

Short economic and financial analyses

Core inflation in the euro area: What explains the post-pandemic dynamics of services and NEIG inflation?

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Abstract

This short paper reviews post-pandemic trends in services and non-energy industrial goods (NEIG) inflation in the euro area and examines the explanations for the large inflation gap that has emerged between these two components of core inflation over the course of 2024. Model results show that the factors that have contributed to such a large inflation gap appear to be mainly linked to the differences in the timing, composition and strength of the disinflation process, which was faster and stronger for NEIG than for services. Furthermore, higher exposure of services to wage growth is the driver behind the ongoing persistence of services inflation and the high level of the inflation gap. A forward-looking assessment suggests that the economic environment remains conducive to the continuation of the disinflation process for services inflation, implying that the inflation gap is expected to narrow in the future.¹

JEL codes: C22, E31, E32, E52

Keywords: core inflation, euro area, services, non-energy industrial goods, NEIG, post-pandemic inflation, model-based decomposition

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Within the analysis of price dynamics for the purpose of monetary policy decision-making, core inflation plays an important role. Because it abstracts away from volatile components like energy and food, which are often driven by temporary external shocks, core inflation provides a clearer measure of the underlying, persistent price pressures than headline inflation.² As a result of this, the Governing Council of the ECB identifies core inflation as one of the guiding elements of its monetary policy reaction function.³

In the euro area, core inflation has risen substantially in the aftermath of the COVID-19 pandemic, and despite some notable moderation, it remains at an elevated level at the end of 2024. This marks a sharp departure from the pre-pandemic trend of subdued core inflation, which was widely considered as a source of concern (see, e.g., Ciccarelli and Osbat, 2017; Koester et al., 2021). Whereas core inflation fluctuated in the vicinity of 1% in the years prior to the pandemic, it stood at 2.7% in December 2024.

Motivated by such ongoing strength of core inflation and its relevance for the calibration of monetary policy, this short paper gives an overview of recent developments in services and non-energy industrial goods (NEIG) inflation in the euro area.⁴ These two components of the Harmonised Index of Consumer Prices (HICP), which jointly determine core inflation, continue to draw attention mainly due to two enduring characteristics: persistently high services inflation and the large positive gap between services and NEIG inflation.

In light of these developments, this short paper initially reviews the recent inflationary trends for core inflation and discusses the factors that are contributing to the positive differential between services and NEIG inflation. Next, a model-based decomposition is used to highlight the important differences in the exposure of services and NEIG to the still elevated wage growth. Finally, the paper concludes by drawing conclusions for the inflation outlook.

Post-pandemic developments in headline and core inflation

Since the start of the COVID-19 pandemic, the euro area has experienced a pronounced inflation cycle. Between February 2020 and October 2022 (the peak), inflation rose from 1.2% to 10.6%, which was the sharpest increase since the 1970s.

The common narrative links the origins of this inflationary surge mainly to the supply shocks originating from the pandemic disruptions, to sharp increases in energy and

² In this paper, core inflation refers to the changes in the HICP index excluding energy and food.

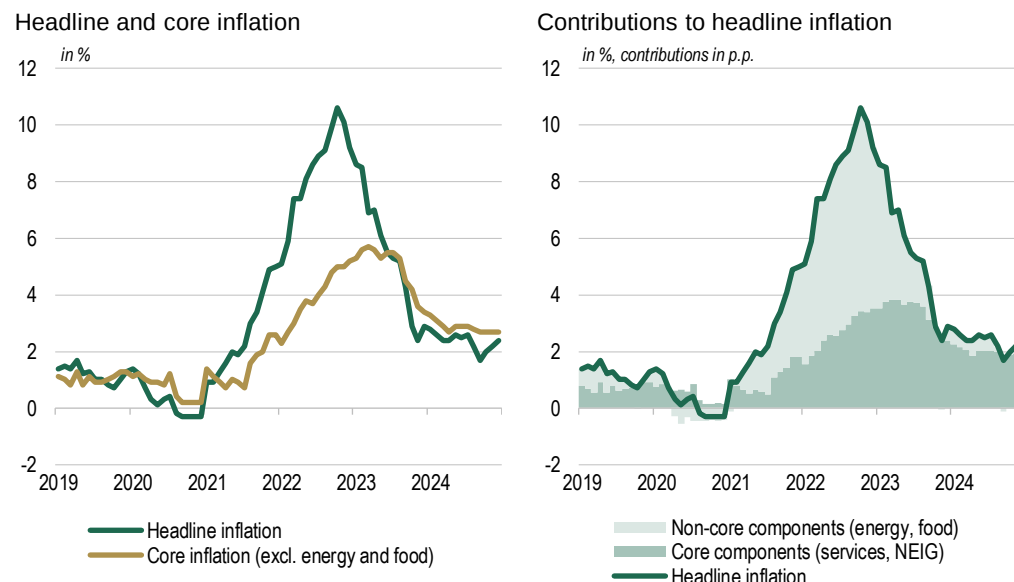
³ In the communication that follows the monetary policy meetings of the ECB, the Governing Council has recently stated: "... the Governing Council's interest rate decisions will be based on its assessment of the inflation outlook in light of the incoming economic and financial data, the dynamics of **underlying inflation** and the strength of monetary policy transmission." (emphasis added; see, e.g., [Monetary policy decision from December 2024](#)) Although core inflation (i.e. HICP excluding energy and food) represents only one measure of underlying inflation, it is widely considered as the most important one.

⁴ Non-energy industrial goods are commonly referred to also as core goods.

commodity prices, and, later, to the fallout of the war in Ukraine (Lane, 2024). In line with this narrative, the increase in inflation was, at least initially, predominantly driven by rising energy and food inflation, while core inflation remained more muted and responded only sluggishly. As a result, the sharp surge in headline inflation far outpaced the rise in core inflation during this first part of the recent inflation cycle. Whereas headline inflation rose by 9.4 percentage points between February 2020 and October 2022, the increase in core inflation in the same period was only 3.8 percentage points (Figure 1, left).

This inflation surge was subsequently followed by an almost equally fast disinflation, which brought headline inflation back down to 2.4% by December 2024. However, the disinflation has been more pronounced for headline inflation than for core inflation. While the easing of supply-side factors brought down energy and food inflation, core inflation eased only gradually and remained persistently elevated in response to slower-moving domestic drivers of inflation and elevated wage growth. As a result, core inflation (at 2.7%) continued to exceed headline inflation (at 2.4%) at the end of 2024.

Figure 1: **Headline and core inflation in the euro area**



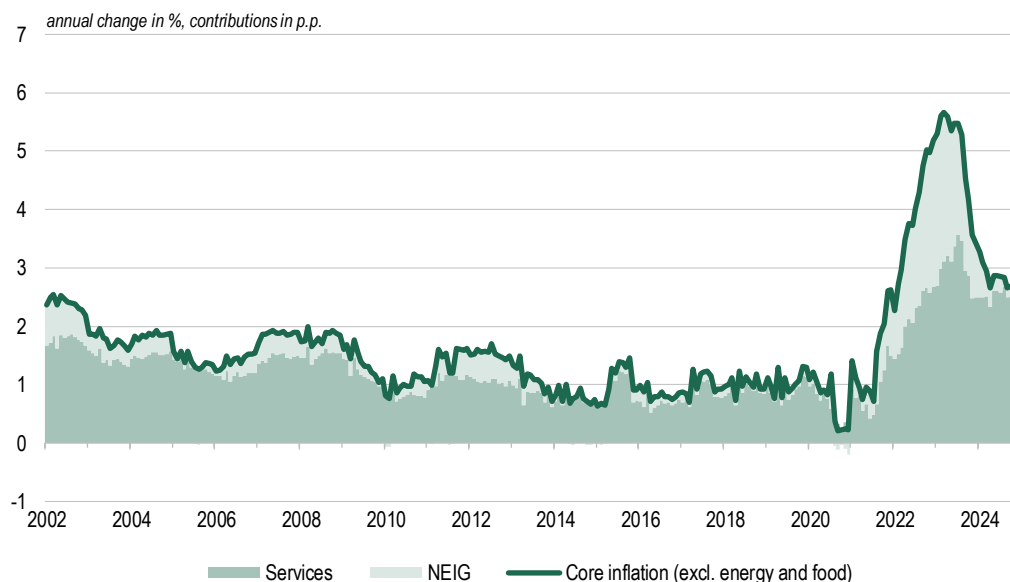
Sources: Eurostat, ECB, own calculations.

These dynamics reflect a material change in the composition of inflation in the post-pandemic period. While the non-core components – energy and food prices – were the dominant drivers of headline inflation in the first phase of the cycle, core components – services and non-energy industrial goods (NEIG) – have taken on a larger role since early 2023. In recent months, headline inflation has been almost exclusively driven by core inflation, which highlights a fundamental shift in inflationary dynamics in the euro area (Figure 1, right).

Post-pandemic developments in services and NEIG inflation

At a disaggregated level, the nature of core inflation has also changed noticeably over the course of the post-pandemic period. It switched from being broad-based (encompassing services and core goods) to being mainly driven by services (Figure 2).

Figure 2: Core inflation in the euro area and the contributions of services and NEIG



Sources: Eurostat, ECB, own calculations.

This dynamic reflects the evolution of the inflation cycle for core inflation in the euro area, which can be broadly split into three phases.

In the first phase of the core inflation cycle (mid-2021 to mid-2023), core inflation rose sharply in response to a broad-based build-up of cost pressures. Rising energy and commodity prices, pandemic supply chain disruptions and changing (global) consumption patterns (i.e. the rotation of consumption from services to goods) all contributed to a surge in non-wage cost pressures from 2021 onwards (Figure 3, left). The Russian invasion of Ukraine in February 2022 further amplified these pressures, as it caused an unprecedented rise in European gas and electricity prices, which reverberated along the pricing chains.

At the same time, nominal wage pressures also started to build up, driven by inflation compensation motives and labour market tightness. Relative to non-wage costs, the increase in wage costs was, nevertheless, fairly gradual and materialised only with a degree of lag relative to the build-up of non-wage cost pressures (Figure 3, right).

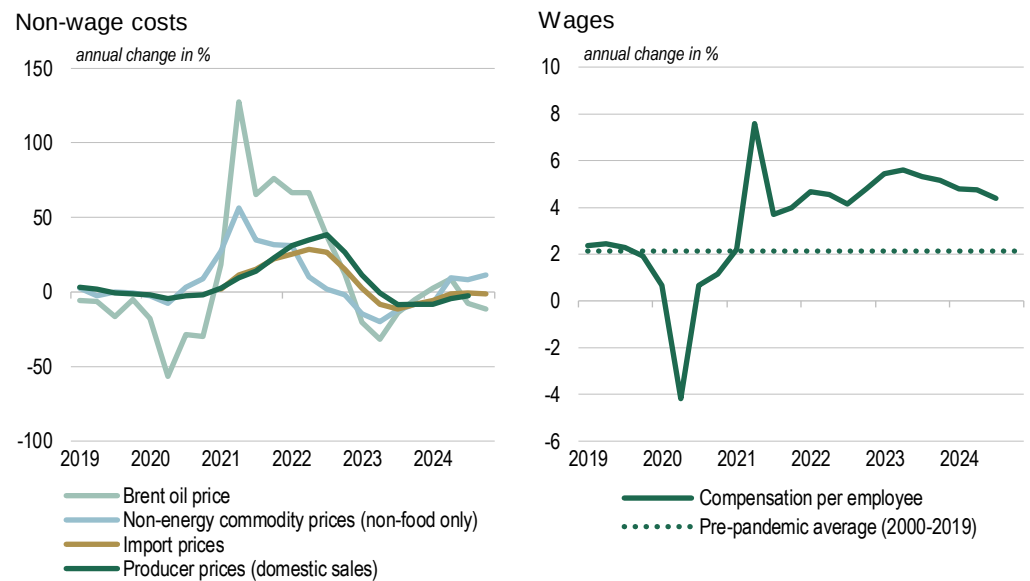
The progression of cost pressures from non-wage costs to wage costs is clearly seen in Figure 3. While the annual growth in commodity prices peaked already in 2021 and the growth in import and producer prices peaked in 2022, wage growth kept increasing all the way until the middle of 2023 (Figure 3).⁵

As a result of these strong cost developments over the course of 2021–2023, NEIG and services inflation both rose sharply from late 2021 onwards and reached a peak in

⁵ The spike in compensation per employee growth in 2021 reflects the mechanical effects of pandemic lockdowns and the associated job retention schemes.

2023. NEIG inflation peaked at 6.8% in February 2023 and services inflation followed by peaking at a slightly lower rate of 5.6% in July 2023. Relative to their pre-pandemic averages, this implied an overshooting of 6.2 and 3.7 percentage points for NEIG and services respectively (Figure 4).

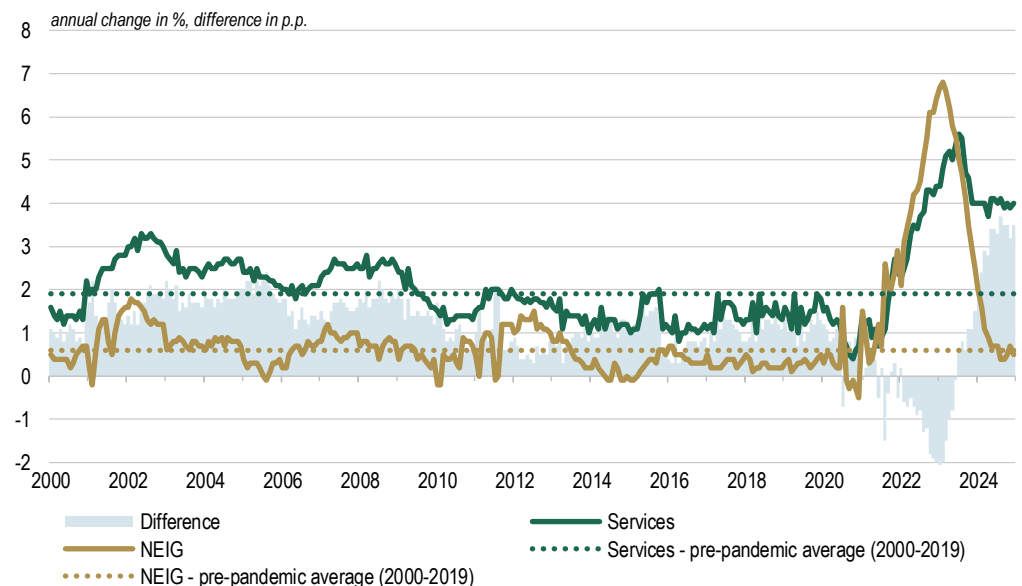
Figure 3: **Cost developments in the euro area**



Sources: Eurostat, ECB, own calculations.

The fact that NEIG inflation increased much more strongly than services inflation during this first phase of the cycle highlights the exceptional nature of cost shocks affecting the goods market and reflects the fact that core inflation at this point in time was to a great extent driven by external cost drivers and not by domestic forces.

Figure 4: **Services and NEIG inflation in the euro area**



Sources: Eurostat, ECB, own calculations.

In the second phase of the cycle (mid-2023 to early-2024), services and NEIG inflation eased as external cost drivers increasingly waned and the restrictive stance of monetary policy became felt. Goods inflation returned to levels in line with the pre-pandemic patterns, reflecting the elimination of pipeline pressures, the easing of supply chain

conditions and the normalisation of consumption patterns. On the other hand, services inflation declined only partially, as easing non-wage cost pressures were offset by the growing effects of persistently elevated wage growth (Figure 3, right). Reflecting this dichotomy, NEIG inflation declined by 6.1 percentage points relative to its peak by May 2024, while the corresponding decline in services inflation was only 1.5 percentage points.

The third phase of the cycle (early-2024 to end-2024) corresponds to a period of relatively stable core inflation at an elevated level. During this phase, NEIG inflation remained low and was not a main driver of core inflation (Figures 2 and 4). On the other hand, services inflation remained sticky, at around 4%, and represented the primary driver of core inflation and headline inflation. As discussed later, the stickiness of services inflation at this stage of the inflation cycle can be mostly attributed to persistently elevated wage growth.

3.1 Inflation gap between services and NEIG

Reflecting these differential patterns, a large positive gap has opened between services and NEIG inflation over the recent period (Figure 4). In December 2024, this gap amounted to 3.5 percentage points, which is a consequence of services and NEIG inflation standing at 4.0% and 0.5% respectively. Such a magnitude of the gap is exceptional from the historical perspective, as it is larger than at any point during the pre-pandemic period (2000–2019) and is 2.2 percentage points larger than the long-term average of 1.3 percentage points.

Therefore, the current high level of the inflation gap cannot be solely explained by the usual structural drivers found in the literature, which deals with the common fact that services inflation tends to exceed goods inflation on average. This literature typically attributes the persistent positive inflation gap between services and goods mainly to lower productivity growth in the services sectors vis-à-vis the goods sectors. Other factors are argued to play only a smaller role in driving the inflation differential between services and goods. These other factors include higher demand for services relative to goods, open economy considerations (in the form of heightened foreign competition in goods and fluctuations in the euro exchange rate) and rising mark-ups in services (see ECB, 2009; Antoniadou et al., 2004).

In contrast to these structural drivers, the factors that have contributed to such a large inflation gap over the past two years appear to be mainly linked to the differences in the timing and strength of the disinflation process, which was faster and stronger for NEIG than for services. The underlying reason for this is the fact that during this inflationary episode, NEIG was more affected by the faster-moving external cost factors such as supply chain disruptions and rising energy prices, whereas services are still under the effect of the slower-moving wage growth. Since wage growth persists at relatively high levels up to this point, while external cost factors have already mostly dissipated, the cumulative disinflation has consequently been much stronger for NEIG than for services up to this point.

In particular, the disinflation for NEIG has been almost four times larger than for services when judged by the decline in inflation rates between their respective peaks and their values in December 2024 (6.3 versus 1.6 percentage points).

3.2 Model-based decomposition of services and NEIG inflation

In order to provide more insight into the nature of the inflation process for services and NEIG in the post-pandemic period, this section uses econometric models to decompose services and NEIG inflation into the contributions of two main cost drivers, namely intermediate input costs (broadly non-wage costs) and wages.⁶

To do so, I use autoregressive distributed lag (ARDL) models, which are linear time series models in which the dependent variable and explanatory variables can be related contemporaneously and across lagged values.

A general $ARDL(p, q_1, \dots, q_k)$ model is given by

$$y_t = a_0 + \sum_{i=1}^p \psi_i y_{t-i} + \sum_{j=1}^k \sum_{l_j=0}^{q_j} \beta_{j,l_j} x_{j,t-l_j} + \epsilon_t, \quad (1)$$

where y_t is the dependent variable, $x_1, \dots, x_k$ are k explanatory variables, ϵ_t are the innovations, a_0 is a constant term, and ψ_i and β_{j,l_j} are the coefficients associated with the lags of y_t and current and lagged values of the k explanatory variables $x_{j,t}$.

I estimate the ARDL models separately for services and NEIG inflation and use producer prices for domestic sales as a proxy for intermediate input costs and compensation per employee as a proxy for wages. All of the variables enter the models in annual growth rates, which simplifies the decomposition of annual inflation rates. The estimation sample covers the period Q1 2000–Q3 2024.

The number of lags for the dependent variable and for the explanatory variables is chosen using information criteria. When faced with conflicting suggestions, I use the Bayesian information criterion as the deciding one.⁷ This consequently results in estimating an $ARDL(1,1,4)$ model for services inflation and an $ARDL(3,1,4)$ model for NEIG inflation.⁸ I present the model estimates in the Appendix.

Figure 5 shows the results of the model-based decomposition of services and NEIG inflation into the contributions of wage growth (green bars) and of intermediate input costs (golden bars) obtained using the estimated ARDL regressions.

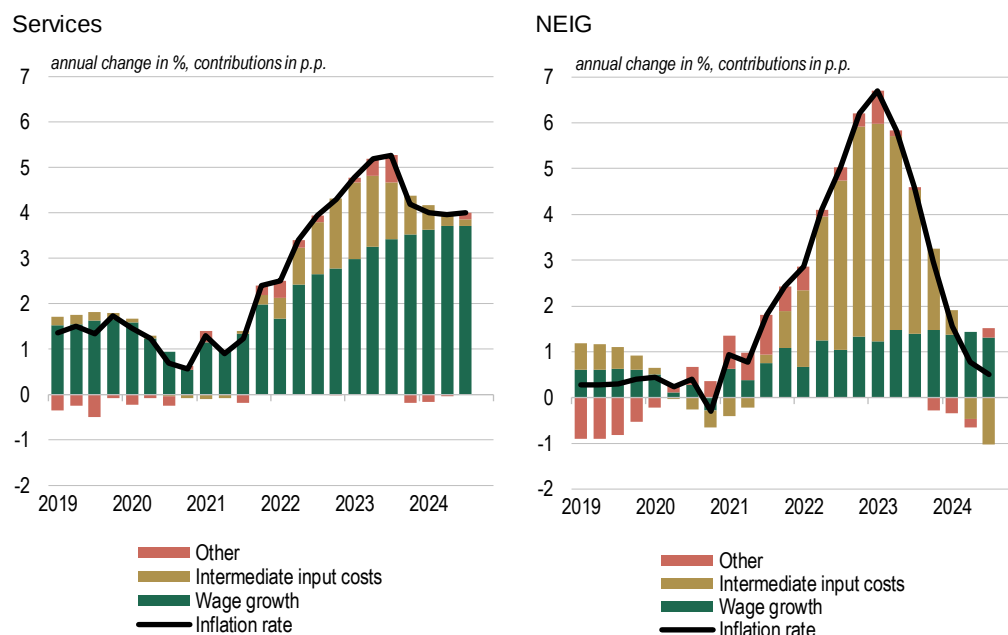
The results demonstrate clear differences in the compositions of the inflation cycle, with NEIG inflation being mainly driven by the dynamics of intermediate input costs and services inflation being predominantly driven by wage growth.

⁶ The decomposition follows the approach in Bank of England (2024).

⁷ I use the Bayesian IC as the deciding criterion because it tends to favour more parsimonious models in comparison with the Akaike IC. Results obtained using the Akaike IC are similar.

⁸ An $ARDL(p, q_1, q_2)$ model includes p lags of the dependent variable (services or NEIG inflation), q_1 lags of domestic PPI inflation and q_2 lags of wage growth. The estimated models have been checked to ensure that they produce economically meaningful results, and they have been tested for residual autocorrelation.

Figure 5: **Decomposition of services and NEIG inflation**



Sources: Eurostat, ECB, own calculations.

Notes: Decompositions are derived from the ARDL regressions of services/NEIG inflation on a proxy for intermediated input costs (domestic PPI inflation) and a measure of wage growth (compensation per employee), with the contributions derived as in Yellen (2015). Model specifications are selected using the Bayesian information criterion. The chosen models are ARDL(1,1,4) for services and ARDL(3,1,4) for NEIG. "Other" includes the constant, the impact of initial conditions and the model residual. The estimation sample is Q1 2000–Q3 2024. Based on Bank of England (2024).

In the case of NEIG (Figure 5, right), the results show that the sharp increase in inflation between 2021 and 2023 was due to an increasing contribution of intermediate input costs, which is in line with the common narrative that attributes the sharp increase in goods prices to the post-pandemic supply chain bottlenecks and rising commodity and energy prices. From 2023 onwards, the contribution of intermediate input costs declines quickly, in line with the normalising supply-side conditions and easing energy prices, and NEIG inflation consequently falls. The contribution of wage growth to NEIG inflation remains small throughout the period, although it increases gradually.

In the case of services (Figure 5, left), the situation is very different, and wage growth plays a much more important role in the build-up of inflationary pressures. Intermediate input costs also play a role, but their effect is limited and peaks already in late 2022 at approximately 1/3 of the overall effect. After that, the contribution of intermediate input costs declines, and by the end of the sample (Q3 2024), almost all of the services inflation is due to wage growth. Thus, these model results show that it is wage growth that is currently keeping services inflation at an elevated level. Furthermore, all of the moderation in services inflation until the end of 2024 has been due to a decline in the contribution of intermediate input costs.

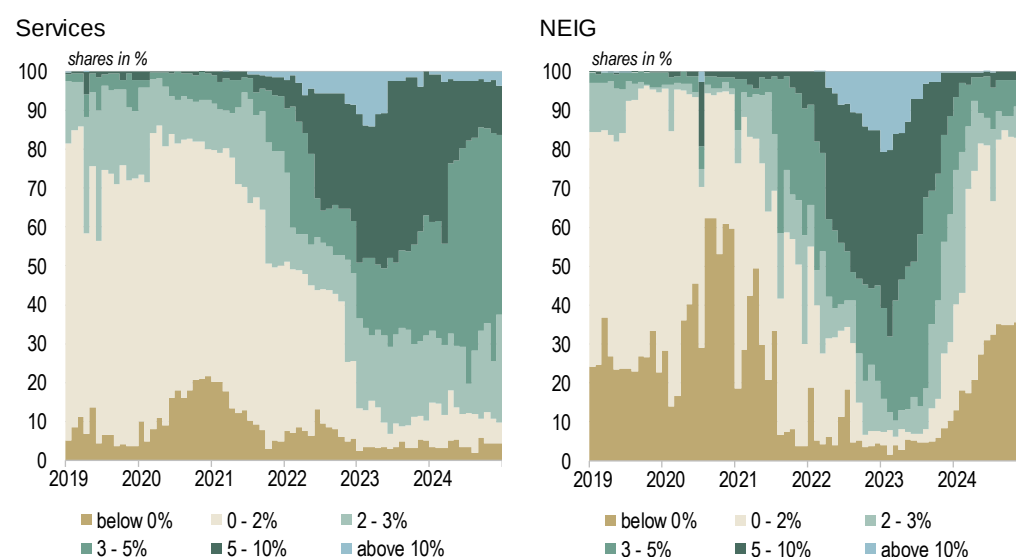
The findings of the model-based analysis presented in the previous section show that the outlook for core inflation in the euro area remains heavily influenced by the evolution of wage growth. This is particularly true for the services component of core inflation, which remains strong due to its higher exposure to the still elevated wage growth.

With core inflation standing at 2.7% in December 2024, there is still some distance to cover before it can be claimed that the disinflation process has run its course. Given that services accounted for almost all core inflation at the end of 2024, it is also clear that further progress in reducing core inflation will have to come mainly from lowering services inflation.

While services inflation remains elevated at 4% at the end of 2024, NEIG inflation has already undergone the process of normalisation and stands below the long-term pre-pandemic average of 0.6% at the end of 2024.

The normalisation of NEIG inflation has been broad-based, and there are no residual pockets of high inflation left, as evident from the distribution of annual inflation rates for individual items included in the NEIG aggregate (Figure 6, right). On the other hand, the situation with services is very different, and high inflation remains fairly prevalent: 16% of services items still showed annual inflation above 5% in November 2024, and 75% of items showed annual inflation above 3% (Figure 6, left). These shares are substantially higher than in the pre-pandemic period and indicate the broad-based nature of lingering services inflation.

Figure 6: **Distribution of inflation rates for components of services and NEIG HICP**

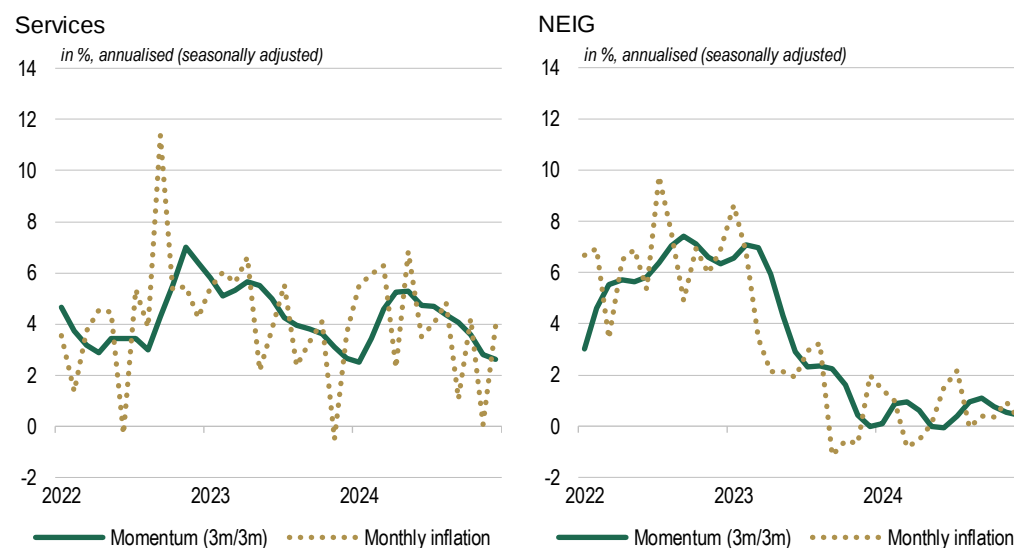


Sources: Eurostat, own calculations.

These data on annual inflation rates (i.e. 12-month changes), however, do not tell the whole story of the current state of inflationary pressures, as they obscure the fact that short-term price dynamics of services have become increasingly favourable over the course of 2024. The month-on-month inflation rate, calculated from the seasonally adjusted services HICP, has been on a downward trend for the larger part of 2024, and the inflation momentum (i.e. the 3-month-on-3-month inflation rate) has eased markedly to 2.6% in annualised terms by December 2024 (Figure 7, left). This indicates that

in the absence of a renewed upward inflationary shock, the annual inflation rate for services should also start declining more noticeably in the near future. In combination with the continuation of the subdued short-term price dynamics for NEIG (Figure 7, right), this suggests a relatively favourable outlook for core inflation in the euro area.

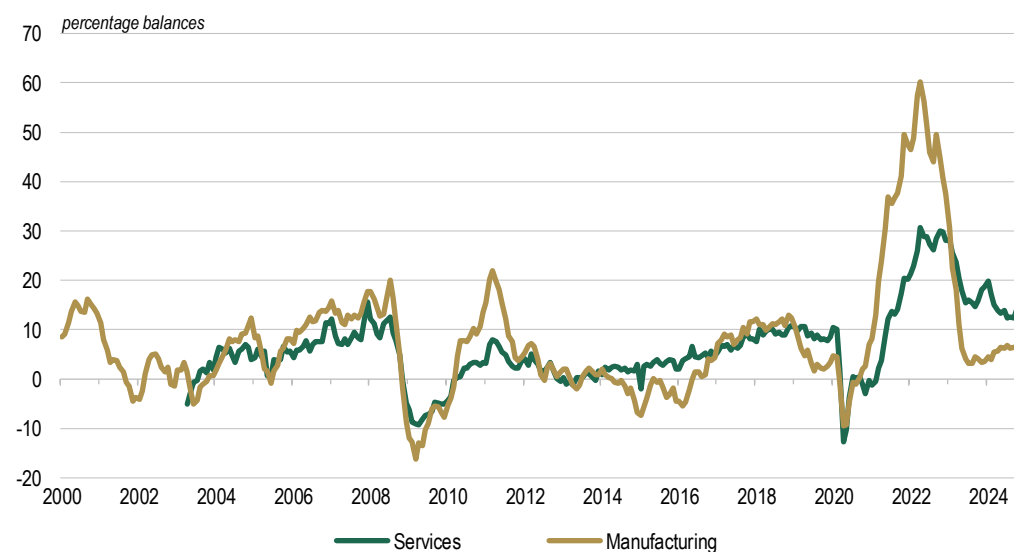
Figure 7: Short-run seasonally adjusted dynamics of services and NEIG



Sources: Eurostat, ECB, own calculations.

Relatively positive signals about the continuation of the disinflation process in the near future are also coming from surveys that elicit firms' expectations about the path of their future selling prices. The responses of firms to the European Commission's business survey indicate that pricing intentions of euro area services firms have moderated noticeably over the past few years, and services firms now indicate only a slightly elevated intention to increase selling prices relative to the pre-pandemic year 2019 (Figure 8). At the end of 2024, selling price expectations have started, however, to inch up again for services firms, which suggests some residual risks to the disinflation process for services in 2025. At the same time, manufacturing firms continue to signal subdued pricing intentions, indicating limited upward pressure on goods inflation.

Figure 8: Selling price expectations of firms in the euro area



Source: Eurostat.

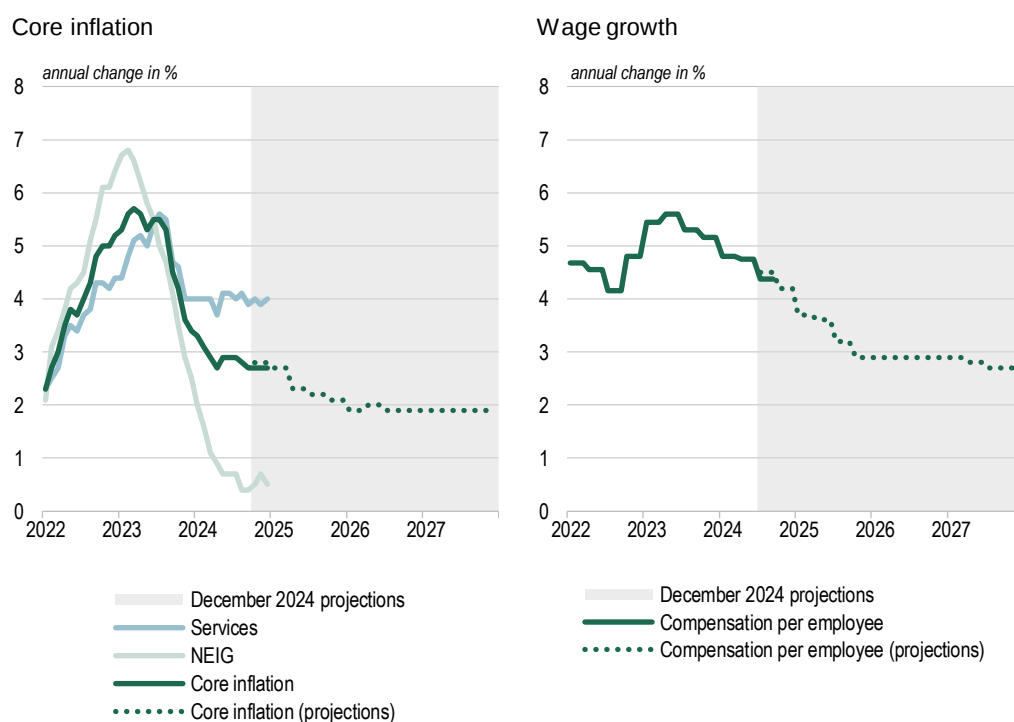
Notes: The figure shows the balance of answers to the survey question "How do you expect your selling prices to change over the next 3 months?".

The evidence presented above, in combination with the continued weakness in the euro area economy, suggests that the euro area economic environment remains relatively conducive to the continuation of the disinflation process and that upside risks to the outlook for core inflation have noticeably receded over the recent period.⁹ Although wage growth still remains elevated, the cooling labour demand in combination with the favourable forward-looking wage indicators (see Bates et al., 2024) suggest that the inflationary pressures from wage growth are also on the decline.¹⁰

Mirroring these findings, the latest (December 2024 BMPE) round of the Eurosystem's projections for the euro area (ECB, 2024) projects that wage growth and core inflation will both slow materially over the course of 2025 (Figure 9). Core inflation is projected to be in the vicinity of 2% from late 2025, while wage growth is expected to stabilise at around 3%, a level that is broadly in line with the overall inflation target of 2%.

A successful materialisation of these projections over the course of 2025 would mark the final step of the post-pandemic disinflation process for core inflation in the euro area.

Figure 9: Latest Eurosystem projections for core inflation and wage growth in the euro area



Sources: Eurostat, ECB December 2024 BMPE projections, own calculations.

⁹ For a broader overview of the euro area macroeconomic environment at the end of 2024, see the [December 2024 edition of the ECB's Economic Bulletin](#).

¹⁰ In December 2024, the ECB started publishing new wage tracker indicators for the euro area, which use granular data from collective bargaining agreements to track developments in negotiated wages. Importantly, these indicators also provide forward-looking information on the future wage increases embedded in wage settlements, which often cover more than one year. Consequently, this forward-looking information can be used as a leading indicator for future negotiated wage growth developments. The December 2024 vintage of indicators suggests a notable easing of wage pressures in 2025 relative to 2024. See Bates et al. (2024) for more details.

This short paper gave an overview of the post-pandemic developments in core inflation in the euro area and explored the drivers of services and NEIG inflation. The findings show that the large inflation gap that has recently emerged between services and NEIG inflation mostly reflects the differences in the timing, composition and strength of the disinflation process, which was faster and stronger for NEIG than for services. Furthermore, results of a model-based decomposition show that higher exposure of services to wage growth is the driver behind the current persistence of services inflation and the high level of the inflation gap between services and NEIG.

A forward-looking assessment of the outlook for core inflation shows that the environment remains conducive to the continuation of the disinflation process, implying that the current level of inflation gap should diminish as the disinflation process runs its full course.

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Table 1: ARDL model estimates

Dependent variable:	NEIG	SERV
NEIG(-1)	0.702 (0.082)**	
NEIG(-2)	0.474 (0.098)**	
NEIG(-3)	-0.442 (0.076)**	
SERV(-1)		0.783 (0.054)**
PPI	0.005 (0.010)	-0.005 (0.008)
PPI(-1)	0.034 (0.012)**	0.020 (0.008)*
W	0.074 (0.033)*	0.049 (0.028)
W(-1)	-0.045 (0.032)	0.033 (0.028)
W(-2)	0.098 (0.032)**	0.096 (0.028)**
W(-3)	-0.127 (0.032)**	-0.108 (0.029)**
W(-4)	0.074 (0.034)*	0.100 (0.028)**
Constant	-0.024 (0.086)	0.031 (0.060)
Number of observations	94	94
R ²	0.969	0.955

Source: own calculations.

Notes: The table shows estimates of ARDL regressions of services/NEIG inflation on a proxy for intermediated input costs (domestic PPI inflation) and a measure of wage growth (compensation per employee). Model specifications are selected using the Bayesian information criterion. The chosen models are ARDL(1,1,4) for services and ARDL(3,1,4) for NEIG. The estimation sample is Q1 2000–Q3 2024. Standard errors are shown in parentheses.

** p < 0.01, * p < 0.05