BOX 2: INFLATION PERSISTENCE OVER TIME: DEVELOPMENTS AND CONTRIBUTING FACTORS[1]

This box examines the persistence of inflation in Malta and compares its evolution over time and across various subcomponents with that of the euro area. Using time-varying autoregressive models and Bayesian techniques, the study highlights the increasing trend of inflation persistence in Malta, particularly since the onset of the COVID-19 pandemic and the subsequent global economic disruptions. The analysis identifies key factors that might have contributed to this persistence, including supply shocks, inflation expectations, and labour market tightness.

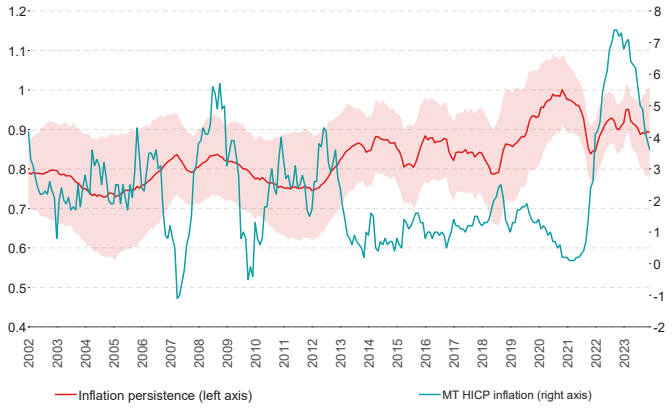
How inflation persistence in Malta has evolved for headline and its main subcomponents

The uneven global economic recovery from the pandemic in 2020 and 2021, as well as the onset of the Russia-Ukraine War in 2022, brought about significant supply-imbalances that caused an extraordinary episode of very high inflation. As a small open economy, Malta also underwent a period of elevated inflation. According to the HICP, inflation in Malta peaked at 7.4% in October 2022, the highest rate recorded since the index's inception in 1997. The recent surge in inflation in Malta closely mirrors that of the euro area, which has also experienced both a higher peak and a longer duration of inflation above its historical average.

In this box we analyse the recent developments in inflation persistence, defined as the tendency for past inflation to stay near where it has been recently, absent any other economic counteracting forces (Fuhrer, 2009). To this end, separately for each inflation series of interest, we estimate an autoregressive model featuring time-varying parameters and stochastic volatility and we define the month-specific persistence parameter as the sum of the autoregressive coefficients.[2]

Chart 1 shows the estimated evolution of Maltese inflation persistence for headline HICP from

Chart 1
TIME-VARYING PERSISTENCE ESTIMATES OF OVERALL INFLATION



Source: Author's estimates.
Notes: Left-hand axis shows the estimated time-varying persistence parameters. Right-hand axis shows annual percentage changes.

[1] Prepared by Germano Ruisi, Principal Research Economist of the Economic Research Department at the Central Bank of Malta. The analysis presented in this box is based on the authors' study: Ruisi and Borg (2024), "Inflation persistence over time: Developments and contributing factors", Central Bank of Malta *Policy Note*. Helpful comments by Mr Alexander Demarco, Dr Aaron G. Grech, Mrs Rita Schembri, Dr Massimo Giovannini, Mr Noel Rapa, Mr John Farrugia, and all the participants in an internal seminar are gratefully acknowledged. The views expressed are the author's own and do not necessarily reflect the views of the Central Bank of Malta.

[2] For more details on the model please refer to Ruisi and Borg (2024) "Inflation persistence over time: Developments and contributing factors", Central Bank of Malta *Policy Note*.

2002 to 2023, along with the 68% credible bands. It also plots the series of headline HICP inflation.

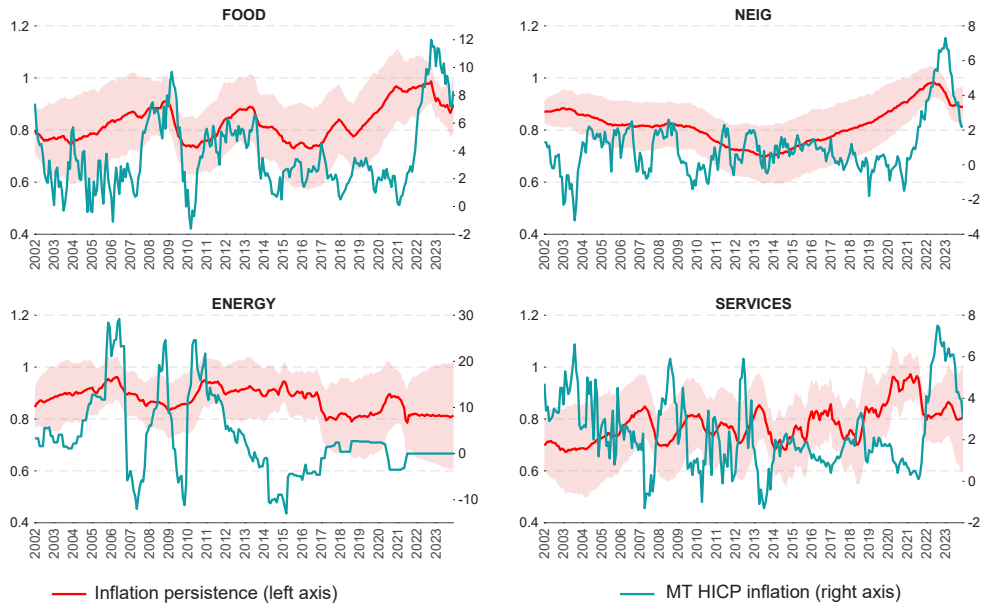
Despite the erratic movements in HICP inflation between 2002 and 2012, inflation persistence hovered close to 0.8. However, estimates of inflation persistence began trending upwards from 2012, stabilising at around 0.85 by 2019. This period, characterised by generally below-average inflation, suggests that the estimated inflation persistence reflects a persistently low inflation environment.

Inflation persistence increased sharply following the onset of the pandemic in 2020, peaking in November of the same year and coinciding with some of the lowest inflation rates since the declines experienced in 2010. This rise in persistence might be linked to the historically low inflation levels before the pandemic.

Since 2021, estimates of inflation persistence have been relatively unstable but have remained historically high throughout the high inflationary period that emerged in 2022. By the end of 2023, inflation persistence had settled at around 0.9, confirming that the last two years have been characterised by both high and persistent inflation.

Chart 2 delves into the subcomponents of HICP and shows how the drivers of persistence in headline inflation have been rather diverse over the last 20 years.

Chart 2
TIME-VARYING PERSISTENCE ESTIMATES OF SUBCOMPONENTS



Source: Author's estimates.
Note: Left-hand axis shows the estimated time-varying persistence parameters. Right-hand axis shows annual percentage changes.

With regards to food inflation, persistence increased during the 2000s and peaked in 2008, mirroring a period of high food inflation due to the food price shock in 2007/2008.[3] Persistence then declined after 2013 as food inflation shifted from a rather prolonged period of high inflation to a lower inflation regime. As food inflation settled at persistently low levels between 2015 and 2021, inflation persistence rose and peaked in the latter part of this period. The increase in food inflation in the post-COVID period led to an elevated estimate of inflation persistence, which remained elevated even as food inflation moderated somewhat since mid-2023.

Turning to NEIG, estimates show a consistent decline in an otherwise elevated inflation persistence measure until 2013. This was followed by an upward trend in inflation persistence that occurred over the following decade. Despite the sudden increase in goods inflation since 2021, inflation persistence continued to increase markedly, and hovered close to 1 by 2022, suggesting that the sharp rise in goods inflation experienced in the post-COVID period was highly persistent. As goods inflation eased during 2023, the estimated inflation persistence also moderated but remained rather high from a historical perspective.

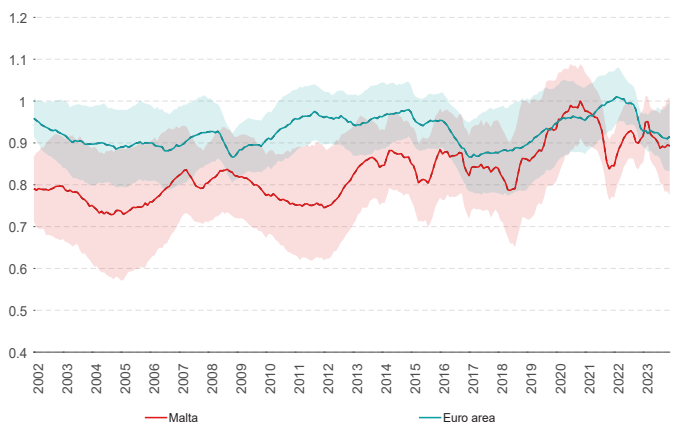
Persistence in energy inflation has been comparatively stable and high over the period under consideration, which might reflect the fact that this subcomponent is administered by the Maltese Government. In view of the Government's decision to keep energy prices unchanged throughout the period characterised by sharp increases in international energy commodity prices, energy inflation persistence remained stable unlike that in the other subcomponents.

Finally, persistence in services inflation was comparatively lower than other subcomponents across the sample under consideration. But, similarly to others subcomponent measures, as services inflation stabilised over the 2013-2021 period, the estimated persistence rose rapidly. Despite falling somewhat, persistence remained relatively elevated from a historical point of view during the high inflation period which started in 2022.

How has inflation persistence evolved in Malta vis-à-vis in the euro area

Chart 3 shows that Malta's inflation persistence has been consistently lower than that of the euro area up until 2019.

Chart 3
TIME-VARYING PERSISTENCE ESTIMATES OF MALTA AND THE EURO AREA



Source: Author's estimates.
Note: Chart shows the estimated time-varying persistence parameters for overall inflation in Malta and the euro area.

[3] The food price shock was a period which featured a dramatic increase in the price of international food commodities such as rice, corn, and wheat. It was driven by a confluence of factors such as higher oil prices, the depreciation of the U.S. dollar, weather shocks, etc. (see Heady and Fan, 2008). There could be other factors explaining the food price shock that occurred in 2007-2008 but there is no full consensus in the literature.

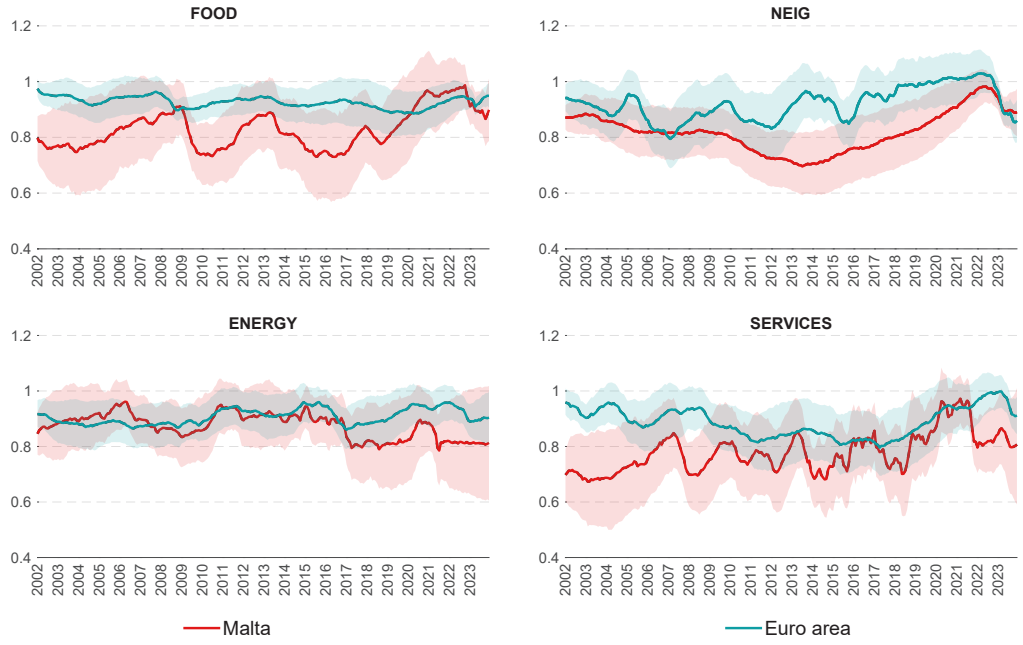
The dynamic nature of the time-varying estimation shows a gradual convergence towards euro area inflation persistence. A brief alignment with euro area persistence was observed in Malta during 2020 and 2021. Conversely, a spike in headline inflation in 2022 prompted a slight drop in Maltese inflation persistence, followed by a subsequent rise into 2023. Concurrently, the euro area experienced a peak in inflation persistence around mid-2022, tapering off gradually throughout 2023, resulting in a convergence with Malta's persistence by mid-2023.

Delving into subcomponents in Chart 4, a comparison shows some divergences in the drivers of headline inflation persistence dynamics.

Maltese food inflation's persistence was consistently lower than the euro area's between 2013 and 2017 but, subsequently, the two began to converge. The convergence during the recent inflationary period reflects the synchronization of the upward swing in food inflation dynamics between the euro area and Malta. This convergence could also reflect the fact that common international supply side shocks were the main drivers of inflation dynamics in both euro area and Malta during this period and by the fact that Malta's goods consumption basket has a large import content.

Estimates of energy inflation persistence for Malta reflect a significant influence from governmental price administration, contrasting with the euro area's more dynamic energy pricing. Pre-2017, energy inflation persistence of Malta and the euro area remained

Chart 4
TIME-VARYING PERSISTENCE ESTIMATES OF SUBCOMPONENTS – MALTA VS EURO AREA



Source: Author's estimates.
Note: Chart shows the estimated time-varying persistence parameters for subcomponent inflation in Malta and the euro area.

comparable, yet post-2017, Malta's estimates were consistently lower, driven mainly by the Maltese Government price stabilisation policies. This divergence intensified amid large shocks to euro area energy inflation versus Malta's zero-energy inflation.

Services inflation in Malta exhibits lower persistence compared to the euro area. This is true throughout most of the period under consideration with the exception of the period between 2015 and 2022 where the Malta's services inflation persistence has mirrored that of the euro area.

Factors that might explain the recent developments in inflation persistence

We seek tentative evidence of factors that might explain the recent developments in inflation persistence by extending the inflation persistence estimates to each of the 20 euro-area countries. Subsequently, by utilising a panel regression framework, we regress the estimated country-specific series of time-varying headline HICP inflation persistence on a set of common determinants.[4] The main results are shown in Table 1.[5]

Inflation expectations do play a role in explaining the evolution of inflation persistence, though there are variations across periods considered. Sellers' expectations in industry contributed negatively to overall inflation persistence until February 2021. Neri (2023) showed that long-term inflation expectations were generally well-anchored and had reached very low levels by 2019, which might explain the low impact of sellers' expectations on inflation persistence.

Table 1
SOURCES OF INFLATION PERSISTENCE

Prices expectations industry (till 2021M02)	-0.042	*
Prices expectations industry (since 2021M03)	0.131	***
Prices expectations consumers (till 2021M02)	-0.001	
Prices expectations consumers (since 2021M03)	-0.074	***
Equipment limiting production (till 2021M02)	0.170	***
Equipment limiting production (since 2021M03)	0.089	***
Unemployment cycle abs (till 2021M02)	1.393	***
Unemployment cycle abs (since 2021M03)	1.014	*
Trade openness	2.106	**
Dummy EA	-2.829	***
Dummy 2021M03 onwards	2.001	**
ECB shadow rate	-0.697	***
Cons	86.772	***
Observations	4895	
Within R-squared	0.251	

Source: Author's estimates.

[4] For more details on the model please refer to Ruisi and Borg (2024) "Inflation persistence over time: Developments and contributing factors", Central Bank of Malta *Policy Note*.

[5] Throughout this section, the dependent variable, i.e., inflation persistence, has been multiplied by one hundred for easier readability of the slope parameters of interest.

Conversely, since March 2021, sellers' price expectations contributed positively to inflation persistence. During this period, sellers' price expectations rose significantly, mainly due to sharp increases in input and financing costs as well as to pent-up demand from the pandemic.

Consumer price expectations do not seem to have been a factor driving inflation persistence prior to February 2021. To the contrary, they are found to be negatively related to inflation persistence post March 2021. Evidence from the ECB's Consumer Expectations Survey (CES) shows that consumers have primarily adjusted downwards their consumption (and increased savings) to cope with higher inflation (Bobasu et al., 2023). Hence, higher consumer expectations might have brought about a stronger downward adjustment in consumption, which in turn reduced inflationary pressures, thus reducing its persistence.

The coefficients on equipment shortages and labour market tightness, the latter captured by the absolute value of the unemployment cycle, are positive and statistically significant, both for the period prior and post 2021. Bernanke and Blanchard (2023) found that the two are major drivers for the increase in inflation occurring in the post-COVID period. From our results, we find that they are also positively correlated with inflation persistence.

Finally, the parameters associated with trade openness and the dummy are positive and statistically significant. Additionally, a country's entry into the euro area has generally been associated with a reduced overall inflation persistence as highlighted by the significant slope relative to the and to the ECB's policies as proxied by the shadow rate.

Conclusions

This box shows estimates of the persistence of inflation in Malta and compares their evolution over time and across various subcomponents with that of the euro area. Inflation persistence in Malta has trended upwards since 2012, generally reflecting a period of persistently low inflation and has then increased sharply since 2021. Overall, Maltese inflation persistence was lower than in the euro area until 2019 but has recently converged, both for headline and for its main subcomponents. The analysis also identifies key major factors that might have positively contributed to persistence, especially after March 2021 with supply shocks, sellers' and consumers' inflation expectations, and labour market tightness found to be correlated with inflation persistence measures.