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Uncertainty and Monetary Policy in the Euro Area

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

The outbreak of the COVID-19 crisis has triggered a new wave of uncertainty, which may amplify the negative effect of the crisis. Based on several uncertainty measures, we show that inflation in the euro area is negatively affected by higher uncertainty. However, uncertainty does not impair the transmission of monetary policy. Consequently, the ECB should consider uncertainty in its reaction function in order to fulfil its mandate.

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LIST OF ABBREVIATIONS

CISS	Composite Indicator of Systemic Stress
CPI	Consumer Price Index
ECB	European Central Bank
EPU	Economic Policy Uncertainty
GDP	Gross domestic product
OECD	Organisation for Economic Co-operation and Development
SPF	Survey of Professional Forecasters
US	United States
VIX	(Chicago Board Options Exchange) Volatility Index
VSTOXX	Euro Stoxx 50 Volatility Index

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EXECUTIVE SUMMARY

- Academic literature emphasises that **uncertainty shocks work as negative demand shocks** suggesting that they would amplify the deflationary pressures already at work.
- **Uncertainty is a multidimensional concept** that can encompass several dimensions – financial, macroeconomic, economic policy. The different types of uncertainty do not have similar dynamics and effects on the economy.
- We show that **uncertainty has negative effects on inflation overall**. Although financial uncertainty does not transmit to non-energy industrial goods and uncertainty about macroeconomic news is positively correlated with energy prices, the overall effect of all uncertainty metrics on the various components of inflation in the euro area is negative and persistent.
- However, **we find no evidence that uncertainty affects the transmission mechanism of monetary policy to inflation**. The effectiveness of the European Central Bank (ECB)'s monetary policy on euro area inflation is the same regardless whether uncertainty is high or not.
- The policy implications of such results are that the effectiveness of the policy instruments is not impaired and that **monetary policymakers should consider uncertainty in their reaction function in order to fulfil their mandate**.

1. INTRODUCTION

The outbreak of the COVID-19 crisis has triggered an unprecedented worldwide recession. In the first semester of 2020, gross domestic product (GDP) plummeted by 15 % in the euro area and even if a rebound is expected during the second half of the year, the economic outlook remains gloomy. This situation has been accompanied by a new wave of uncertainty as it was the first time in the modern era that the world was confronted with such a pandemic. Not only were the spread of the coronavirus and its health effects unknown but so were the economic consequences of the lockdown measures implemented by most governments. Now that we have the first statistical information released by national institutes, the depth of the recession is confirmed but uncertainty remains as the pandemic is still not under control. The path for the ongoing recovery is still unchartered and several scenarios are likely: will it be a V-shaped recession, a W-shaped or "inverted square root sign"-shaped recession?

The volatility of financial markets has testified to this uncertainty. After a sharp decline of stock price indices, prices have rapidly gone up and even fully recovered in the United States (US). The difficulty to understand the evolution of the pandemic has led the Organisation for Economic Co-operation and Development (OECD) to provide two scenarios in its spring forecast for assessing the economic effect of the crisis. Statistical information for the second quarter has exhibited a wider heterogeneity than usual across industrialised countries. In the euro area for instance, GDP fell by 18.5 % in Spain but only by 4.4 % in Finland. According to the September Consensus forecasts, there is a high dispersion of GDP forecasts for 2020 ranging from -8.9 % to -6.3 % for the euro area as a whole and the probability of higher forecast errors provide additional signs of how the current economic outlook is uncertain.

This uncertainty is an important feature that central banks need to take into account when setting their monetary policy. The ECB indeed faces major supply and demand shocks but also an uncertainty shock. Theoretical and empirical literature has generally emphasised that uncertainty may reinforce negative demand shocks, suggesting that it would amplify the reduction of inflation in the current situation. Consequently, monetary policy is expected to be expansionary but the question arises of whether uncertainty may affect the transmission of monetary policy. In this paper, we deal with these issues and document the effect of uncertainty on several components of inflation in the euro area. Then, we focus on the effect of monetary policy on inflation and assess, by disentangling between periods of low and high uncertainty, whether this transmission mechanism is influenced by uncertainty. The main challenge of the analysis is to proxy uncertainty, which is unobservable. To that end, we first survey the different measures proposed in the literature. We notably point to the fact that uncertainty encompasses several dimensions – financial, macroeconomic, economic policy – and that available indicators generally capture only one of these dimensions. Given that the current situation is characterised by a large degree of uncertainty, our analysis is not restricted to one dimension but strives to account for all potential sources of uncertainty.

2. MEASURING UNCERTAINTY

While the role of uncertainty for individual choice has been assessed for several decades, its role in the macroeconomic business cycle has been emphasised more recently.[1] Yet, uncertainty is an unobservable variable and can only be proxied. A growing literature has therefore been devoted to provide various measures encompassing the different dimensions of uncertainty. In this section we notably focus on four measures of uncertainty.[2]

First, uncertainty can be observed on financial markets through indices of volatility. For example, as stock prices encompass all kinds of information that are useful to anticipate future dividends, their volatility captures uncertainty related to stock markets but also about the economic outlook that affects current stock prices. A widely used measure of uncertainty is the VIX index, an indicator based on the US option prices for the S&P 500 index.[3] The VIX – or alternatively VSTOXX for the euro area – have been interpreted as indicators of risk appetite. The more investors are ready to take risky positions, the lower is the VIX. Conversely when investors are reluctant to take risks, they express "fear" about the future. Implicit volatility then increases, thus indicating higher uncertainty. As the US stock market is highly internationalised, the VIX index has often been used as a proxy for global uncertainty. Yet, an equivalent indicator can be obtained from options related to European stock market indices. As stock markets are often synchronised, those indicators based on implied volatility are usually highly correlated.

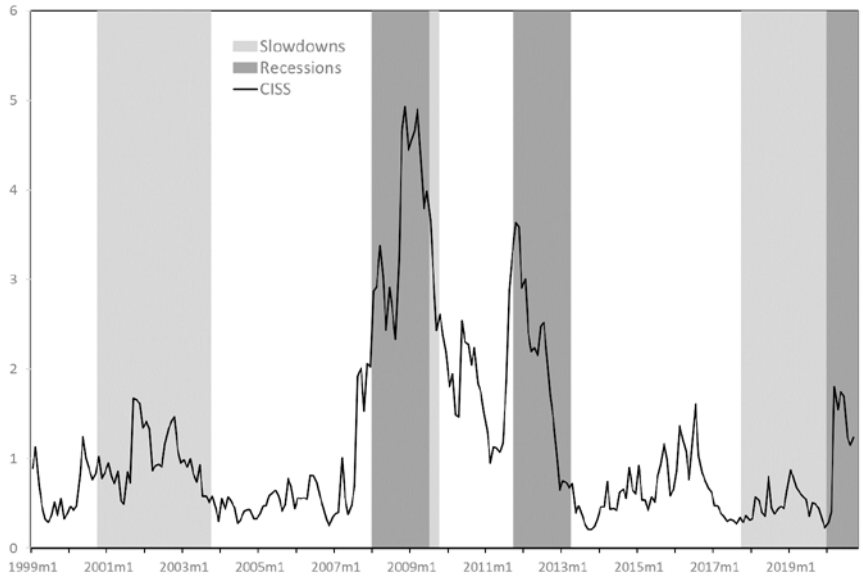
The ECB proposed an aggregate measure called the composite indicator of systemic stress (CISS). The CISS is computed for the euro area but also does not only focus on stock price volatility. This index encompasses 15 market-based financial stress measures that are split equally into five categories, namely the financial intermediaries sector, money markets, equity markets, bond markets and foreign exchange markets. High levels of CISS are associated with systemic risk. It has therefore reached record levels during the subprime and the sovereign debt crisis in the euro area (see Figure 1). By comparison, the CISS has slightly increased since the COVID-19 pandemic. The peak reached during this period is notably below the levels reached during the previous crises.

[1] See Bloom (2009) for a first attempt to quantify the macroeconomic effect of uncertainty.

[2] See Ferrara et al. (2018) for a survey of those measures.

[3] A stock option gives an investor the right, but not the obligation, to buy or sell a stock at an agreed upon price and date. The price of option is related to the volatility of stock prices.

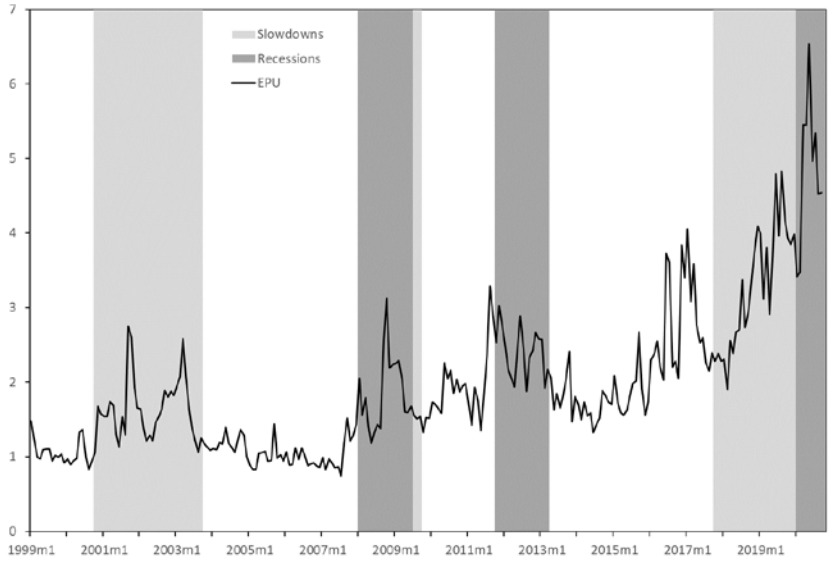
Figure 1: The evolution of financial uncertainty: the CISS



Source: ECB. Shaded areas represent euro area slowdowns and recessions as defined by the Eurostat Business Cycle Clock. Sample period: January 1999 – September 2020.

Second, uncertainty can also be captured by analysing daily news. Newspapers indeed report events and policy decisions and they provide indications on how those are perceived, and hence how they are subject to uncertainty. Based on a textual analysis, Baker et al. (2016) build an indicator of Economic Policy Uncertainty (EPU), which is another dimension through which aggregate dynamics can be affected drastically. The indicator relates to the uncertainty surrounding elections, referenda and political decisions that affect the implementation of economic and social programs. Baker et al. (2016) construct an EPU index for different economies based on a textual analysis that consists in counting the occurrence of a sequence of words that together refer to the economy, policy and uncertainty. This method has been developed for several countries: e.g. the United States, China, the euro area as a whole, France and Germany. Uncertainty can also stem from different economic policies: fiscal policy, monetary policy and trade policy for instance. Husted et al. (2020) develop an indicator of monetary policy uncertainty for the US. In Europe, the EPU index has been high during the subprime crisis and the sovereign debt crisis but is higher since 2018, probably pushed by the uncertainty surrounding Brexit and the political decisions during the COVID-19 pandemic (Figure 2).

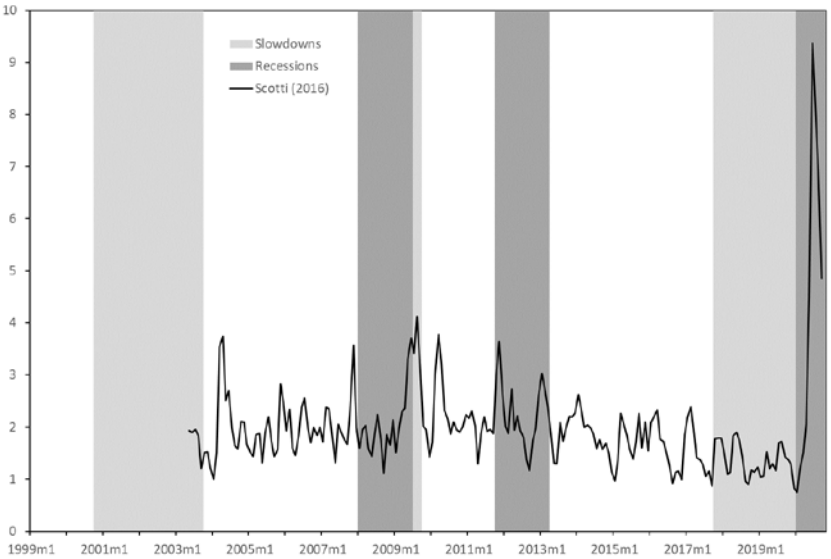
Figure 2: The evolution of economic policy uncertainty: the EPU



Source: Baker et al. (2016). Shaded areas represent euro area slowdowns and recessions as defined by the Eurostat Business Cycle Clock. Sample period: January 1999 – September 2020.

Third, uncertainty can also be reflected through macroeconomic forecasting errors or, said differently, through macroeconomic news surprises. The idea being that when uncertainty about the state of the economy is rising, macroeconomic forecasts are less and less accurate. On this subject, Scotti (2016) identifies macroeconomic surprises as differences between professional forecasts and real data. Then, based on these surprises, she develops an uncertainty index. This indicator clearly captures the uncertainty since the COVID-19 pandemic as all forecasts have been dramatically revised (Figure 3). Macroeconomic uncertainty can also be measured when observing the disagreement between professional forecasters: forecasts about the future state of the economy should be more dispersed when uncertainty is high and vice versa. The ECB's Survey of Professional Forecasters (SPF) provides, for example, the variance of forecasts for the real GDP growth rate. The shape of this measure of dispersion is very similar to the shape of Figure 3 and indicates that uncertainty about future real GDP growth dynamics in the euro area has never been that high.

Figure 3: The evolution of macroeconomic news uncertainty: the Scotti (2016) index



Source: Scotti (2016). Shaded areas represent EA slowdowns and recessions of the Eurostat Business Cycle Clock. Sample period: March 2005 – September 2020.

The correlation coefficients between these measures of uncertainty suggest that a common component between these indicators exists (Table 1) but they also show that the correlation is not perfect. It suggests that the choice of the uncertainty estimator is crucial as all measures are not focused on the same kind of uncertainty. Moreover, Figure 1 illustrates that during the subprime crisis and the sovereign debt crisis, uncertainty observed on the financial markets was a key factor. But since the COVID-19 pandemic, the euro area is dealing with a new kind of uncertainty that seems to be a combination of macroeconomic and economic policy uncertainty, reflecting how the economy will be affected by the shock and what will be the economic policy responses to deal with the crisis. The CISS indicator does indeed not show a drastic rise.

Table 1: Correlation between uncertainty measures

	VIX	CISS	Scotti (2016)	EPU
VIX	1			
CISS	0.69	1		
Scotti (2016)	0.27	0.21	1	
EPU	0.18	0.12	0.19	1

Source: Authors' own computation.

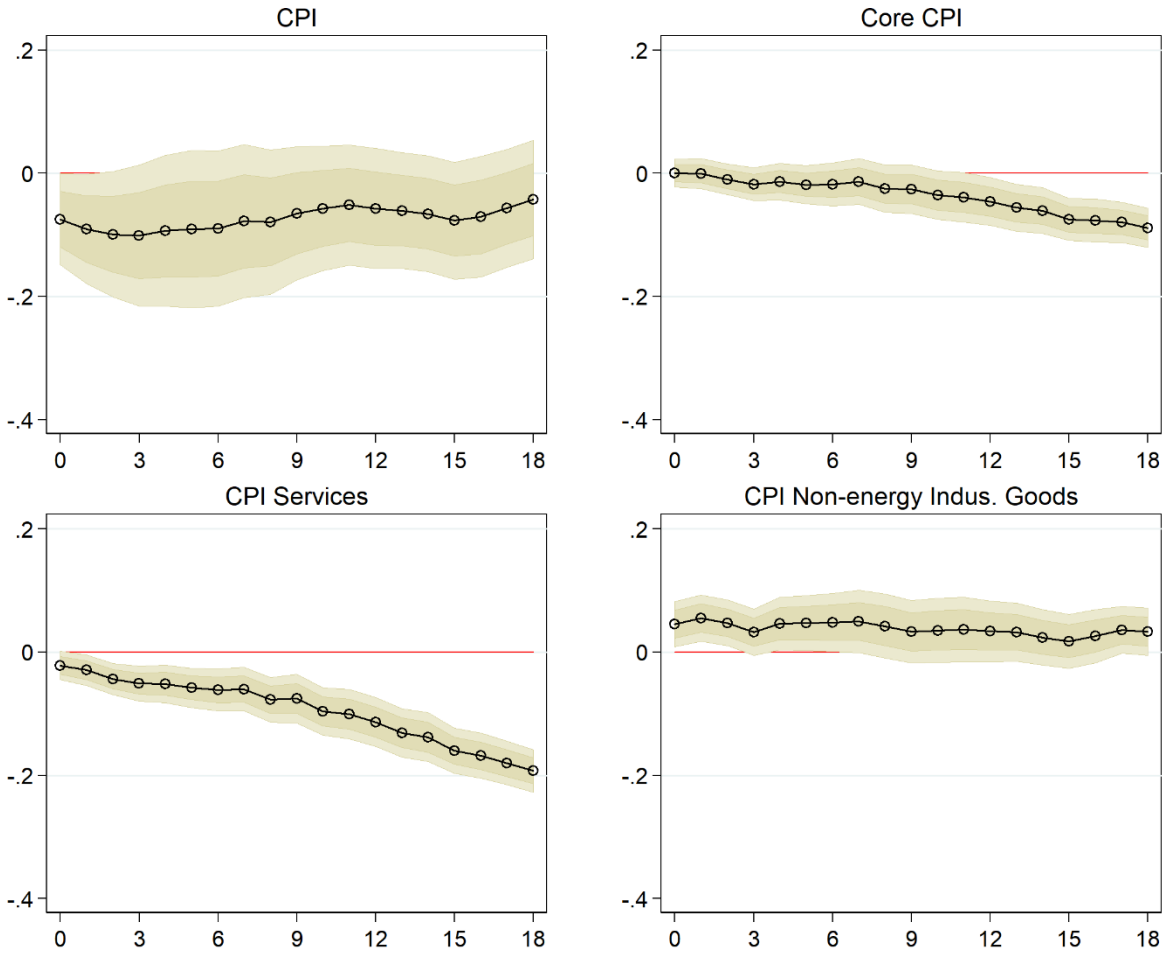
3. THE EFFECT OF UNCERTAINTY ON EURO AREA INFLATION

We assess the effect of uncertainty on euro area inflation by estimating its dynamic response to uncertainty shocks at several horizons. To that end, we use local projections to infer how different measures of inflation are affected by a rise in different indicators of uncertainty. The estimations are realised for several indicators of inflation: headline inflation, core inflation, the inflation of prices of services and the inflation of prices of industrial non-energy goods. All data are taken from Eurostat. We assume that uncertainty is not influenced by current inflation so that it can be treated as exogenous (i.e. orthogonal to inflation). Thus, we are able to quantify whether subcomponents of the price index react differently to uncertainty. Besides, we control for three lags of the inflation indicator, oil prices and the unemployment rate in the euro area to circumvent reverse causality or omitted variable biases. Thus, we are able to estimate the effect of uncertainty beyond the effect of change in demand – captured by the unemployment rate – and the effect of oil prices, which play an important role in the dynamic of the consumer price index (CPI). The sample period goes from January 1999 to September 2020.

When we consider the effect of uncertainty on inflation either measured by the CISS – reflecting uncertainty on financial markets – or by the EPU index computed by Baker et al. (2016), our estimates show that a rise in uncertainty has a negative impact on inflation and its components. The evidence is however more nuanced with the Scotti (2016) measure of uncertainty related to macroeconomic news surprises.

The response of headline inflation is negative but weakly significant to a rise in the CISS. More precisely, a one-standard deviation increase in the CISS index reduces headline inflation on impact by less than 0.1 percentage point. The effect of uncertainty on core CPI is less pronounced on impact but more significant at longer horizons. The effect of CISS uncertainty on CPI services is more pronounced: a one-standard deviation increase in uncertainty yields a 0.2 percentage point decrease in prices after 18 months (Figure 4). However, the response of non-energy industrial goods to uncertainty is slightly positive. This might be related to the fact that financial uncertainty does not transmit much to industrial firms (which by definition are non-financial). This might explain why the overall effect of CISS uncertainty on core CPI is negative.

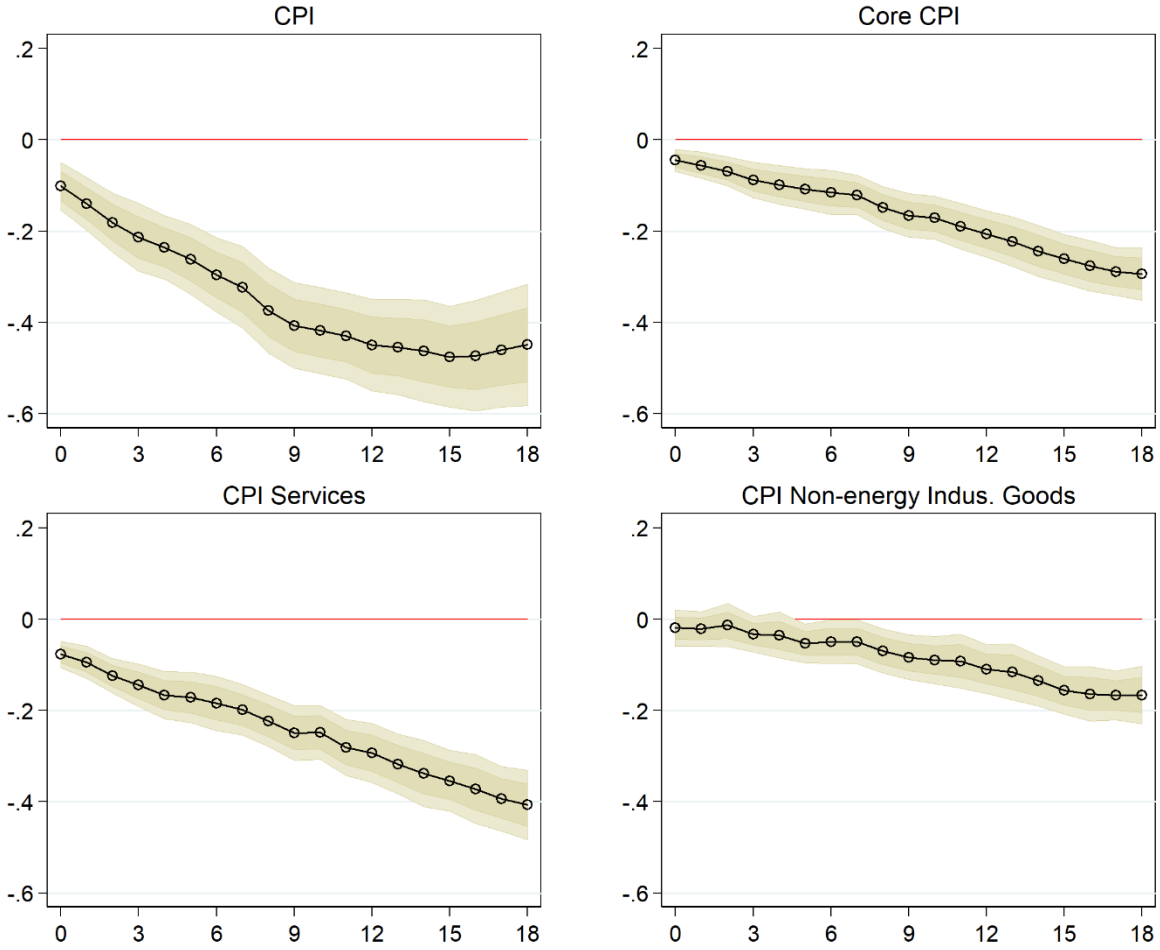
Figure 4: The effect of CISS uncertainty on inflation



Source: Authors' estimates. Shaded areas represent 68 and 90% confidence intervals.

When uncertainty is measured with the EPU index, all responses are significantly negative, suggesting no discrepancies across services and non-energy industrial goods (Figure 5). The effect of economic policy uncertainty appears strong and homogeneous across markets.

Figure 5: The effect of EPU uncertainty on inflation

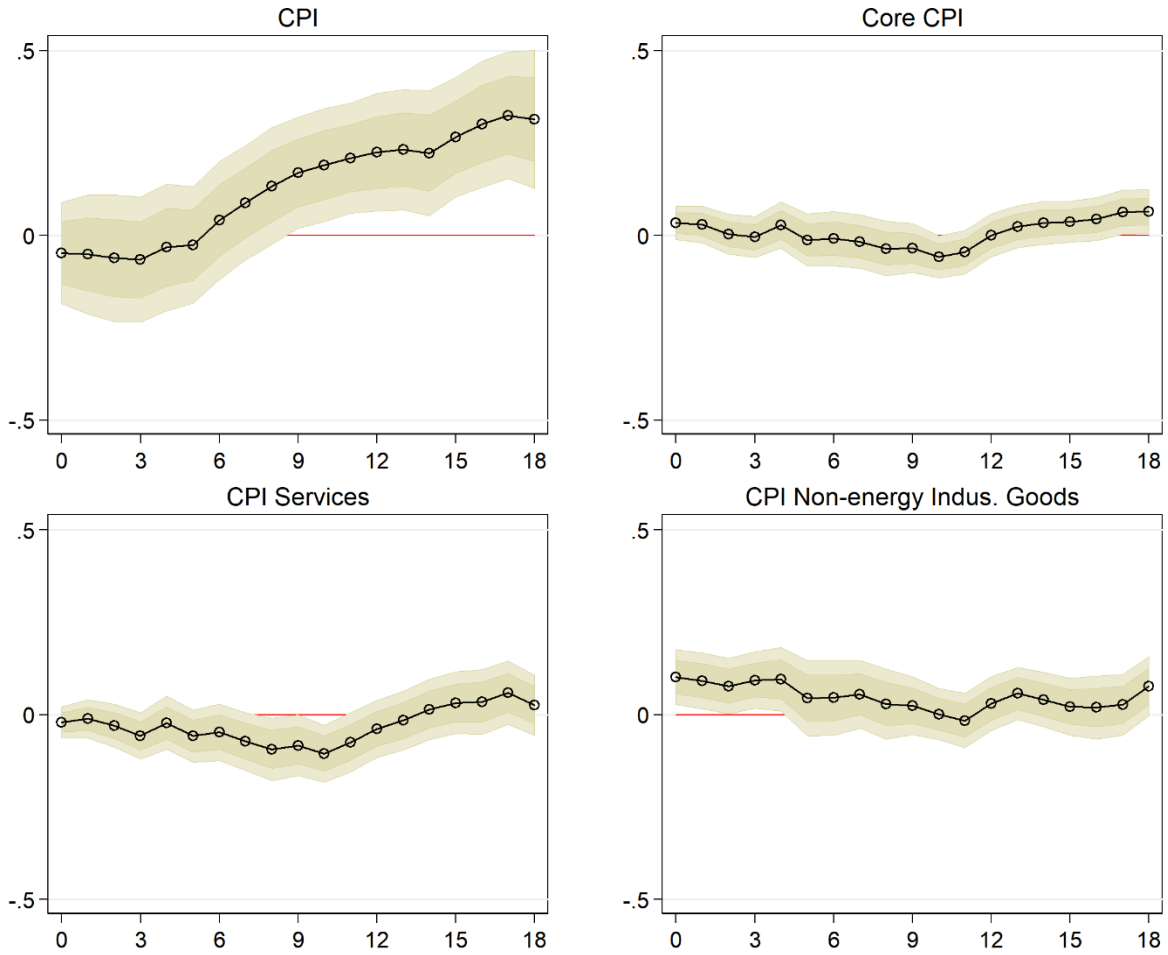


Source: Authors' estimates. Shaded areas represent 68 and 90% confidence intervals.

These results, across the CISS and the EPU indices, are consistent with macroeconomic evidence indicating that an increase in uncertainty is associated with a reduction in demand, as can be inferred from the decrease in core CPI. Uncertainty shocks can be indeed interpreted as negative demand shocks as it would deter firms from investing and households from consuming. Following Bernanke (1983), we may consider that investment – or hiring – decisions entail "sunk" costs representing fixed expenses needed to implement those decisions, that cannot be recovered even if the investment or the hiring decision is reversed. Those decisions are seen as irreversible and when firms face higher uncertainty, they prefer to postpone decisions to avoid paying the sunk costs. The same argument may hold for consumers. When uncertainty regarding their future revenues is higher, they increase precautionary saving to avoid a more substantial fall of consumption if their revenues decrease. Finally, uncertainty may also affect the financial sector. Uncertainty is intrinsically related to the ability to take risks. The financial system – financial intermediaries and markets – will request a risk premium when uncertainty rises. It increases the cost of financing for firms and reduces aggregate demand. These different transmission channels all point to a negative demand shock explaining why the rise of uncertainty is followed by a reduction of inflation as illustrated by Figures 4 and 5. Caldara et al. (2016) and Mumtaz and Surico (2018) confirm the negative effect of uncertainty – measured by different indicators – on output, consumption and investment. The negative effect of uncertainty on output, prices, interest rates and exports has also been confirmed by Cuaresma et al. (2019).

The effect of uncertainty measured by Scotti (2016)'s indicator that focuses on macroeconomic news surprises provides a slightly different picture since the response of the headline CPI after an uncertainty shock is positive (Figure 6). The response of core CPI and CPI services is however slightly negative. The contrast between these latter responses and the response of the headline CPI suggests an effect of uncertainty on the most volatile components of CPI. Figure 6 plots a positive effect of the uncertainty about macroeconomic news on the overall price index. However, this positive effect disappears when we focus on the effect of uncertainty on core CPI and on more structural prices: services or non-energy industrial goods. Our estimates show a negative response of core CPI and prices of services after an increase of uncertainty. One interpretation of this positive effect is that the uncertainty related to macroeconomic news in general and potentially from energy prices more specifically – like volatile oil price news – have a positive effect on energy prices. This is related to the finding of Piffer and Podstawski (2018) who show that uncertainty shocks can be confounded with news shocks that would generate positive responses of prices.

Figure 6: The effect of Scotti (2016) uncertainty on inflation



Source: Authors' estimates. Shaded areas represent 68 and 90% confidence intervals.

This result is somehow at odds with the results found by Scotti (2016) for the United States since she shows that a rise in her indicator on uncertainty is followed by a decline in employment. To that extent, her results are consistent with the evidence from other indicators. Our analysis would suggest a different impact of this uncertainty indicator on the components of euro area inflation: the most

volatile part – energy prices – reacts positively whereas more structural parts – like services – react negatively. This latter being consistent with the result of Scotti (2016).

Finally, for the sake of completeness, some other uncertainty indices have been proposed in the literature. Regarding the relationship between uncertainty and inflation, one could also refer to the uncertainty about the inflation target or about future inflation. In this strand of the literature, Cogley (2005) establishes a link between uncertainty about the inflation target and risk premia on long-term US bonds, while Wright (2011) relates the fall in inflation uncertainty and the fall in term premia in a cross-country analysis. Istrefi and Mouabbi (2018) construct a measure of monetary policy uncertainty and show that this uncertainty about future interest rates has large, negative and persistent effects on the economy. Jurado et al. (2015) compute econometric estimates of macroeconomic uncertainty. They show that large and significant uncertainty episodes appear far less than suggested by popular uncertainty proxies. When they do happen, they are larger, more persistent, and have more negative effects on real activity. Bachmann et al. (2013) provide business-level uncertainty measures. This type of uncertainty leads to significant reductions in production that are, however, offset quickly. Overall, these different contributions point out that uncertainty shocks are akin to demand shocks in their macroeconomic effects.

4. DOES UNCERTAINTY IMPAIR THE TRANSMISSION OF MONETARY POLICY?

If uncertainty reduces aggregate demand and core inflation, it will eventually appear in the reaction function of monetary policymakers. When such a negative shock occurs, central banks are expected to implement more expansionary monetary measures in accordance with their final objective. Yet, the effect of monetary policy may itself be affected by uncertainty as illustrated by Tillmann (2020) who shows that a policy tightening decision is less effective – leading to a weaker reaction of long-term interest rates – if uncertainty is high. However, those results do not focus on the transmission of monetary policy to inflation and the uncertainty considered by Tillman (2020) relates to monetary policy itself. Aastveit et al. (2017) show that policy uncertainty reduces the transmission of Fed monetary policy on investment and consumption. This dampening of the effects of monetary policy in situations of uncertainty is confirmed by Castelnuovo and Pellegrino (2018). Andrade et al. (2019) show that ambiguity reduces the effectiveness of forward guidance. Empirical analysis has also emphasised that the effects of uncertainty shocks are state-dependent. As for standard demand shocks, the consequences of negative uncertainty increase when the economy is at the zero lower bound (Caggiano et al., 2017) or during recessions (Caggiano et al., 2014). There is consequently evidence suggesting several non-linearities when assessing the role of uncertainty.

Here we notably assess whether the transmission of monetary policy is affected by the size of uncertainty. To that end, we estimate the effect of monetary shocks identified by Altavilla et al. (2019) on our different measures of euro area inflation. As for the effect of uncertainty, we consider monthly data over the sample 2002-2020.[4] We disentangle the effectiveness of monetary policy during periods of low and high uncertainty.[5] More precisely, for each indicator, we label a "low" (respectively "high") uncertainty regime for uncertainty values in the first third (respectively the last third) of the distribution of uncertainty outcomes. Monetary policy shocks capture the conventional and unconventional measures implemented by the ECB. As for our previous estimations, we use the local projections approach since we can consider that the monetary shocks identified by Altavilla et al. (2019) – stemming from an event-study approach – are exogenous. The equations include three lags of the dependent variable.

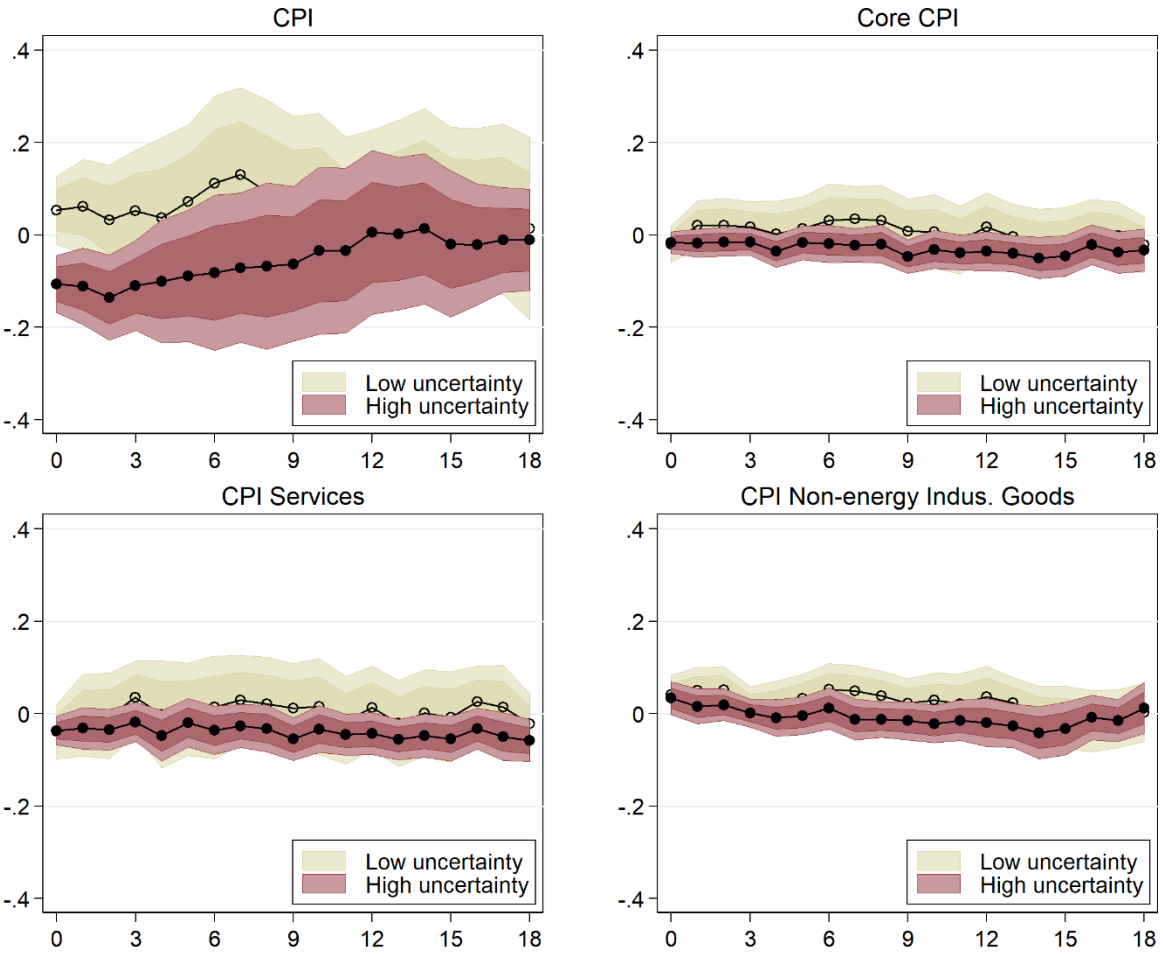
The linear effect of monetary policy on the inflation indicators is exhibited in the Annex (Figure 10). As expected, we find that a restrictive monetary policy has a negative effect on inflation. The effect is short-lived for the headline index but is significant at longer horizons when we consider the core inflation or inflation in services. The effect is negative but not significant for non-energy industrial goods.

When we disentangle periods of "low" and "high" uncertainty, we do not find any significant difference in the response function of inflation to monetary policy whatever the uncertainty indicator. Our focus is not on the effect of monetary policy *per se* (see Figure 10 in the Annex) but whether there are differences in price responses according to the level of uncertainty. The only small difference that may be captured is for the CPI response to monetary policy when uncertainty is measured by the CISS (Figure 7).

[4] The measures of monetary policy shocks in the euro area provided by Altavilla et al. (2019) is based on overnight indexed swap (OIS) data, which were very noisy until the end of 2001.

[5] Altavilla et al. (2019) provide a distinction between surprises related to the policy decisions, which are estimated on a window following the policy announcement and surprises related to information released by the ECB during the press conference held 45 minutes after the press release.

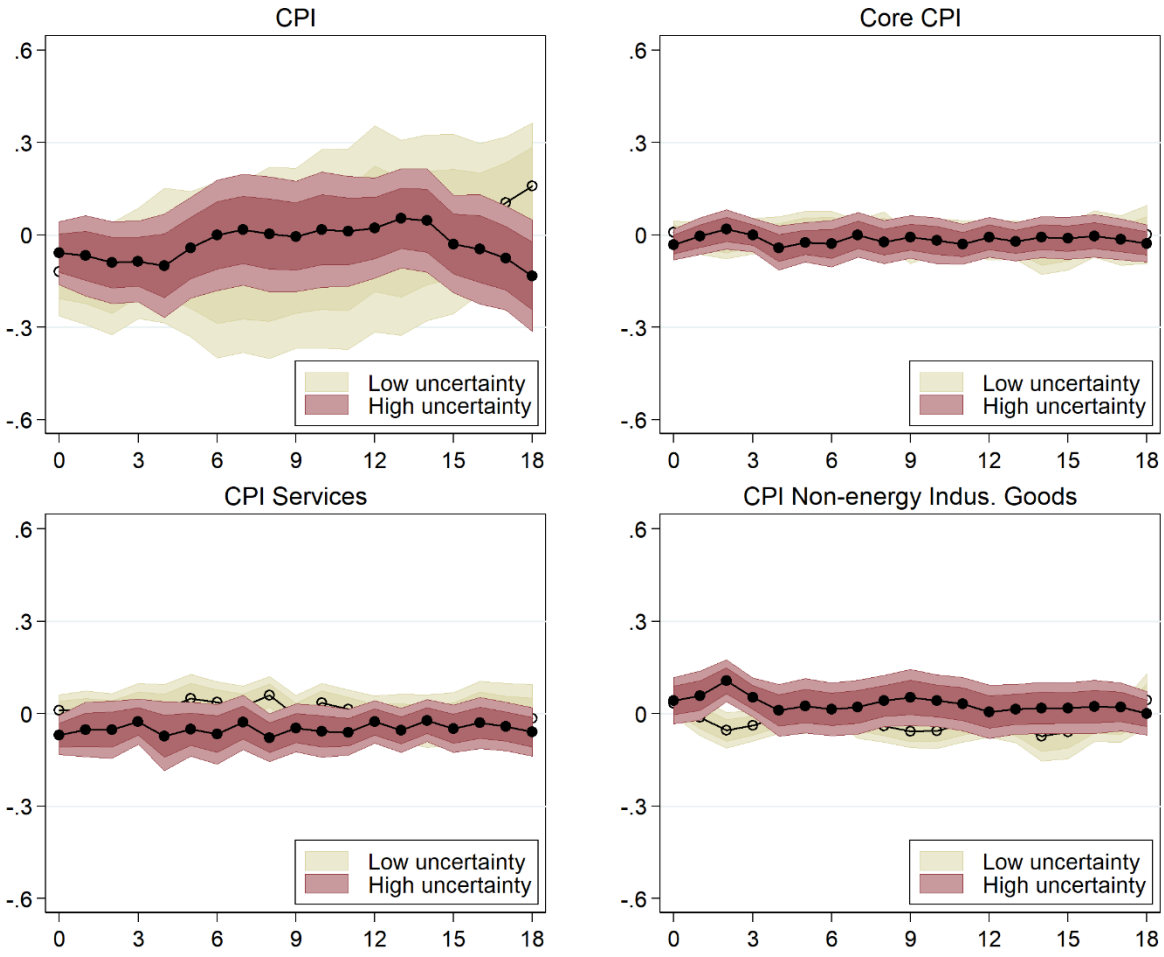
Figure 7: The state-dependent effect of monetary policy to the CISS



Source: Authors' estimates. Shaded areas represent 68 and 90% confidence intervals.

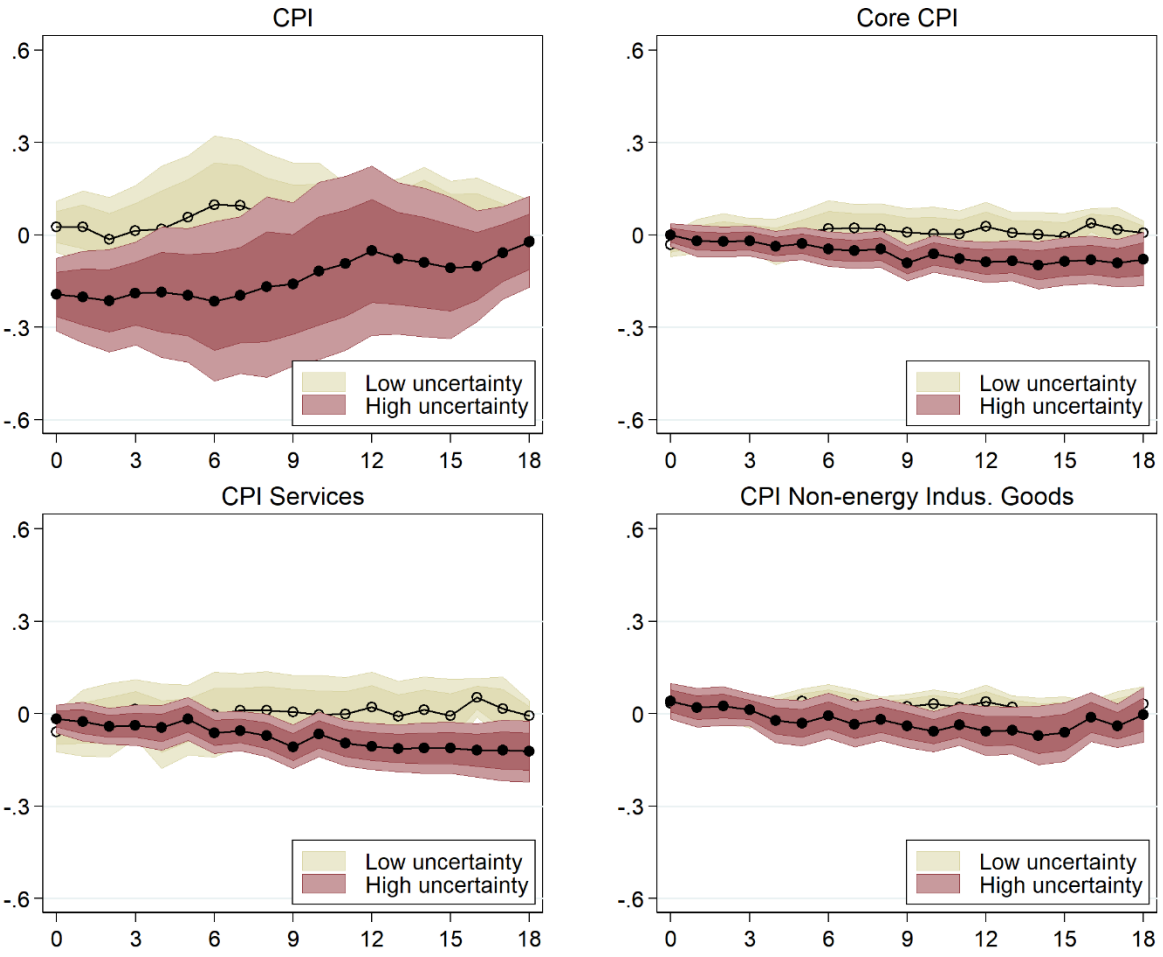
It seems here that the short-term effect of monetary policy is stronger when uncertainty is high. The other results are shown in Figure 8 and Figure 9. The state-dependent effect of monetary policy estimated conditional on the EPU or the Scotti (2016) index does not suggest any difference. The level of uncertainty does not change the transmission of monetary policy.

Figure 8: The state-dependent effect of monetary policy to the EPU



Source: Authors' estimates. Shaded areas represent 68 and 90% confidence intervals.

Figure 9: The state-dependent effect of monetary policy to the Scotti (2016) index



Source: Authors' estimates. Shaded areas represent 68 and 90% confidence intervals.

Those results suggest that the transmission of monetary policy is not affected by uncertainty. Consequently, the expansionary measures taken by the ECB during the crisis may help to mitigate the recessionary shock and its negative effect on inflation.

Beyond the transmission channel of monetary policy, there is also a role for policy makers to influence expectations and potentially mitigate uncertainty. Central banks and governments may strive to implement measures that will restore confidence. By making sure that monetary policy will act when economic outlook is at risk, central banks may help to mitigate the risk of negative self-sustaining expectations. Central bank communication may help to provide information on the future path of monetary policy and signal their intentions when the economic outlook becomes more uncertain.

5. CONCLUSION

The academic literature emphasises that uncertainty shocks work as negative demand shocks suggesting that they would amplify the deflationary pressures already at work. The analysis carried out in this paper for the euro area generally confirms these results. Uncertainty is a multidimensional concept that can encompass several dimensions – financial, macroeconomic, economic policy – and we aimed to investigate the role of each of them. The different types of uncertainty do not have similar dynamics and effects on the economy. We show that uncertainty has negative effects on inflation overall. Although financial uncertainty does not transmit to non-energy industrial goods and uncertainty about macroeconomic news is positively correlated with energy prices, the overall effect of all uncertainty metrics on the various components of inflation is negative and persistent. However, we find no evidence that uncertainty affects the transmission mechanism of monetary policy to inflation. The effect of ECB monetary policy on euro area inflation is the same regardless whether uncertainty is high or not. The policy implications of such results are that the effectiveness of the policy instruments is not impaired and that monetary policymakers should consider uncertainty in their reaction function in order to fulfil their mandate.

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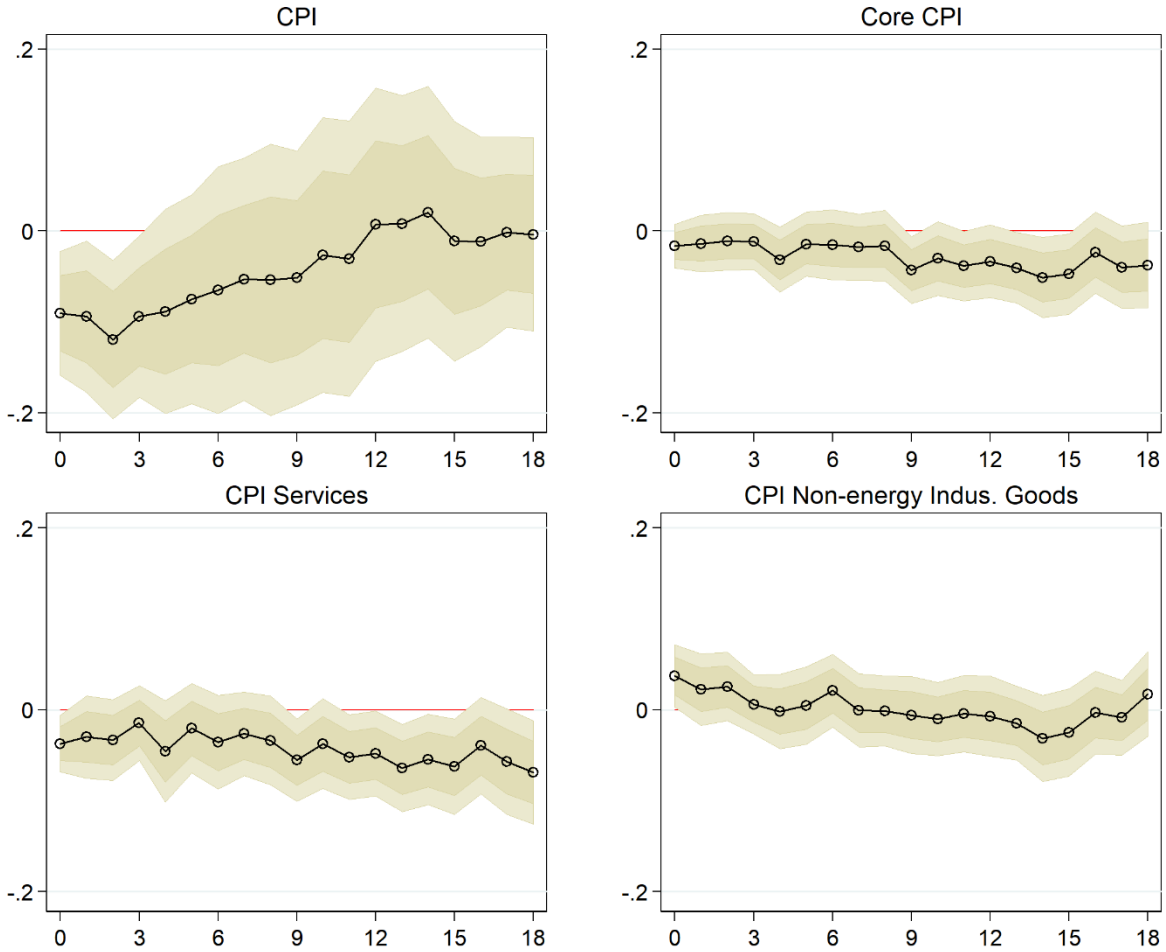
ANNEX

Figure 10: The linear effect of monetary policy on inflation



Source: Authors' estimates. Shaded areas represent 68 and 90% confidence intervals.

The outbreak of the COVID-19 crisis has triggered a new wave of uncertainty, which may amplify the negative effect of the crisis. Based on several uncertainty measures, we show that inflation in the euro area is negatively affected by higher uncertainty. However, uncertainty does not impair the transmission of monetary policy. Consequently, the ECB should consider uncertainty in its reaction function in order to fulfil its mandate.

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