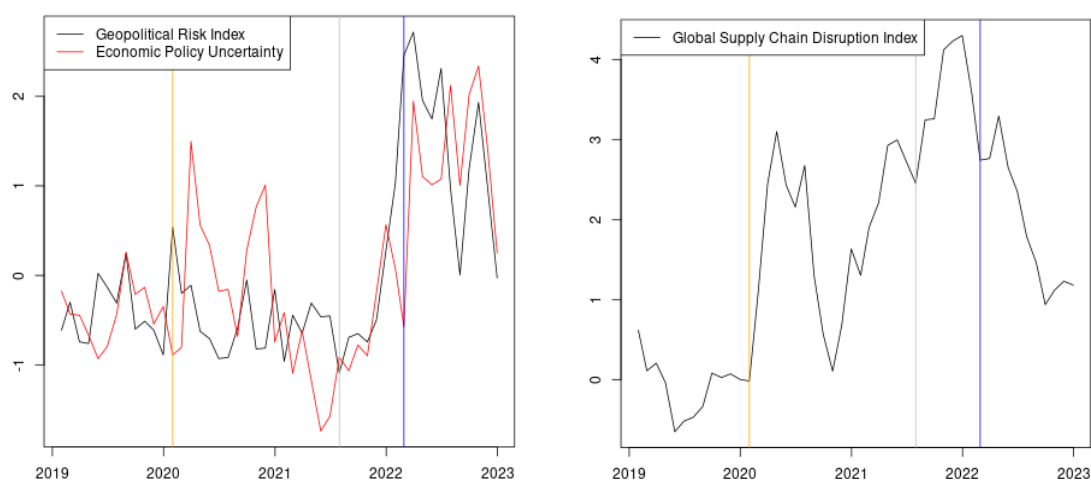
This descriptive evidence makes it clear that excessive inflation rates in the euro area started before the war in Ukraine and were triggered by the supply-side constraints caused by the pandemic. The unexpected persistence of the bottlenecks in the international supply chains of raw materials and other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

a medium-term recovery.<sup>3</sup> 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.

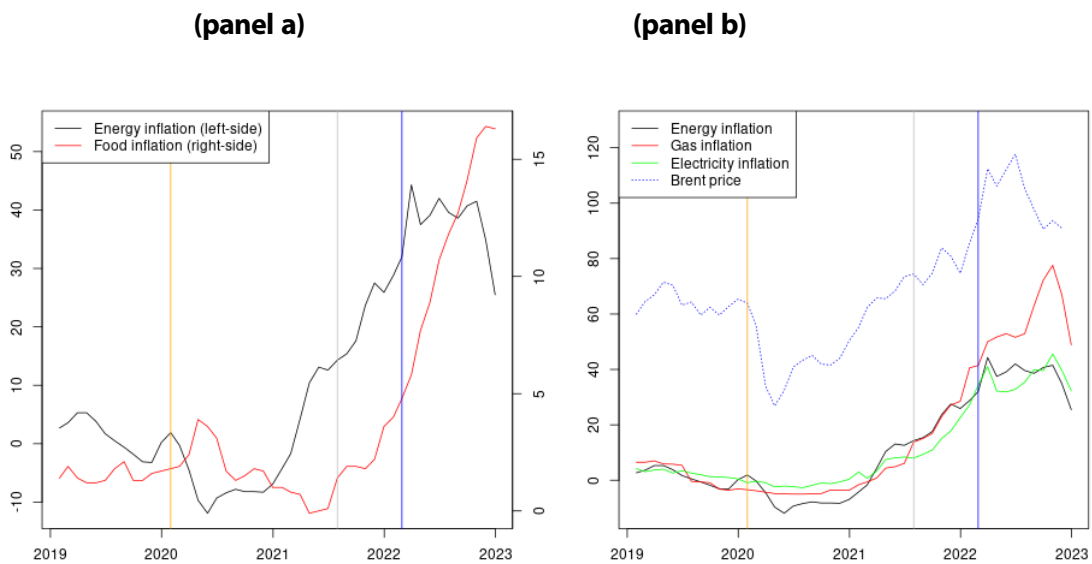
Note. Yellow: 01/2020 (COVID-19 outbreak), Grey: July/2021 (headline inflation over the 2% target), Blue: 02/2022 (war in Ukraine).

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

<sup>3</sup> 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).<sup>4</sup> 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.<sup>5</sup>

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



Source: Eurostat. Monthly Data.

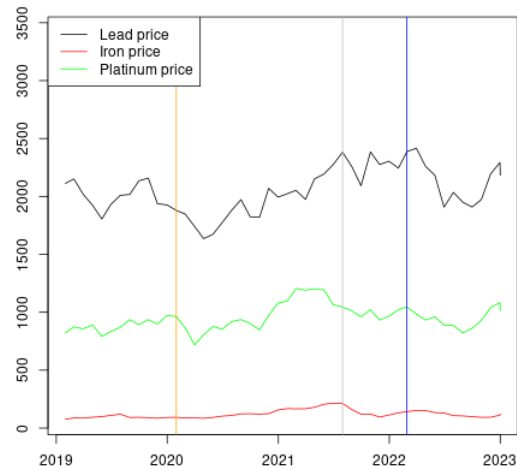
Note. Yellow: 01/2020 (COVID-19), Grey: July/2021 (headline inflation over the 2% target), Blue: 02/2022 (war in Ukraine).

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.

<sup>4</sup> 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).

<sup>5</sup> 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



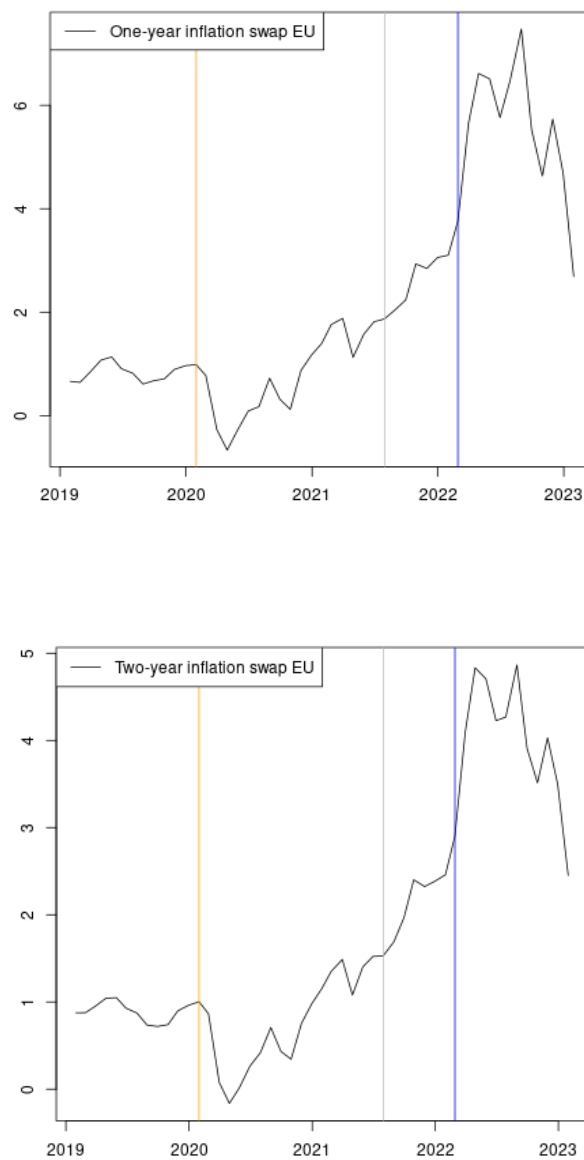
Source: Datastream (Thomson Reuters). Monthly Data.

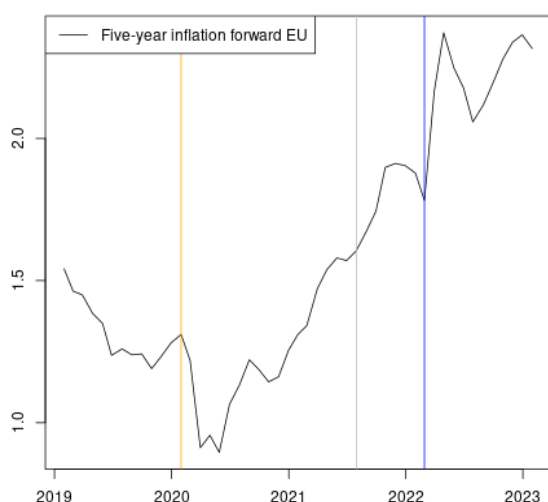
Note. Yellow: 01/2020 (COVID-19), Grey: July/2021 (headline inflation over the 2% target), Blue: 02/2022 (war in Ukraine).



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.

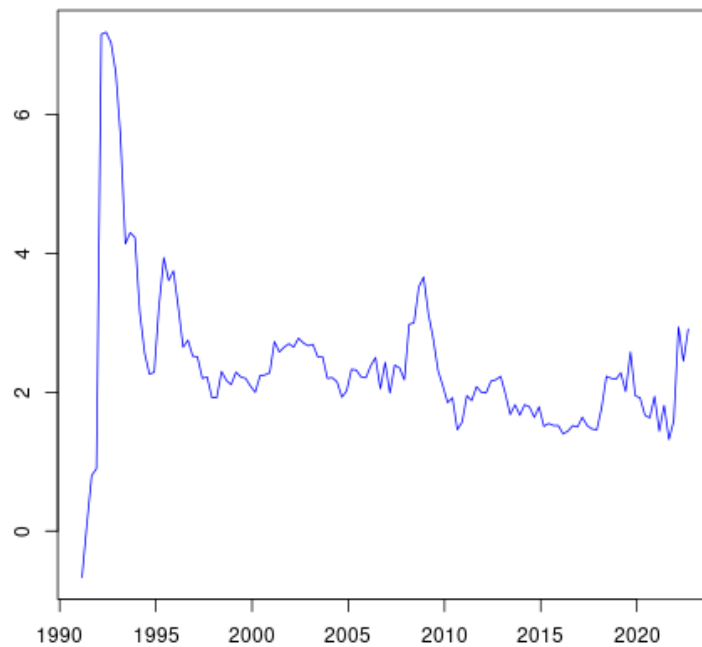
Note. Yellow: 01/2020 (COVID-19), Grey: July/2021 (headline inflation over the 2% target), Blue: 02/2022 (war in Ukraine).

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.<sup>6</sup> 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.<sup>7</sup>

<sup>6</sup> 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.)

<sup>7</sup> 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 (Adrián and Lydon, 2022) and the Beveridge curve (Lane, 2022.)

**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.

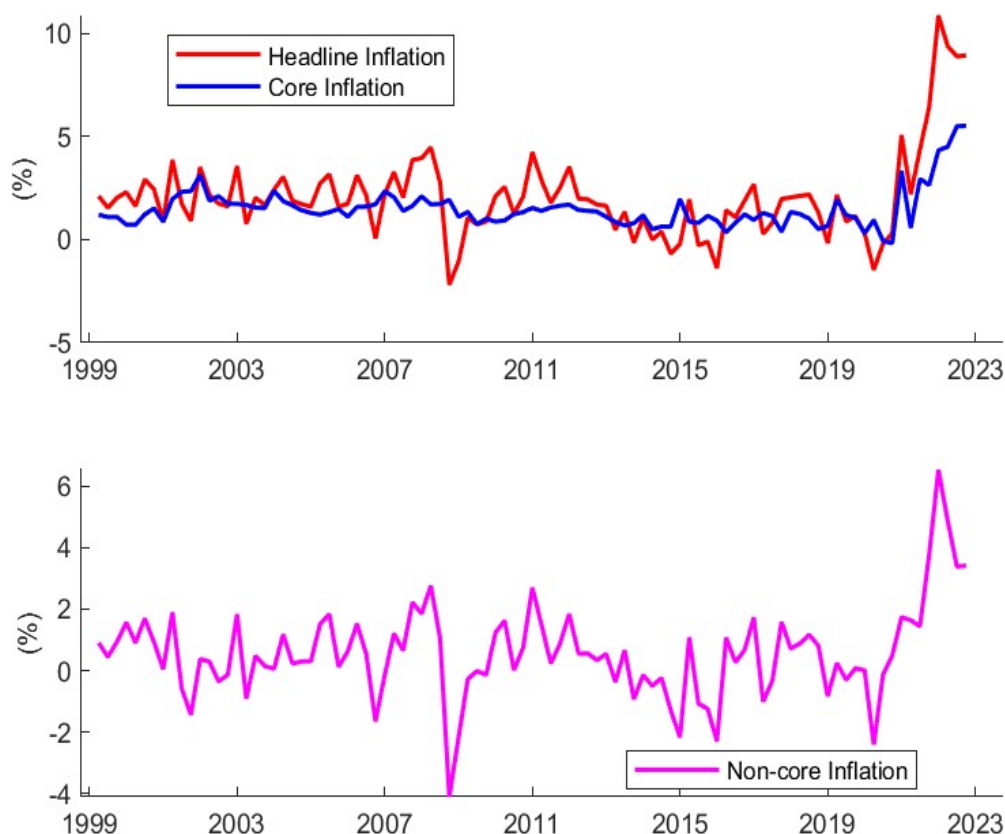
### 3. AN EMPIRICAL AND ANALYTICAL DEEPENING

Headline inflation, hereinafter denoted with  $\pi^h$ , can be decomposed into its core and non-core components,  $\pi^c$  and  $\pi^{nc}$ , 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.<sup>8</sup>

**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

<sup>8</sup> 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.<sup>9</sup> 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.<sup>10</sup>

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,<sup>11</sup> 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.<sup>12</sup>

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

<sup>9</sup> 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.

<sup>10</sup> For the euro area, see Moretti *et al.* (2019), Beqiraj *et al.* (2020), and Ball and Mazumder (2021).

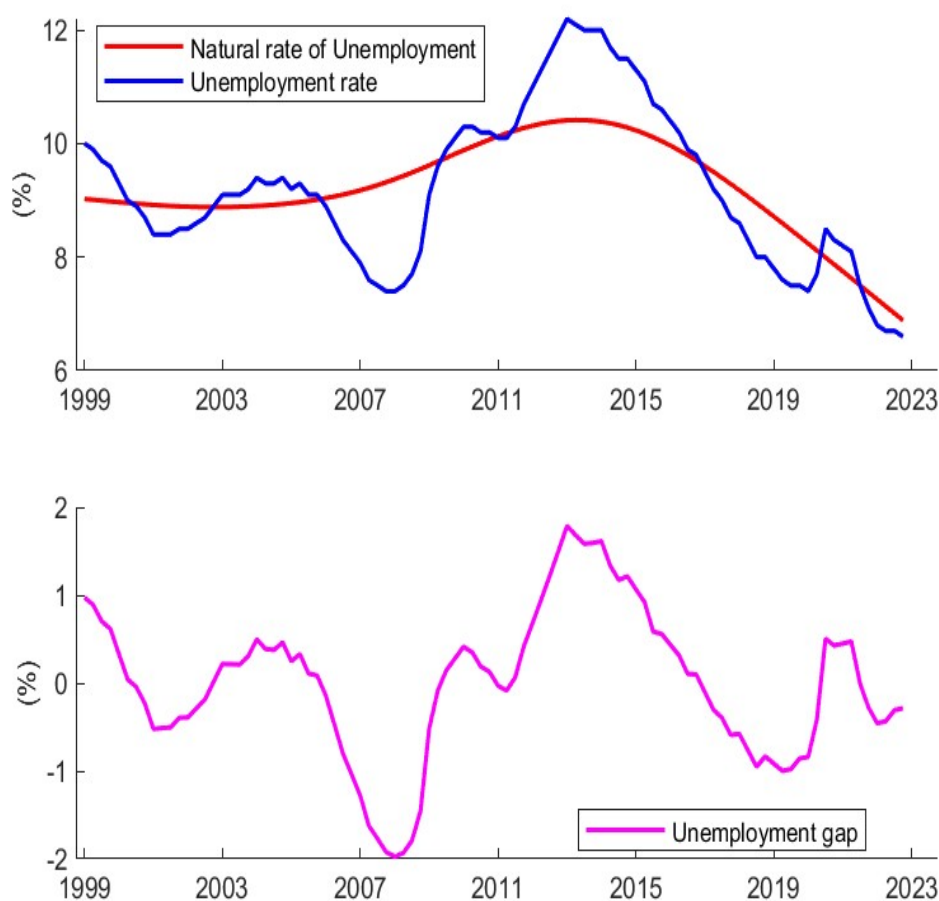
<sup>11</sup> See Woodford (2003), and Gali (2015).

<sup>12</sup> 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.<sup>13</sup>

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.

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



Source: Datastream (Thomson Reuters). Quarterly Data.

<sup>13</sup> The low-frequency component is extrapolated through a Hodrick-Prescott filter.

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.

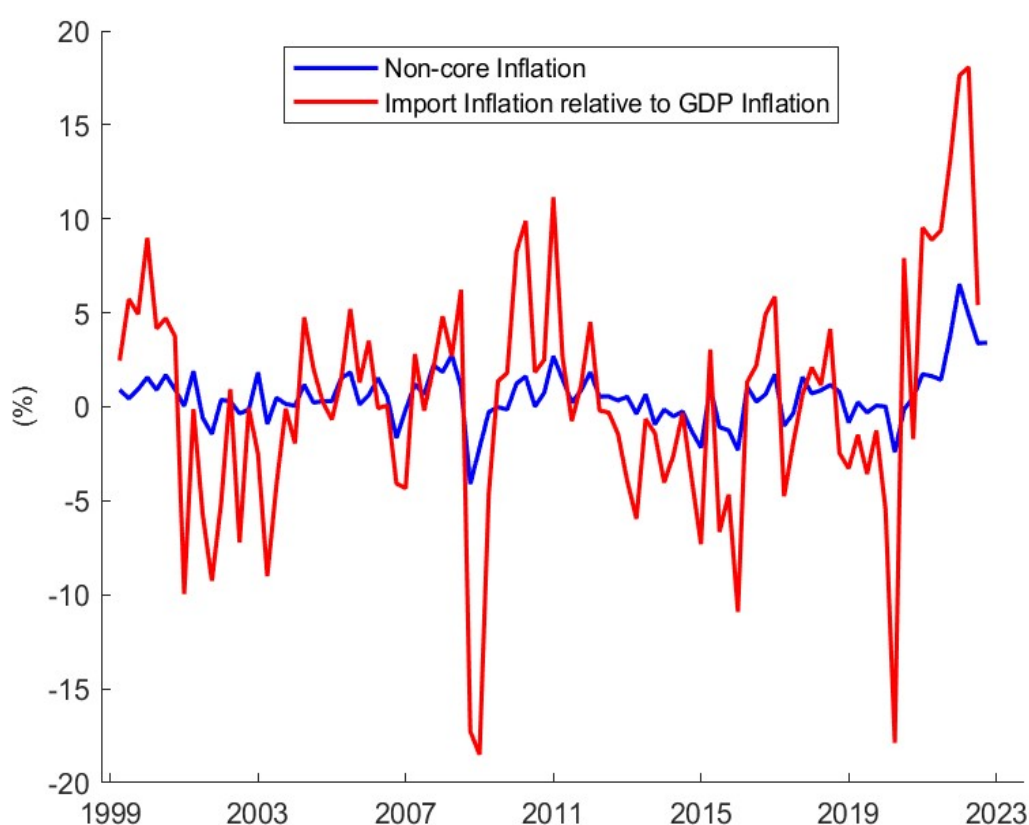
In general, the inflation rate has some degree of persistence because of the pressure of wages or intermediate-goods prices on producer prices. This latter channel should operate through supply value chains. These linkages might be significant determinants of the intrinsic persistence of the inflation 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



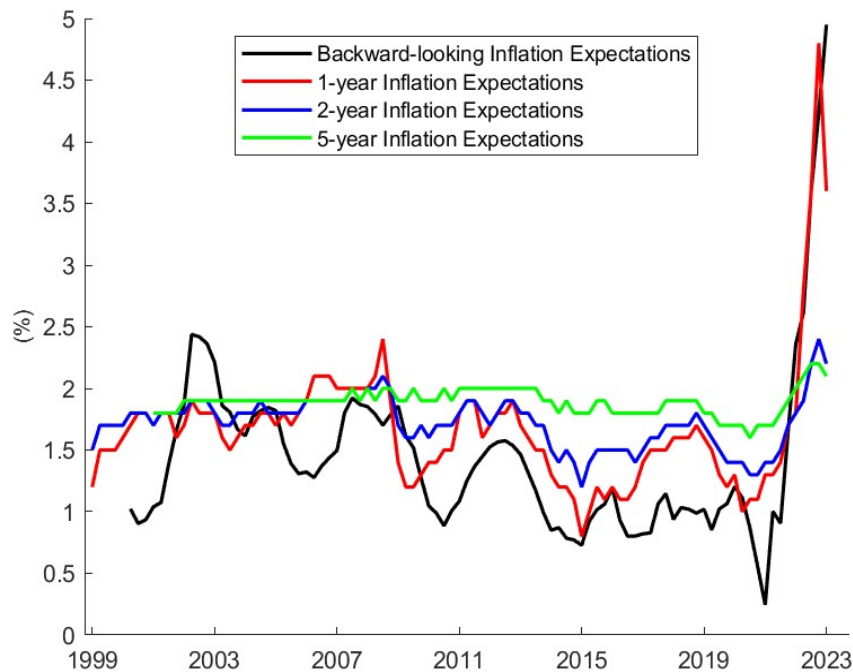
Source: ECB. Quarterly Data.

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.<sup>14</sup> 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,

<sup>14</sup> This evidence is based on four estimations.

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 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<sup>15</sup>. 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<sup>16</sup>. 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 institutional duty is to put price dynamics under control independently of supply-side or demand-side

<sup>15</sup> The specificities of this type of inflation are analysed by Korinek and Stiglitz (2022), Stiglitz and Regmi (2022), and Buti and Messori (2022).

<sup>16</sup> 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.

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<sup>17</sup>. 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"<sup>18</sup>, 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 transforming the current slowdown and the forecasted stagnation of the euro area economy into a recession.

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<sup>17</sup> 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.

<sup>18</sup> 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.)

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)<sup>19</sup>, 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.<sup>20</sup> 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.<sup>21</sup> 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 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

<sup>19</sup> 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.

<sup>20</sup> 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.

<sup>21</sup> 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),

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.<sup>22</sup> 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 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.

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<sup>22</sup> 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.

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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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.

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