STUDY

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Monetary Dialogue, November 2020

European Parliament

Effects of Pandemic-Induced Uncertainty on Monetary Policy

Compilation of papers

Policy Department for Economic, Scientific and Quality of Life Policies
Directorate-General for Internal Policies
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Effects of Pandemic-Induced Uncertainty on Monetary Policy

Compilation of papers

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

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Monetary Policy in the Time of COVID-19, or How Uncertainty is here to Stay

Maria DEMERTZIS, Marta DOMINGUEZ-JIMENEZ

Abstract

The COVID-19 crisis has compounded the uncertainty that has come to characterise the European economy. We explore how this uncertainty manifests itself in terms of ECB decision-making and the long-run challenges the ECB faces. Confidence in ECB actions will come from the contingency scenarios it considers and communicates on, and from the adoption of potential policies for a wide range of such scenarios. Greater clarity around the ECB's inflation target and surrounding tolerance bands would also be beneficial.

This document was provided by the Policy Department for Economic, Scientific and Quality of Life Policies at the request of the Committee on Economic and Monetary Affairs (ECON) ahead of the Monetary Dialogue with the ECB President on 19 November 2020.

CONTENTS

LIST OF ABBREVIATIONS

ABSPP	Asset-backed securities purchase programme
APP	Asset purchase programme
CBPP	Covered bond purchase programme
CSPP	Corporate sector purchase programme
ECB	European Central Bank
EP	European Parliament
EPU	Economic Policy Uncertainty
EU	European Union
GDP	Gross domestic product
HICP	Harmonised Index of Consumer Prices
MRO	Main refinancing operations
NPL	Non-performing loans
PEPP	Pandemic emergency purchase programme
PSPP	Public sector purchase programme
SMP	Securities markets programme
QE	Quantitative easing
TLTRO	Targeted longer-term refinancing operations
VIX	(Chicago Board Options Exchange) Volatility Index
VSTOXX	Euro Stoxx 50 Volatility Index

EXECUTIVE SUMMARY

- **Even before the COVID-19 pandemic the European macro-economic environment was approaching a poorly understood 'new normal' that the European Central Bank (ECB) sought to navigate with unconventional tools**. The pandemic has accelerated some of these trends, pushing real interest rates further into negative territory and moving economies further from equilibrium.
- **The unprecedented resulting increase in uncertainty is evident in the different proxies used to measure it**: newspaper and Twitter analyses, stock market implied volatility and cross-sectional disagreements in forecaster estimates.
- **Moreover, traditional notions of uncertainty depend on the idea that we can measure risks reliably, which is no longer entirely the case**. Current circumstances approach fundamental uncertainty: our understanding of both the COVID-19 shock and the new economic equilibriumare incomplete.
- **In the shorter term, this uncertainty manifests itself in the effects of immediate ECB policy**.
- **The pandemic affects inflation through both supply and demand mechanisms**. While overall it appears deflationary, inflation risks remain and compound uncertainty, exacerbated by a growing supply of money and soaring debt, and the small possibility of fiscal dominance.
- **Unconventional measures, while perhaps necessary to stabilise an exceptional situation, lead to rapid expansion of an already large balance sheet, with uncertain consequences**. The subsequent compression of sovereign spreads raises concerns about medium-term debt sustainability and whether the ECB could conceivably come under pressure to continue support beyond the appropriate horizon.
- **These aspects combine with more fundamental challenges for monetary policy from the increasing uncertainty about the state of the world**.
- **Market and econometric estimates both place the equilibrium real interest rate in negative territory**, which is fundamentally 'not normal' and a source of concern about clearing capital markets and central bank ability to manage demand.
- **The design of monetary policy relies on estimates of oft-unobserved variables**, yet forecasting has become increasingly inaccurate in the presence of fundamental uncertainty, and thus less useful in informing policy.
- **In these circumstances, traditional confidence intervals should be discarded**; confidence is provided instead by the range of contingency scenarios considered. The ECB should provide a certain set of predictions based on a range of assumption outcomes.
- **Effective communication of these assumptions is key and should focus on what the response will be to a wide range of scenarios if they materialise** (as opposed to focusing on what the ECB expects to happen).
- **Policy options should then be ranked based on their ability to keep inflation within an acceptable (pre-determined) range for a wide set of assumptions** (i.e. in the most extreme scenarios).
- **Additionally, redefining the price stability objective to a simple target of 2% would help best manage inflation under uncertainty**. Under the theory of focal points, greater clarity improves

communication and provides a good signal to the markets that should facilitate the achievement of the target.

- **Finally, the establishment of a tolerance band around this target would explicitly set the levels of inflation that are tolerable.** Remaining within this range establishes credibility, while the cost of failing to do so is also heightened. The bands should be moderately wide: in times of uncertainty, it is more important for the ECB to be predictable than precise.

1. INTRODUCTION

The euro area is forecast to contract by 8.7% in 2020 and grow by 6.1% in 2021 (European Commission, 2020). The drop in GDP in 2009, the worst year of the financial crisis, was just over 5%. There is no doubt that the drop we face today is much more significant, although it is expected to be short-lived and with a sharp bounce back. However, all EU countries are currently going through a COVID-19 second wave which is worse than the first wave in terms of number of infections, albeit with fewer deaths at time of writing. Countries, one after the other, apply partial shut-downs to contain the spread of the virus. Who knows what the real hit to the economy will be, and indeed how long it will be before we can resume normality?

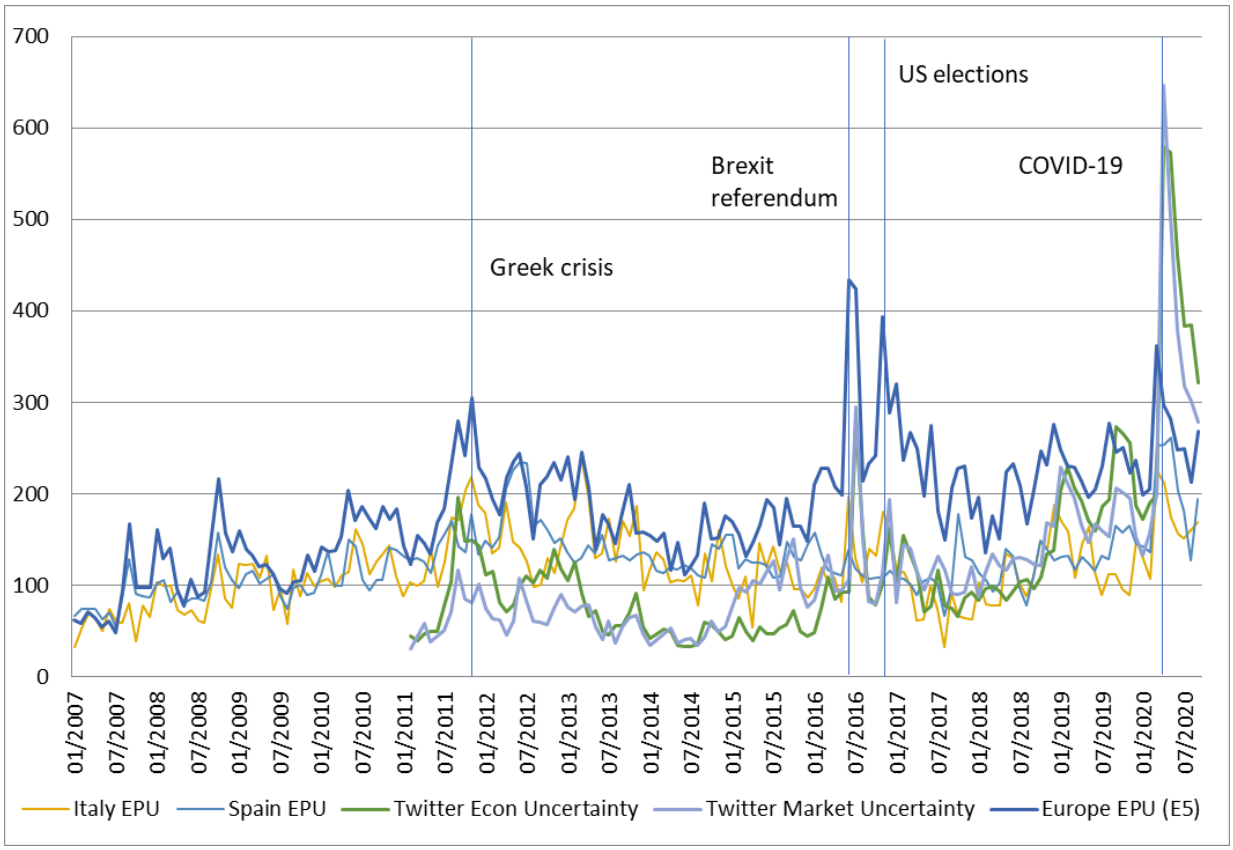
Furthermore, the notion of a "return to normality" masks the fact that major shifts were taking place in the global economy before the outbreak of the COVID-19 health crisis. Digitisation, globalisation and its possible reversal, and shifting powers across the globe all point to a transition underway and to a poorly understood "new normal" that the European Central Bank (ECB) has been navigating for some years now with unconventional monetary tools. Policy design in such circumstances becomes particularly difficult: how can you steer a boat when the destination remains unknown (Claeys et al., 2019)?

The global pandemic has accelerated some of these trends, such as digitisation, but has interrupted and possibly reversed others, such as long integrated value chains. COVID-19 appears to have pushed real interest rates further into negative territory and moved our economies further from equilibrium, undermining our ability to forecast. If one thing is clear, it is that the pandemic is adding to an already high level of uncertainty. And while policy intervention, including by the ECB, will need to be present and big, it will be guided by changing and imprecise information.

Before we delve further into these mechanisms, it is worth trying to get a sense of how uncertainty has evolved in recent years. Figures 1 to 3 present different measures that can be used as proxies for uncertainty: the expression of economic uncertainty in newspapers and on Twitter, implied volatility of options in the market, and the cross-sectional disagreement between forecasters' growth estimates. All three show an evident peak at the outset of the pandemic.

First, Figure 1 plots the frequency of the word "uncertainty" in the popular press and in tweets. A small peak is evident during the Greek crisis, followed by a slightly larger double peak in 2016 around the Brexit referendum and then the election of Trump, and a final and more significant peak in the past few months related to the COVID-19 uncertainty. Both the medium-term build-up and the compounding effects of COVID-19 are evident. This is particularly clear in the two Twitter indices, although all measures exhibited are comfortably above 100.

Figure 1: Newspaper and Twitter text uncertainty measures hit all-time highs during the pandemic



Source: Bruegel. For Economic Policy Uncertainty (EPUs): Baker et al. (2016) for Italy and Ghirelli et al. (2019) for Spain. St Louis Fed for Europe EPU Index (constructed from newspaper uncertainty in the five largest economies: France, Germany, Italy, Spain and UK).

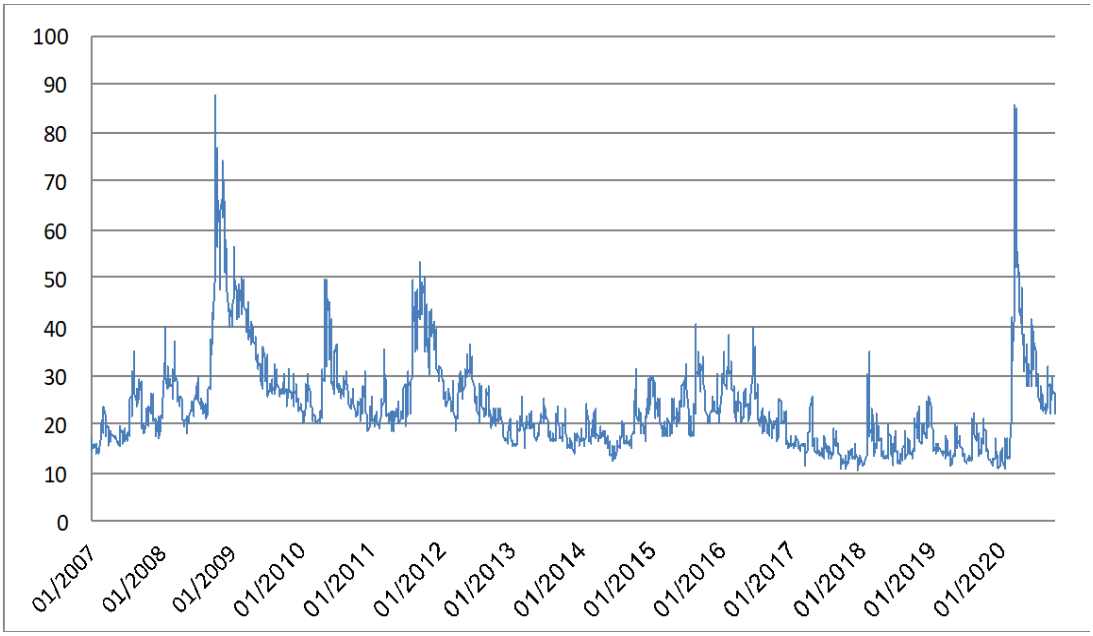
Notes: See Baker et al. (2016) for details of EPU index construction. Monthly values available at http://www.policyuncertainty.com/. The daily version of this index reflects the frequency of newspaper articles with one or more terms about "economics," "policy" and "uncertainty" in roughly 1,000 daily US newspapers. It is normalised such that its mean value over the period from 1985 to 2010 is 100, so values above 100 reflect higher-than-average uncertainty. For Twitter-based Economic Uncertainty (TEU) and Twitter-based Market Uncertainty (TMU), see Renault et al. (2000). The index is constructed by extracting all tweets related to uncertainty, economics and equity markets, then rescaling each series to a mean of 100 from 2010 to 2015. Values exhibited represent rolling monthly averages to avoid the excessive prevalence of isolated one-day events. Daily values available at http://www.policyuncertainty.com/. Twitter-based measures constructed from tweets only in English, thus best reflecting the situation in the English-speaking world.

Other measures of uncertainty tell a similar story. Figure 2 plots the VSTOXX index, which is the euro area volatility index (similar to the VIXX in the US). It tracks the implied volatility of EURO STOXX 50 options, those of the primary European equities index. The evident peak that followed the outset of the COVID-19 crisis is only comparable to the financial crash of 2008. Implied volatility captures market expectations of the move in a security's price, thus indicating market expectations of large fluctuations, given economic uncertainty.

Finally, Figure 3 looks at a third alternative proxy of uncertainty – disagreements between professional forecasters over the economic outlook. We constructed this measure for the euro area by looking at GDP growth expectations from the ECB's survey of professional forecasters. To measure the degree of disagreement, we plotted the standard deviation between the estimates of different forecasters at each point in time. This was calculated for the expected year-on-year change in real GDP two and six

quarters after the forecasting date. The results are striking. The COVID pandemic has resulted in an unprecedented spike in forecaster disagreement almost triple that seen during the Great Financial Crisis. Professional forecasters thus expect very different states of the world in just six and 18-months' time. This measure was first constructed by Altig et al. (2020) for the US and UK, for both of which the results were similar.

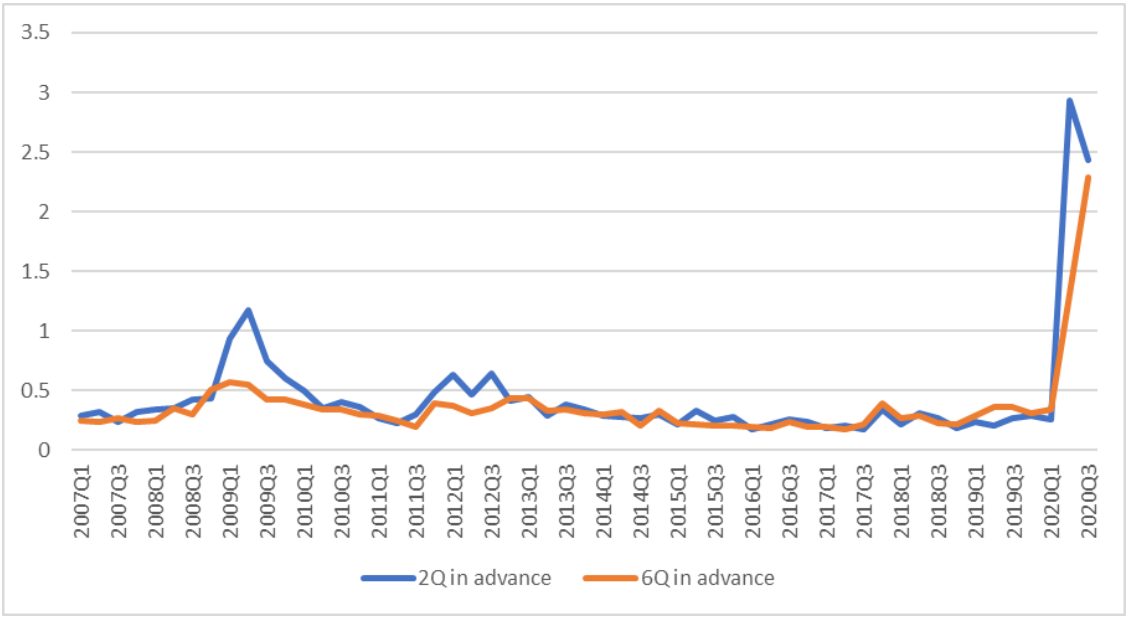
Figure 2: VSTOXX index



Source: Bloomberg.

Notes: The VSTOXX Index, similarly to the VIXX Index in the US, measures euro area stock market volatility through the implied volatility of EURO STOXX 50 Index options with rolling 30-day expiry. While implied volatility structurally trends above realised volatility, its evolution through time is the variable of interest.

Figure 3: Cross-sectional dispersion, GDP growth forecasts



Source: Bruegel based on ECB Survey of Professional Forecasters, standard deviation between forecasts. See https://www.ecb.europa.eu/stats/ecb_surveys/survey_of_professional_forecasters/html/index.en.html.

But while measures of uncertainty provide an informative signal of volatility, they are also based on the assumption that risk can be measured. And if it can be measured, then policy can rely on such measurements to "optimise" and achieve precise and well-defined outcomes. But both the nature of the current health shock and the significant structural changes in the global economy, in our view, imply that uncertainty cannot be measured reliably. Our understanding therefore of how the challenges we face will work themselves out in the economy is incomplete.

With this in mind, we describe COVID-19's effects on inflation and discuss possible risks arising from ECB decisions. We then look at how uncertainty poses challenges for monetary policy in the long run, given the inoperability of an uncertain and negative equilibrium real interest rate and under increasingly imprecise forecasts that are unable to capture our present deviations from equilibrium.

The first issue is to understand whether COVID-19 is deflationary or inflationary, and over what term. The ECB's latest forecast[1] is that annual inflation will drop to 0.4% in 2020 but will gradually recover in 2021 (1.0%) and 2022 (1.3%). While most scholars tend to see deflationary effects as more pronounced, others, such as Goodhart and Pradhan (2020), maintain that given the massive policy measures on the fiscal and monetary sides, the risk of high inflation beyond the policy horizon are not negligible. As we will show, markets do not seem to agree with this.

Second, beyond the inflationary impact, ECB non-conventional measures imply a big increase in its balance sheet. Two risks are associated with this: first, what does a large balance sheet mean for bank profitability and financial stability? Second, the immediate impact of ECB policy has been to suppress the cost of borrowing for all Member States[2], thus allowing them to finance expenditure associated with containing the pandemic. Will these suppressed costs continue without the ECB's help, and is it conceivable that the ECB will come under pressure, threatening its independence, to continue quantitative easing (QE)? And what about the sustainability without ECB support of national fiscal debts, which will have increased as a result of COVID-19?

Third, the current shock has aggravated longer-term challenges from increasing uncertainty about the state of the world, which were already present. Markets believe that the nominal rate will hover around zero for the next 10 years and possibly longer. This means that policy space will be seriously constrained. At the same time, given very low inflation, markets expect that real interest rates will remain negative for a long time. What do sustained negative real interest rates mean for the clearing of capital and how does this affect a central bank's ability to manage demand?

Lastly, the existence of fundamental uncertainty poses a serious challenge for central banks when measuring and designing policy. We will show that forecasting in general has been very inaccurate during big structural shifts and also continued to underperform persistently afterwards.

[1] HICP forecast in 2020 Q3. See https://www.ecb.europa.eu/stats/ecb_surveys/survey_of_professional_forecasters/html/table_hist_hicp.en.html.

[2] Including Greece, whose debt is still not rated as investment grade.

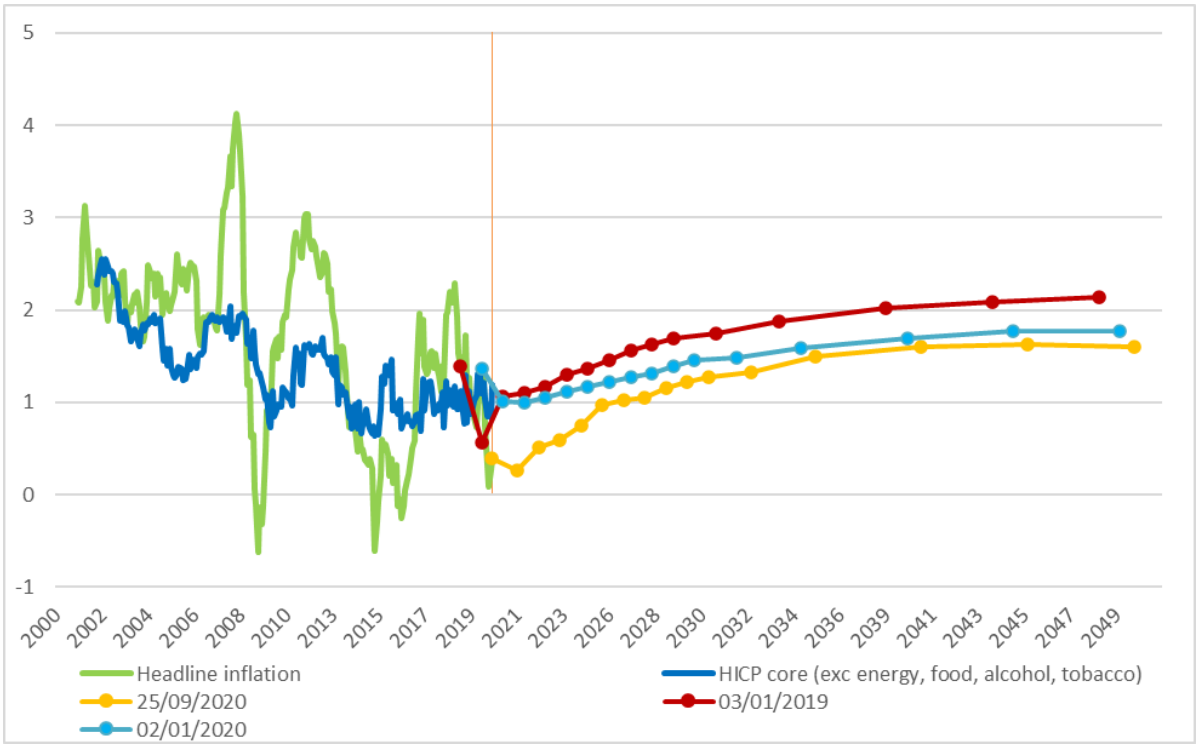
2. UNDERSTANDING THE EFFECTS OF ECB POLICY DECISIONS

The COVID-19 pandemic will have far-reaching economic consequences that are not yet well understood. When it comes to inflation, the mechanisms at play are often contradictory. Thus, while most scholars believe COVID-19 will be deflationary, the possibility of high inflation remains. Meanwhile, ECB actions to combat the downturn have been largely necessary, but they still compound certain sources of uncertainty: the effects of the ballooning balance sheet and the medium-term outlook for sovereign debt sustainability, and whether ECB support for spreads will damage ECB independence.

2.1. Inflation and COVID-19

The first issue is how the pandemic and the ECB's response to it will affect inflation. Is there any inflation risk from the pandemic, arising from the combination of supply chain disruption and very aggressive fiscal and monetary stimulus (and quasi monetisation of debt)? While, so far, COVID-19 appears to have had a deflationary effect on the euro area, and most scholars[3] concur these effects will continue, others have warned of the risks of inflation.

Figure 4: Headline and core inflation, including expectations in the euro area



Source: Bruegel based on Bloomberg.

Figure 4 shows the initial effect of the pandemic has been evidently deflationary. Headline inflation between January and July dropped by almost one full percentage point, and inflation expectations remain under 1% for the next five years. This is a relatively big change from what markets were expecting back in January 2020 (especially up to 2026). The longer-term expectations curve also shows

[3] See Guerrieri et al. (2020), Blanchard (2020), Landau (2020), Balleer et al. (2020) and Miles and Scott (2020).

a small downward shift of around 15 basis points (bps). The market for inflation swaps becomes less liquid over the 15 to 20-year horizon and is therefore less informative.

The mechanisms at play require some disentangling. Historically, pandemics have been found to have an inflationary effect because the disruption of supply, resulting from a reduction in labour from mortality and morbidity, is larger than the disruption in aggregate demand[4].

However, in the current pandemic, the bulk of the economic effect has been driven by containment measures and not disruptions of the supply of labour. Initially, COVID-19 resulted in a large supply shock, given the disruption to global value chains and production, but a seemingly larger aggregate demand shock followed. Household consumption fell because of precautionary saving, social distancing measures, income cuts and eventually also loss of employment. Uncertainty and mounting debt have subdued corporate investment. This was compounded by the collapse in the price of oil (among other commodities). Guerrieri et al. (2020) presented an interesting model of what they term Keynesian supply shocks to explain the theoretical mechanism through which some of the effects, such as those of the current pandemic (such as shutdowns, layoffs and exiting firms), may cause larger aggregate demand shocks. The data and general consensus appear to agree with them: overall, the effects of the pandemic appear to be deflationary.

Two main arguments against this have been made. First, there is a mainstream group of scholars that agrees that, while the effects will most likely be deflationary, there is a small risk of a surge in inflation. This could happen if debt-to-GDP saw a very large surge (above 30%) through several years of widespread government support, causing an increase in the natural rate of interest (above growth) culminating in fiscal dominance of monetary policy (Blanchard, 2020). However, as we will show, there are many factors that have put and continue to put downward pressure to the natural rate of interest. This scenario is therefore unlikely to happen. While the quasi-monetisation of government debt presents some inflation risks, inflation expectations remain low (Landau, 2020).

Goodhart (2020) however sees a different outlook for inflation. It is true, he argues, that despite the large increase in the supply of money, inflation has not increased yet, but this he explains by the fact that the velocity of broad money has been falling at a similar rate (because of the temporary decrease in activity and incomes and rise in precautionary savings). However, once velocity recovers, the inflation risk could be high. Miles and Scott (2020) on the other hand argued that while the stock of money has risen substantially, the fall in the value of private-sector assets should more than compensate for these effects. Either way, underlying forces will cause greater inflation volatility in the near future, thus contributing to overall uncertainty (Brunnermeier, 2020).

2.2. More QE to suppress the spreads?

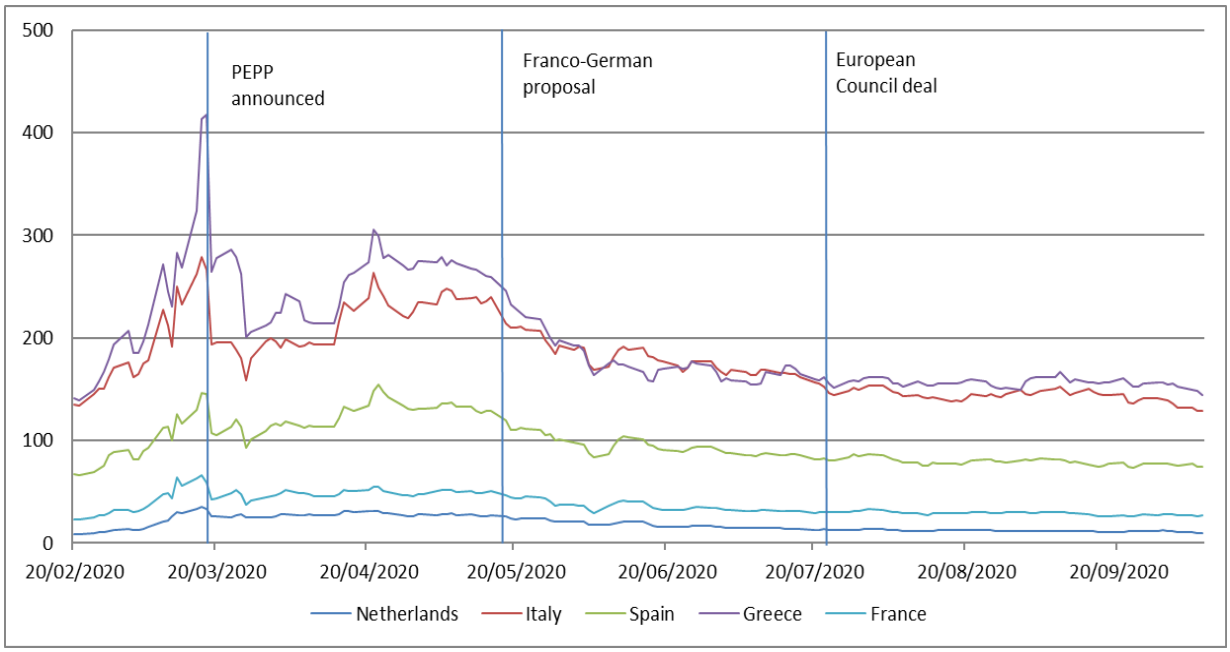
Then, there is the question of the ECB balance sheet and the recent performance of sovereign spreads. With the nominal rate at zero, the central bank lacks conventional tools. At the start of the pandemic the ECB's initial response came in two steps. First, they reduced the targeted longer-term refinancing operations (TLTRO) refinancing rate to -75 bps, establishing an indirect "subsidy" to banks that borrowed under the TLTRO (derived from borrowing at -75 bps and depositing at -50 bps). In parallel, the ECB loosened regulatory requirements and reactivated QE with an initial EUR 120 billion. Second, and most significantly, on 18 March, the ECB introduced the pandemic emergency purchase programme (PEPP). Under this new asset purchase programme, self-imposed issuer limits no longer

[4] For example, Barro et al. (2020), when looking at the Spanish flu, found 1% mortality to have an effect of around 10 percentage points on inflation. Similarly, Keogh-Brown et al. (2010) simulated the contemporary effects of an influenza pandemic in the UK, finding, in the most severe scenario, yearly inflation rising by 1.64%.

apply, Greek debt became eligible for purchase and there was greater flexibility to deviate from the capital key.

Figure 5 shows that the effects of this were immediate. Almost exactly at the time of the announcement, sovereign spreads for all euro area countries fell substantially against the German bund. For Italy and Greece, this provided much-needed relief and ensured they could continue to obtain market financing at sustainable rates. ECB support on sovereign markets assuaged any fears of a possible new sovereign debt crisis and allowed member states to react to the pandemic (Consiglio and Zenios, 2020).

Figure 5: Sovereign spreads, 10Y, to DE (February-September 2020)

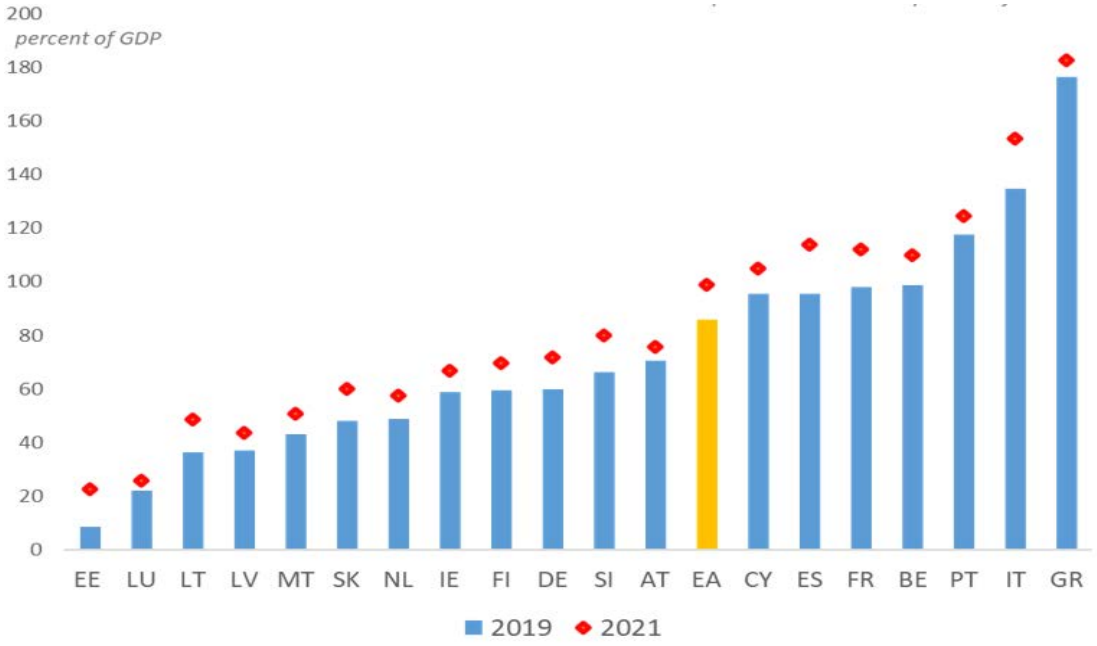


Source: Bloomberg.

Note: the Franco-German proposal was the plan published by France and Germany in May 2020 for a recovery fund based on EU borrowing. It was succeeded by the European Commission's proposal for what became Next Generation EU.

Necessary though these measures are, they do not come without risks. First, the combination of the PEPP and funds under the EU recovery plan, Next Generation EU, has ensured that spreads are kept low and that countries can access the market at low rates in order to deal with the pandemic. The compression of spreads may have been a positive short-term development given the lessons of the past crisis and the need for Member States to have the policy space to combat the unprecedented circumstances. However, these very small spreads might not necessarily reflect the real cost of debt. Lest we forget, spreads for different euro area countries almost entirely disappeared with the introduction of the euro, because of a false market understanding of *de facto* risk-sharing (if it became necessary), which was ultimately damaging. While the circumstances are different this time and spreads have not disappeared, they are around their pre-COVID-19 levels and Member State debt continues to increase (Figure 6).

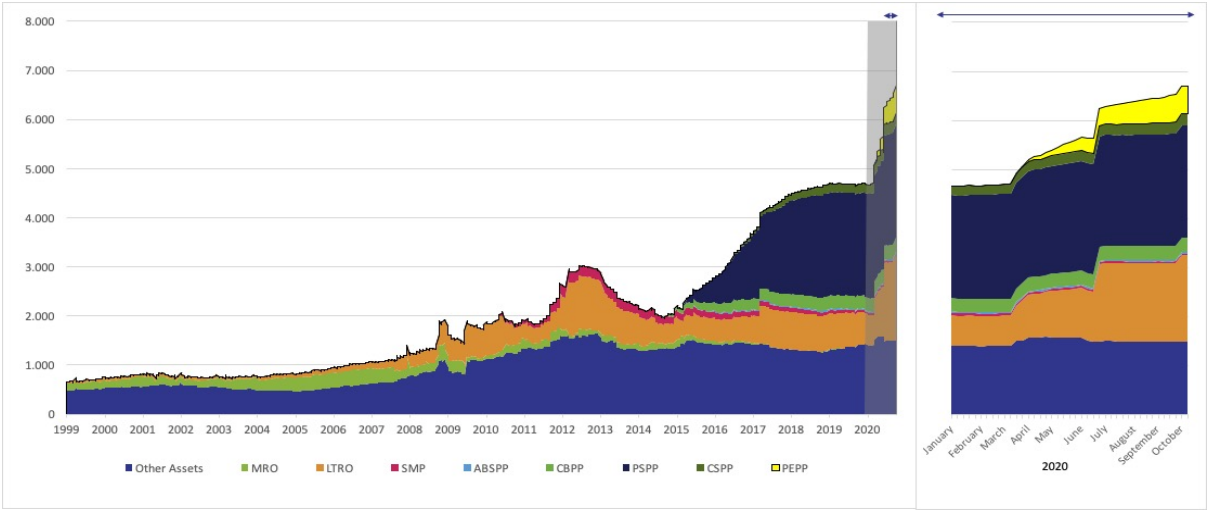
Figure 6: Public debt in the euro area in 2019 vs. projections 2021



Source: European Commission, April 2020 forecast.

Uncertainty also stems from the evolution of the ECB balance sheet. Figure 7 shows that this grew from about EUR 4.8 trillion to just below EUR 7 trillion in a few months. Not all of the growth in the balance sheet is due to the PEPP. As graph 7 shows much of the growth in the balance sheet is due to the increase in the liquidity provision LTRO (orange part).

Figure 7: ECB balance sheet expands during the pandemic



Source: Bloomberg.

The effects of an increased central bank balance sheet are not yet entirely known, though there is no evidence of impact on bank profitability (see Altavilla et al., 2017). The macroeconomic effects of QE are also unclear. When the ECB ended its net purchases in 2018, self-imposed issuer limits of 33%, which had been in place from the outset, had been reached in some jurisdictions (Claeys et al., 2018). The

rationale for this limit was that the ECB did not wish to be in the position of having the power to block the restructuring of a euro area country's ECB-held debt, on the basis that not blocking such a restructuring might be interpreted as monetary financing. Combined with the rule that requires purchases to be proportionate to the shares of different national central banks in the ECB's capital (exhibited in the capital key), this limit reduces drastically the scope of asset purchases. This first condition (issuer limits) will not apply for the PEPP, and there will be greater flexibility to diverge from the capital key. For the ECB to be able to implement the PEPP it has had to break these self-imposed limits on how much it purchases, meaning it is going against its previous rationale.

From this, two key challenges are evident: 1) what does this ballooning balance sheet mean for central bank health and what will be the side effects on aspects such as bank profitability? (Altavilla et al., 2017). And 2) what will be the medium-term outlook with compressed spreads? Will the ECB need to support the spreads and at what cost for its independence (in particular if there arises a need to restructure debts)?

3. MONETARY POLICY AND DEALING WITH LONG-TERM CHALLENGES

Beyond the uncertain policy circumstances brought about by the pandemic and the ECB's actions under uncertainty, wider structural issues have been posing a challenge for monetary policy in the longer term. First, there is the uncertainty regarding an apparently negative equilibrium real interest rate. As the traditional benchmark for monetary policy, lack of understanding of this new normal has left the ECB operating without direction. Second, the forecasting models that produce estimates used as inputs to determine monetary policy have become increasingly inaccurate in the past decade. Designed to mean-revert, they have remained continuously off the mark following larger deviations from equilibrium.

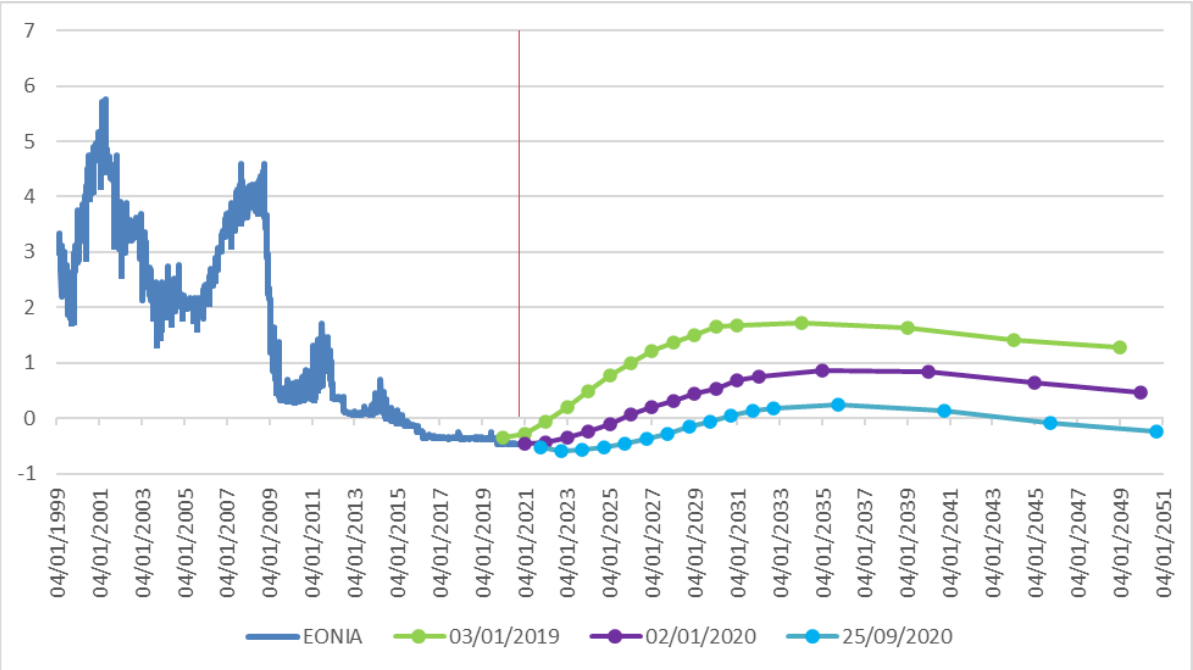
3.1. Interest rates: negative for ever?

A more longstanding challenge, compounded by COVID-19, arises from the recent levels of nominal and real interest rates, with the latter now negative even in equilibrium (according to markets and more econometric estimates).

The scope for applying traditional monetary policy tools has been substantially reduced. While there is evidently no constraint on tightening, there is very limited room to ease monetary policy further, given that nominal interest rates are at their lowest level. There is very little scope for the ECB to support demand at the zero lower-bound, with the continuation of QE being the obvious first alternative despite the risks we have described. And while low rates are the result of many evolving factors, they further suppress productivity and growth, in a self-reinforcing circle.

Figure 8 shows that the COVID-19 pandemic has had a substantial effect on this, in that it has caused a further downward shift in the yield curve. Markets now expect interest rates to remain negative for over a decade and hover around zero after that.

Figure 8: Nominal interest rate in the euro area (policy rate) up to 2050



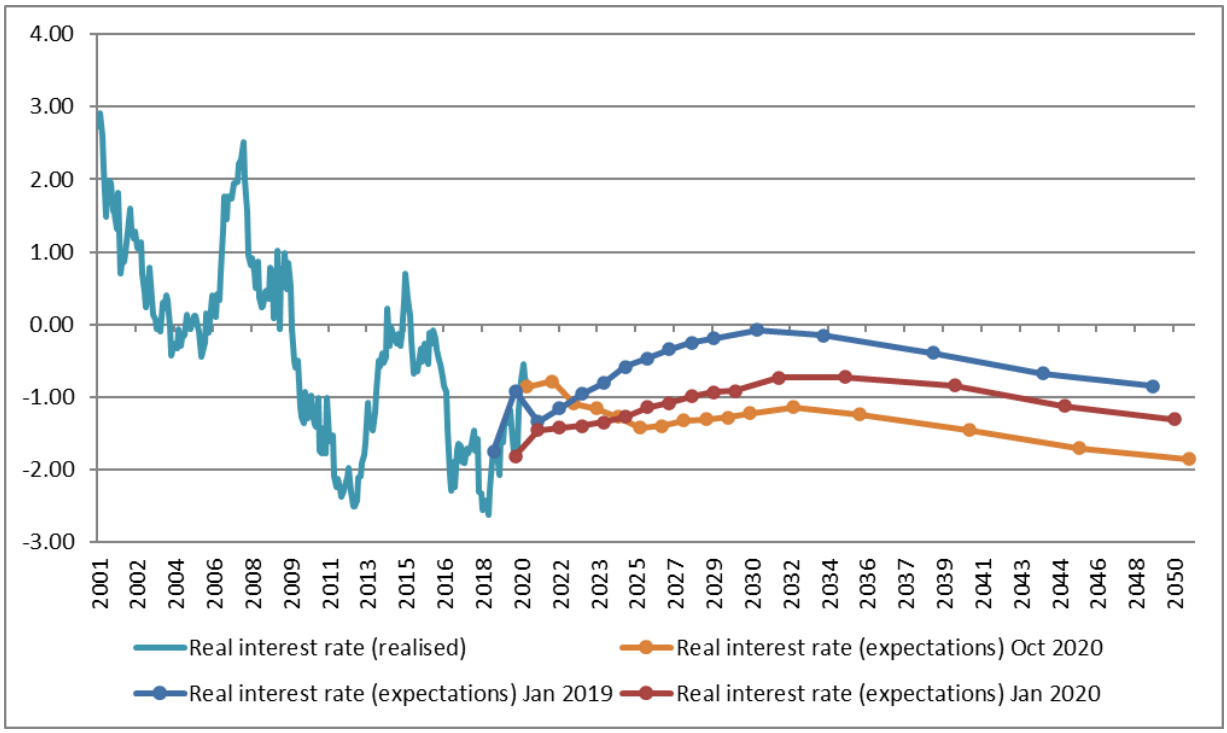
Source: Bruegel based on Bloomberg.

Note: Inflation expectations are derived from inflation zero-coupon swaps of different terms (1 year, 2 years, up to 10 years), which provide information on market expectations of average yearly inflation over the contract term. Expectations for 2020 inflation, for instance, are derived through expected inflation over the next year (2019), given by the 1-year swap, and expected inflation over the next two years (2019 and 2020), given by the 2-year swap. Expectations related to the Eurostat HICP exc. tobacco.

Protracted periods of low rates raise significant concerns, in particular for financial stability. Financial institutions (including non-bank institutions) may pursue yield enhancement through excessively risky means, including with complex structured products (Dell'Ariccia et al., 2017). Though non-performing loans (NPL) that built up in the financial crisis had reduced substantially before the pandemic, households and firms in many euro area countries were already highly indebted. The debt overhang can be a source of financial instability. With the pandemic, the situation has become more precarious. Through well-capitalised banks, it has been possible to avoid a genuine financial dimension to the crisis so far, but it is not clear whether this can be sustained.

The combination of zero nominal rates but positive inflation (Figure 4) implies that real interest rates are also expected to remain negative for the market's entire horizon (Figure 9). This has been exacerbated by the pandemic for most of this horizon, though interestingly not for the first few years (explained by the collapse in inflation). However, the real rate's entire curve was already negative (though only just) even at the start of 2019, when the outlook for the euro area economy was bright, pointing to a more structural explanation. Arguably, the notion of negative long-term interest rates (for the entire curve) could be identified with equilibrium. In effect, a negative, 30-year interest rate begs the question of where this places the equilibrium real interest rate, which functions as the benchmark for monetary policy. But what does a negative real cost of capital (in equilibrium) mean for the efficient allocation of resources? Can demand management, including by the ECB, be counted upon to manage prices and clear supply and demand?

Figure 9: Real interest rate (realised and expectations)

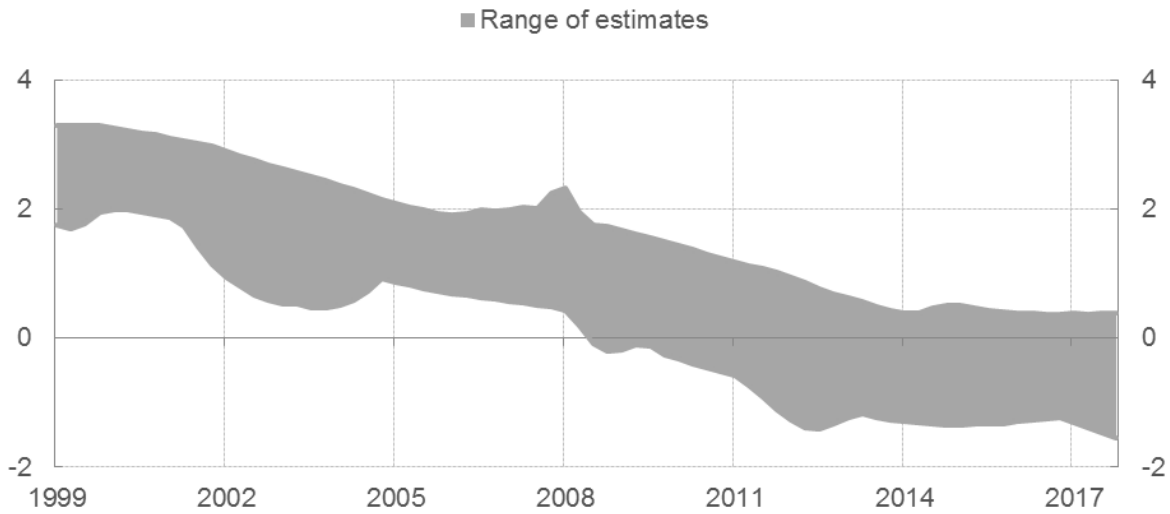


Source: Bloomberg.

Notes: Compounded as the difference between the nominal interest rate and inflation.

Granted, beyond market expectations, estimates of the natural equilibrium real interest rate are very poor as they rely on largely unobserved variables (see Beyer and Wieland, 2019). However, this is consistent with attempts to estimate the interest rate in equilibrium. Figure 10 maps the range of such estimates taken from the literature (including Fiorentini et al., 2018; Hledik et al., 2018; Holston et al., 2017; and Jarocinsk et al., 2017) and shows that the equilibrium interest rate has been declining now for some decades and was already in negative territory around 2018.

Figure 10: Range of point estimates of the natural rate of interest in the euro area obtained from econometric models (percentages)



Source: Philip Lane, Remarks, Dublin, 28 November 2019.

Notes: The grey-shaded area reports ranges of point estimates of r* for the euro area, as estimated in Brand and Mazelis (2019). Corresponding individual point estimates are reported in Brand et al., (2019). Sample period: 1999 Q1 to 2017 Q4 (Lane, 2019).

Three reasons for this decline have been identified. First, there seems to have been stagnation in trend growth for some decades. Holston et al. (2017) showed trend potential output growth to have fallen by about one percentage point across developed economies between 2007 and 2016. Falling trend growth is shown to be more consistent in the euro area, with a more modest fall during the financial crisis but a continued downward trajectory since. This has a knock-on effect on growth expectations. Lane (2019) broadly estimated that a fall in potential output of one percent would cause a similar-sized decline in the real equilibrium rate. This decline in productivity can be explained by many factors beyond the scope of this paper, and includes a decline in technological innovation and technological diffusion, and the structural shift in employment towards less productive sectors (such as services)[5]. As we have discussed briefly, this results in a vicious cycle of sorts as low rates themselves subvert productivity and trend growth.

Second, demographic trends in the past decades have further contributed to a reduction in the equilibrium rate. The growing share of retirees in the population (and their ratio to workers) causes a reduction in aggregate productivity, reinforcing the mechanisms we have discussed and thus causing

[5] For a good overview see Lane (2019). Academic analyses of these trends and their effects on rates include: Summers and Rachel (2019), Gordon (2015), Summers (2016), Roberts (2001), Edge et al. (2007) and Kahn and Rich (2007).

a more rapid decline in the equilibrium rate. An older population further implies a reduction in the demand for capital. A working population that expects to live in retirement for many decades will also likely have a higher propensity to save, and a lower propensity to engage in riskier investments. This shifting ratio between the demand for and supply of capital causes a downward shift in the equilibrium rate. The effect of these demographic trends is expected to cause a reduction of the equilibrium rate of between 1 and 2 percentage points (between around 1980-2050)[6], as pointed out by Lane (2019).

Third, global factors appear to have played a role, with the decline identified in the euro area following a similar trend in other developed economies. The two decades have seen a substantial increase in the global supply of savings, resulting in a large increase in the demand for safe assets. The developing world has partly led this drive, as booming global capital flows and currency crises in the 1980s and 1990s led developing countries to stock up on reserve currencies (Bernanke, 2005). The financial crisis also resulted in a fall in investor risk appetite, further concentrating savings in safe assets. At the same time, the crisis and ensuing expansion of sovereign debt-to-GDP ratios led to many euro area countries being downgraded, substantially reducing the supply of euro-denominated safe assets. This shift in both supply and demand has inevitably reduced the equilibrium rate[7].

The COVID-19 pandemic adds an additional layer of uncertainty to these mechanisms. The possible effects on productivity have received significant attention but include conflicting mechanisms. Within firms, the effects on productivity will be seemingly negative, given suboptimal allocation of labour (precautionary measures) and capital (postponed investments), transaction costs due to barriers to mobility, and the additional cost of safety measures (di Mauro and Syverson, 2020). Meanwhile, the exit of less-productive firms may result in creative destruction, increasing overall productivity. However, exit will also be determined by market power and access to credit (disadvantaging SMEs) and government support, none of which necessarily reflect inherent productivity (Cespedes et al., 2020; Restuccia and Robertson, 2020). Finally, at a sectoral level, there may be a shift from the less-productive hospitality sector to the more-productive IT sector (Di Mauro and Syverson, 2020b). The overall effect on the real equilibrium rate is thus ambiguous, creating more uncertainty, although most studies agree that productivity is more likely to decline, which could drive the rate further into negative territory. The market seems to agree with this assessment given the real rate has fallen is expected to fall over 5-30-year horizon (when compared to the beginning of the year), even as shorter-term real rates are higher (Figure 9).

To make matters worse, this is happening at a time when the relationship between employment and wages appears to have weakened, and the Phillips curve might have flattened (at least in some countries; see Bonam et al., 2018). The relationship between wages and prices is seeing a greater degree of uncertainty because variables such as the non-accelerating inflation rate of unemployment are harder to gauge. Not only is the space for monetary policy limited, its effect appears to be smaller.

3.2. Forecasting is difficult, particularly about the future

Finally, the effects of uncertainty are further heightened by the limitations of current forecasting models, even though the outputs of these models are fundamental in the determination of monetary decisions. Monetary policy depends on estimations of both observable and unobservable variables. Under conditions of deep uncertainty, these estimations become less informative and therefore less reliable.

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[6] Rachel and Smith (2015), Rachel and Summers (2019), Papetti (2019) and Lopez-Salido (2016).

[7] For more detail see Del Negro et al. (2017), Del Negro et al. (2018), Bauer and Rudebusch (2019), Hutchinson and Saint-Guilhem (2019) and Laubach (2009).

The ECB and most advanced economy central banks base their monetary policy decision-making on an estimate of a simple Taylor rule:

$$i_t = \pi^* + r^* + \alpha_\pi(\pi_t - \pi^*) + \alpha_y(y_t - y^*)$$

- π^* is the inflation target
- r^* is the equilibrium interest rate.
- $y_t - y^*$ is the output gap.

The policy rate will be chosen to close the inflation and output gap. One can rewrite the Taylor rule in deviations:

$$i_t - r^* = \pi^* + \alpha_\pi(\pi_t - \pi^*) + \alpha_y(y_t - y^*)$$

Monetary policy tools have two characteristics that function less well in times of uncertainty.

First, these models rely on estimates or proxies of unobservable variables (such as the equilibrium real rate or the output gap). In order to compute reliable proxies, we need a mechanism that can understand the "new (economic) normal". Wider global developments have further rendered the shape and form of this *status quo* unknown.

As we have seen, in the current circumstances, estimates of the equilibrium real interest rate point in a direction that is at best unusual, in the sense that a negative real cost of capital cannot be sustained for long and certainly not in equilibrium. It follows that the underlying models – our interpretation of how the economy operates – are also poor. While this was an issue before the COVID-19 pandemic, the current situation has introduced an additional layer of uncertainty and, as we have discussed, has put additional downward pressure on the real equilibrium interest rate.

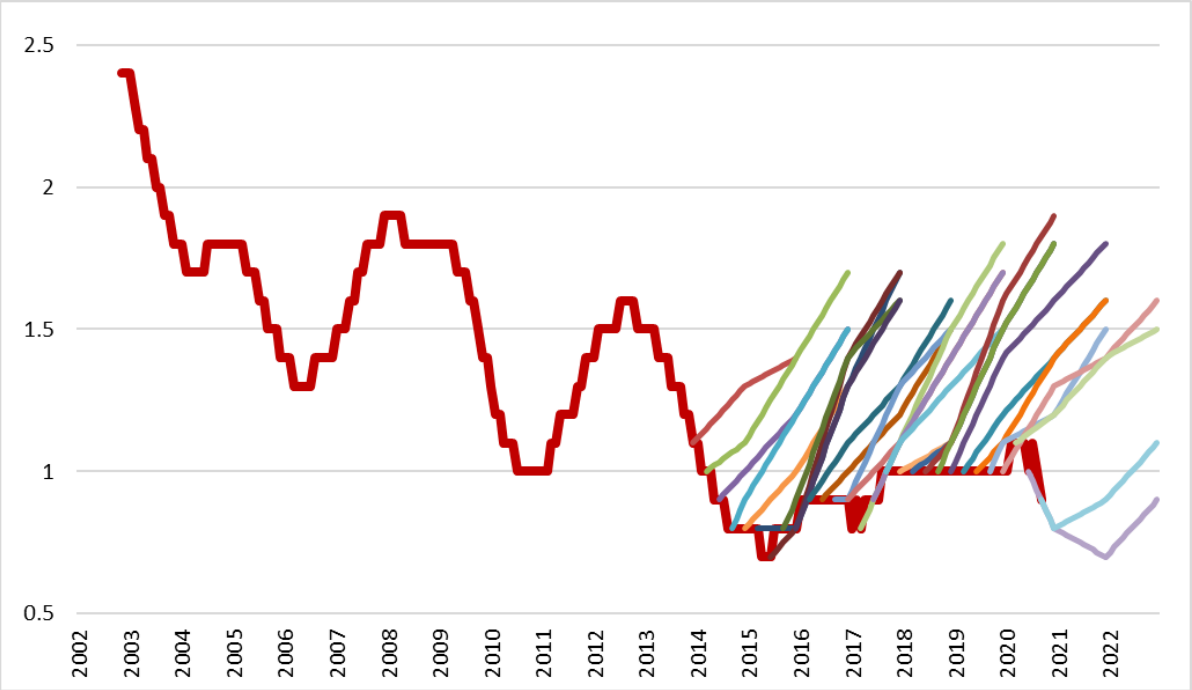
The second problem is that the models used to help predict and form policy are designed to "mean revert", in other words, to return to equilibrium. This means that these models focus on describing a well-defined economic equilibrium that is known and understood. As shocks push the economy away from equilibrium, the role of policy is to simply bring the economy back to equilibrium (i.e. mean revert). Furthermore, for these tools to be tractable they need to be linear (or linearised), which in itself means that shocks really need to be small for model predictions to be sensible.

But, as we have argued so far, the shocks we face today are not small, nor is the equilibrium that we seek known to us. The result is that policy forecasts are prone to two mistakes.

First, models predict that when moved away from equilibrium, policy will intervene so that the relevant variables revert (at a speed captured by estimated lags). Figure 11 represents the ECB staff's macroeconomic projections for core inflation (moving 12-month average rate of change) every month over the next two years. These quarterly projections are shown from December 2013 to September 2020. As inflation during this period was uncharacteristically low and below 2%, the forecasting model predicted persistently throughout the seven-year period a reversion to the mean. As this has not materialised, projections in recent years have been systematically wrong (Darvas, 2018). This would imply that our understanding of the mechanisms that determine inflation and of the monetary-policy transmission channel has been poor, which could jeopardise monetary policy effectiveness and even affect the ECB's credibility. Figure 11 shows that the ECB's last two predictions were better at capturing the short-term movements, but again core inflation is expected to revert in order to meet its target.

The message here is that if the economy is transiting to a new normal, as we have argued, then mean-reverting models will fail to allow for that and will always predict a return to the old equilibrium. A new generation of models will need to allow for transition between steady states.

Figure 11: Core Inflation, ECB staff macroeconomic projections for the euro area, average annual values



Source: Darvas (2018), based on ECB, whom we also thank for updating the series to include latest numbers.

Note: The thick red line represents actual core inflation and each coloured line represents inflation forecasts for the subsequent two years at each point in time.

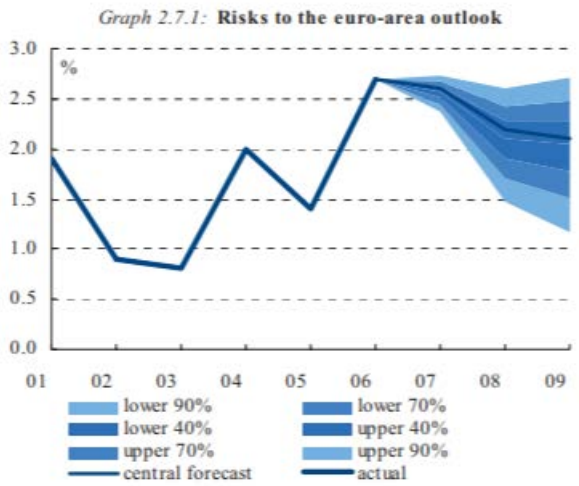
The second policy forecasting mistake is that forecasts typically are communicated around confidence intervals (fan charts), which provide statistical confidence. But this may no longer be appropriate because confidence bands are based on econometric estimates using past data. But if the world is governed by fundamental uncertainty, then the past is not a good predictor of the future, and therefore, all these bands provide is a false sense of certainty.

A rather telling example is the way the European Commission was forecasting the output gap back in 2009. It is important to note that the European Commission is not exceptional in this respect. Many others in the business of predicting were making similar mistakes (graphs available upon demand).

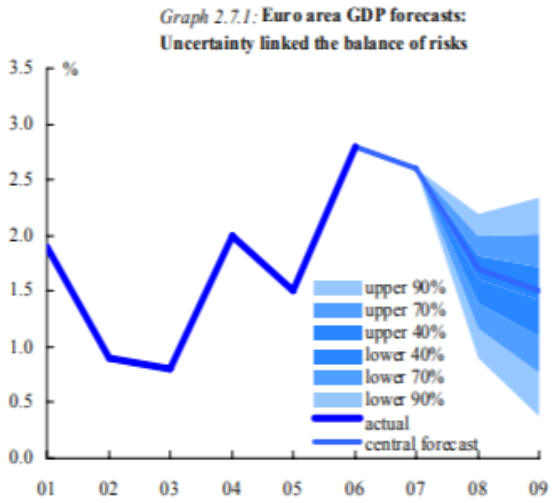
Figure 12 show the Commission's GDP forecasts and its confidence bands, (up to 90%), known also as fan charts, as estimated between 2007 and spring 2009. In autumn 2007, the GDP growth forecast for 2009 was 2% and the lowest estimate at the 90% confidence interval was 1.2%. While the first whiffs of turmoil were apparent in the US financial markets, it was still early. However, even in the autumn forecast for 2008 (published on 3 November 2008, almost two months after Lehman Brothers had filed for bankruptcy), the growth forecast for the euro area in 2009 was still zero, and the lowest output estimate in the 90% confidence band was about -2%. Just six months later, the central projection for 2009 was -4% or an even greater contraction. However, not only was the baseline projection in autumn 2008 very wrong, the estimated 90% confidence bands did not include the baseline forecast in the spring of 2009, as Figure 12 shows. The 90% confidence bands also did not include the eventual contraction for 2009 that turned out to be around -4.5%. Indeed, the lowest band in autumn 2008 was at around the same place as the highest band only six months later – there was no overlap in the 90% confidence intervals for 2009.

Figure 12: European Commission, Economic Forecasts report, euro area GDP predictions for 2009

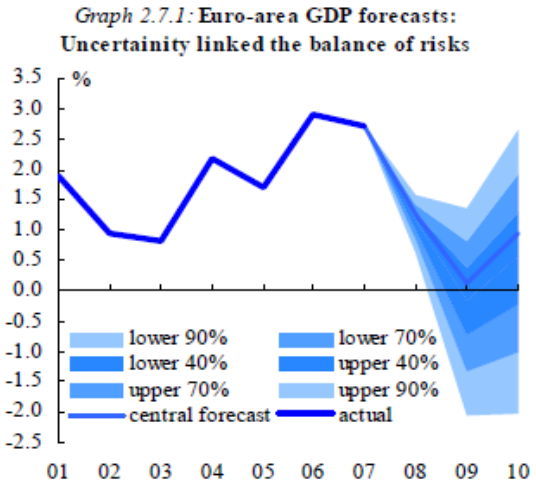
Autumn 2007



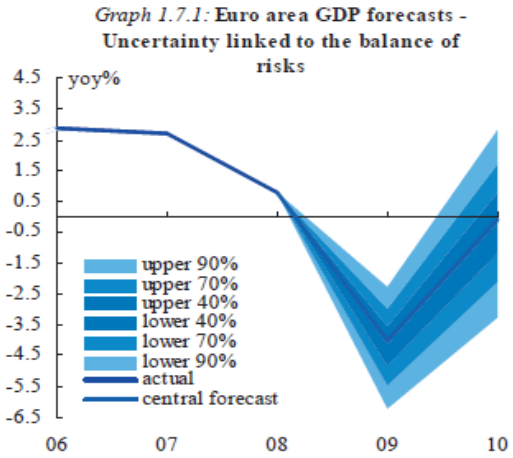
Spring 2008



Autumn 2008



Spring 2009



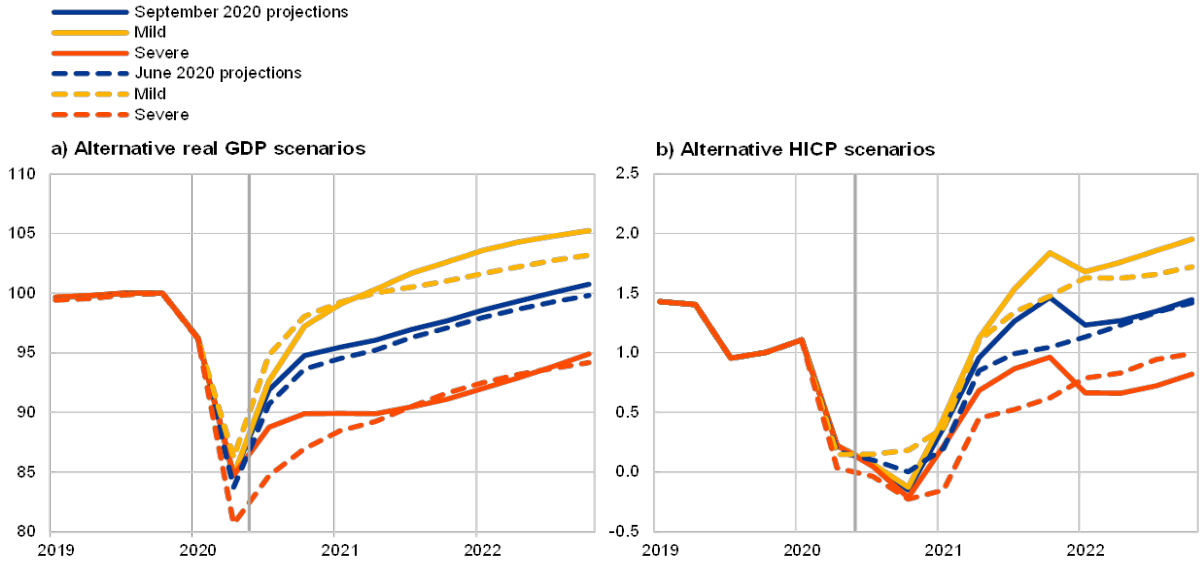
Source: European Commission, Economic Forecast, Autumn 2007 and 2008 and Spring 2008 and 2009.

The European Commission no longer presents confidence bands, but instead discusses alternative scenarios in the *Economic Forecast* report. The ECB also used to provide confidence bands surrounding their forecasts, or rather upper and lower ranges that were consistent with a 57.5% confidence interval[8]. However, this was not done for the last two quarters (June and September 2020). The reason given for this is that the computation of the ranges was based on historical projection errors, unreliable in a situation of such unprecedented uncertainty as that caused by the pandemic.

The ECB has instead included alternative scenarios, just like the European Commission, based on different assumptions of the evolution of the pandemic, shown in Figure 13.

[8] See ECB (2009) https://www.ecb.europa.eu/pub/pdf/other/newprocedureforprojections200912en.pdf.

Figure 13: ECB Staff macroeconomic projections and alternative scenarios for real GDP and HICP inflation in the euro area (September and June projections 2020)



Source: ECB staff macroeconomic projections for the euro area, September 2020, Box 3.

Notes: The vertical line indicates the start of the projection horizon, index: Q4 2019 = 100 (left-hand chart) and year-on-year rate (right-hand chart).

The message here is that discussing scenarios instead of presenting fan charts is a very welcome development and we hope the ECB and the Commission will continue this practice once the pandemic has passed. The backward-looking nature of confidence intervals may not be informative and may even create false confidence as we transit to a new normal.

4. IMPLICATIONS FOR POLICYMAKING

The real problem that policymakers face in the presence of fundamental uncertainty is that they cannot use traditional tools to acquire confidence in their decisions or indeed in the outcomes of their decisions. A 90% percent confidence interval around a baseline projection provides "90% confidence" that inflation or growth, for example, will be within a certain interval. At the heart of this exercise lies a fundamental trade-off: that between precision in outcomes and confidence in achieving them. The greater the degree of confidence and predictability, the wider the range of possible outcomes, as all the panels in Figure 12 show. But if we cannot rely on defining confidence probabilistically, then how do we define confidence at all?

We used the September 2020 ECB forecast for HICP inflation shown in Figure 13b, to describe how to capture confidence in the absence of probabilities. The ECB forecasts as a baseline scenario that HICP inflation in 2021 will be 1% (blue line in Figure 13b). Alongside that, the ECB also provides forecasts for a mild scenario (around 1.5% in 2021, yellow line in Figure 13b) and a severe scenario (0.7% in 2021, orange line). These scenarios are constructed based on critical assumptions around the evolution of the pandemic and our success or failure in containing the number of infections in the euro area, which will translate into very different costs in terms of economic activity. The assumptions for each scenario are carefully laid out and explained. Confidence comes from the breadth of the contingency scenarios considered. If the number of infections turns out to be between what is assumed in the mild and severe scenarios, then the ECB can be confident (not sure) that inflation will be between 0.7% and 1.5%. If the ECB wanted to present a more precise inflation forecast, it would have had to calibrate the two scenarios to be more similar. On the other hand, if the ECB wanted to be prepared for very extreme pandemic scenarios, it would have had to present a much greater, and thus less precise, range of inflation outcomes.

This framework provides two useful ways of forming decisions.

- The ECB is in a good position to reveal which inflation range it would be prepared to communicate (for example, in this case between 0.7% and 1.5%). Once this is decided, it can say for which range of outcomes in terms of COVID-19 infections this inflation range will materialise. If infections go beyond what is assumed in the severe scenario then inflation will not be in this range. Naturally, the ECB could reason the other way around: what are the consequences for inflation for any given range of infections. However, we feel that the former reasoning is more appropriate, as the ECB is in a better position to judge acceptable levels of inflation rather than the course of the pandemic.
- The second benefit it offers is an ability to rank different policies. If the ECB were to consider alternative policies, it should pick the policy that would achieve any given inflation range, for the most extreme pandemic scenarios (Ben-Haim and Demertzis, 2008, 2016).

This approach will allow the ECB to continue to provide inflation forecasts based on its best guess of what conditions (say, pandemic conditions) will be, but also to inform the public about the consequences of not making the correct assumptions about the pandemic. We hope the ECB continues to present results in this format, but also explains the choice of policies pursued as a way to achieve acceptable inflation outcomes for the greatest set of possible pandemic (and indeed other) scenarios.

In the meantime, while the ECB considers how to adapt its strategy, there are two quick wins it can apply to manage uncertainty better.

The first is to redefine its price stability objective as a target of 2% rather than *"below or close to 2%"*. The benefit of a clear objective is that it is easy to communicate. The theory of focal points then helps

us establish that clarity in the objective provides a very good signal that can help the central bank achieve it (Demertzis and Viegi, 2008).

The second quick win is establishing a tolerance band around the target. Demertzis and Viegi (2010) showed that explicit bands are a tool for communicating what levels of inflation are tolerable. Given the explicit nature of these bands, achieving those outcomes then establishes credibility, which in turn helps the central bank to achieve its objective more easily. And the other way around: if inflation lands outside those bands, the central bank will lose some credibility, which will make it more difficult for it to achieve its objectives.

But Demertzis and Viegi (2010) also showed that for high degrees of uncertainty, policymakers can afford wider bands. When volatility is high, it is better to have wider tolerance bands without fearing the imprecision that this necessarily implies. **In times of uncertainty it is more useful to be predictable than precise.** Given that the euro area economy needs to manage the digital and green transition, we recommend that such bands remain wide (say between 0.5% and 3.5%).

Last, it is important to acknowledge that the nature of central bank communication also needs to change when uncertainty is high. Uncertainly means less knowledge about the future. **Communication then is less about what will happen, which by definition is less known, and more about what the reaction should be if alternative scenarios would happen.** This is exactly what Figure 13 shows without having to explain how likely any of the scenarios are, not even the baseline scenario.

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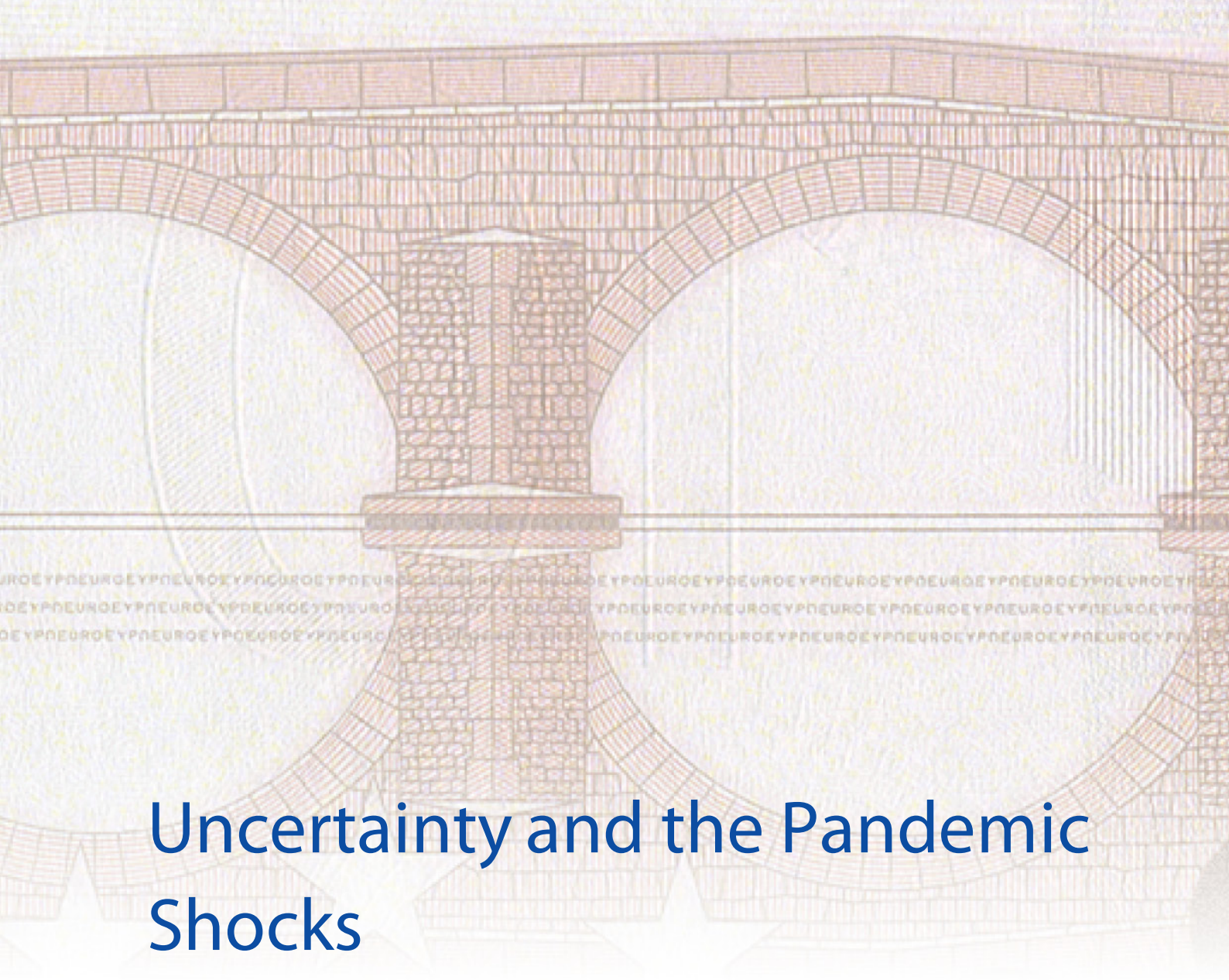

Uncertainty and the Pandemic Shocks

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Abstract

The COVID-19 pandemic shocks are a significant source of uncertainty in several aspects. In particular, these shocks influence the landscape, in which policymakers operate, and create further uncertainty about policy decisions and about their effectiveness. The aim of this paper is to offer some relative measures of the uncertainty caused by the pandemic, and to discuss the impact of this uncertainty on the possible evolution of European economies during the second wave of COVID-19. Emphasis will be placed on the effectiveness of the policies implemented.

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CONTENTS

LIST OF ABBREVIATIONS

APP	Asset Purchase Programme
CMU	Capital Markets Union
EC	European Commission
ECB	European Central Bank
EIB	European Investment Bank
EEPU	European Economic Policy Uncertainty
EMU	European Economic and Monetary Union
ESM	European Stability Mechanism
EU	European Union
GEPU	Global Economic Policy Uncertainty
LTRO	Longer-Term Refinancing Operations
MFF	Multiannual Financial Framework
NG–EU	Next Generation – EU
NRRP	National Recovery and Resilience Plan
PELTRO	Pandemic Emergency Longer-Term Refinancing Operations
PEPP	Pandemic Emergency Purchase Programme
RRF	Recovery and Resilience Facility
SGP	Stability and Growth Pact
SSCI	Systemic Stress Composite Indicator
SURE	Support to mitigate Unemployment Risks in an Emergency
TLTRO	Targeted Longer-Term Refinancing Operations
VAR	Vector autoregression
WUI	World Uncertainty Index

EXECUTIVE SUMMARY

- Newspaper-based measures clearly show **a sharp increase in uncertainty in 2020** due to the outbreak of COVID-19 at both global and European level.
- Other measures of uncertainty based on **volatility in financial markets also show a significant increase in uncertainty** after the first pandemic shock but to a lower extent with respect to other recent financial and "real" crises.
- This evidence could be due to the **policy reactions** implemented by the EU and EMU institutions, which **were more rapid in spring and summer of 2020** than during the previous crises.
- Despite this evidence, European policymakers should take into consideration that, even if the current monetary policy implies very low interest rates, some Member States will have to deal with **a big amount of government debt after the emergency, thus further increasing the level of uncertainty**.
- The possible complex interactions between policies and uncertainty signal that the **economic consequences of COVID-19 could be more persistent** than the previous shocks.
- Using both newspapers and financial-variables-based uncertainty indexes, we show that **higher uncertainty implies declines in GDP, consumption, worked hours, and investment**. The impact on investment is higher than the one on consumption. As uncertainty increases, inflation and policy rates slightly decline.
- These analytical and empirical results show that the ECB's **expansionary monetary policy, as well as the national and EU expansionary fiscal policies, should continue** in 2021 and the following years in order to respond to the second wave of COVID-19.
- Hence, the combination of short-term national fiscal policies and a plan for the utilisation of resources provided by the **European funds is a necessary condition for controlling the persistent level of uncertainty** in the EU and the related macroeconomic consequences.
- It is also crucial to incentivise institutional investors to reduce the part of their portfolio allocated in liquid assets and increase that in riskier assets. This is **necessary in order to finance innovations and organisational changes in the EU productive system** and to be able to improve the economic potential and social development after the pandemic shocks.

1. INTRODUCTION

Uncertainty is an intrinsic component of the economic environment, and therefore of economic modelling. Current decisions made by various economic agents (consumers, firms, financial intermediaries, government, and so on) depend on future outcomes. Since the future is unknown, agents may need to formulate (subjective) forecasts on these outcomes across all possible or understandable contingencies in order to make their choices today. In an ideal world, agents fully utilise their limited set of information on the functioning of the economic system; in doing so, they can understand exactly what the future contingencies are and can assign the "true" probability distribution to their occurrence (cf. Lucas and Sargent, 1978). However, even in this ideal world, there is still uncertainty about which will be the actual outcome; and this uncertainty can vary over time if contingencies and the probability distribution change appropriately. Moreover, in a world with incomplete or asymmetric information, there is also uncertainty about important future contingencies, as well as about the possible outcomes that are conditional on even known future contingencies (see, for instance, Hirshleifer and Riley, 1992). It follows that, in general, there is also uncertainty about the true probability distribution.

The COVID-19 shocks bring about several degrees of uncertainty. There is first an uncertainty related to the epidemiological evolution of the pandemic episodes, for example on the infectiousness of the virus, on the development of the vaccines, and on the magnitude of the second waves and hospitalisation needs. Correlated to this uncertainty, there is an uncertainty about the economic outlook related to the economic outcome of the possible restrictions/lockdown on the agents' behaviour and economic activity. This type of uncertainty affects the possible macro- and micro-economic evolution of the productive systems; and, in turn, the expectations of these impacts determine the sectors that are going to be mostly affected and the way in which the economic agents are going to react in terms of consumption, savings, production and investment plans. Finally, there is an uncertainty related to the policy measures and their impact on the economy. All these different sources and degrees of uncertainty influence the landscape in which policymakers operate and create further uncertainty about their policy decisions, as well as about the effectiveness of these decisions.

The aim of this paper is to apply the latter statement to the economies of the European Union (EU) and the European Economic and Monetary Union (EMU) during the second wave of COVID-19. First, the specific reference to these economies requires a descriptive examination of the impact of the first pandemic shock (winter and spring 2020) on uncertainty in EU, based on a comparison with the impact resulting from other recent significant shocks (see section 2). Then, this descriptive evidence is specified by means of a vector autoregression (VAR) estimation of the impact that the higher uncertainty, induced by the first wave of COVID-19, has had on European economic output and on its components (see section 3). Sections 2 and 3 thus offer a framework to assess the efficiency of the different policy initiatives undertaken by the European institutions and the Member States until last summer, and the appropriate evolution of these policies in the light of the current second wave of COVID-19 (see section 4). A short *Conclusion* summarises our results and underlines the open problems.

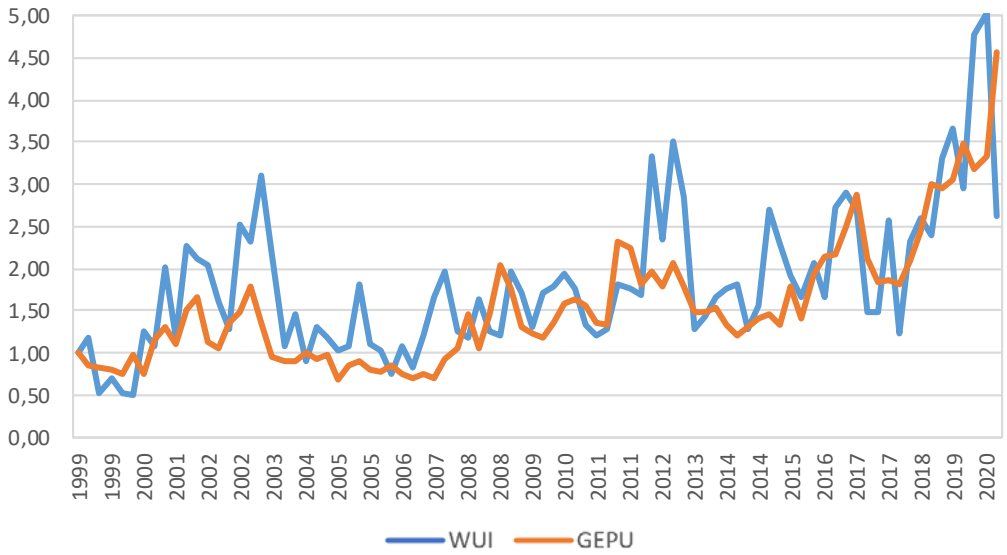
2. UNCERTAINTY: SOME DESCRIPTIVE EVIDENCE

The theme of uncertainty has always been central in economic theory (see Arrow, 1971; Laffont 1989) and has become even more topical during the recent decades, at the empirical level, due to the developments of uncertainty indicators. The latter can be considered imperfect proxies of the uncertainty dimensions underlined in the introductory section.

We report several indicators to study the uncertainty brought about by the COVID-19 shock, and we compare the degree of this uncertainty to the impact of other shocks that occurred in the last two decades.

Figure 1 reports two well-known uncertainty indexes: The Global Economic Policy Uncertainty index (GEPU) and the World Uncertainty Index (WUI). GEPU was developed by Baker et al. (2016), averaging Economic Policy Uncertainty indexes for 21 countries by their respective national GDP data.[1] National economic policy uncertainty indexes are based on newspaper articles related to policy uncertainty; specifically, by counting the number of newspaper articles that include the words "uncertain" or "uncertainty", policy-significant terms, and "economic" or "economy". The WUI was developed by Ahir et al. (2018) and covers 143 countries. Differently from GEPU indexes, the WUI uses the same source for all countries, i.e., quarterly country reports from the Economist Intelligence Unit. The WUI is computed by counting the number of times words related to "uncertainty" appear in each country report.

Figure 1: Global uncertainty dynamics from 1999 to 2020 (quarterly data)



Source: Authors' elaboration (see https://www.policyuncertainty.com and https://worlduncertaintyindex.com/ for the original time series).

Figure 1 displays the dynamics of WUI and GEPU index normalised with respect to their initial value in 1999. The Figure shows how the two measures are correlated and roughly highlights the impact of several main shocking events on uncertainty. Increases in global uncertainty were observed after the September 11 terroristic attack on the Twin Towers (2001), during the 2003 US invasion of Iraq and the

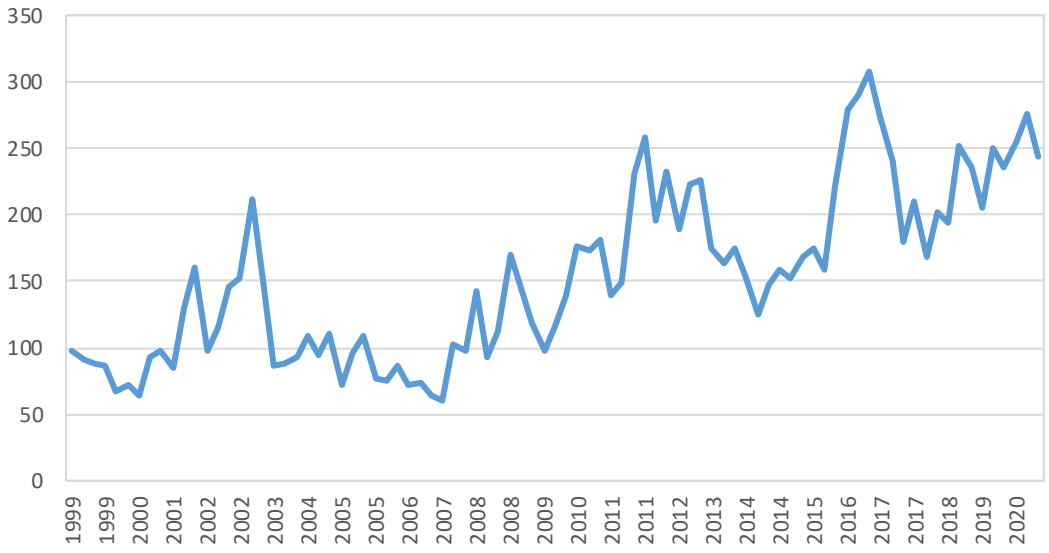
[1] The sample of countries includes: Australia, Brazil, Canada, Chile, China, Colombia, France, Germany, Greece, India, Ireland, Italy, Japan, Mexico, the Netherlands, Russia, South Korea, Spain, Sweden, the United Kingdom, and the United States.

consequent second Gulf War, in the years 2007-2008 characterised by the international financial crisis, and during the EMU's long recession (2011-2013) due to the "doom-loop" between the sovereign debt-crisis and the crisis of the European banking sector. Increases in uncertainty and volatility were also related to the deceleration of the Chinese growth rate and the EMU risks of deflation (2014), to the exit results of the British referendum (23 June 2016) and the subsequent uncertain negotiations between the United Kingdom and the EU, and to the tensions in international trade and the new risks of stagnation in the EMU economy (2018-2019).[2]

Figure 1 clearly shows a sharp increase in uncertainty also in 2020 due to the outbreak of COVID-19. However, it is worth emphasising that the WUI and GEPU index display an opposite behaviour at the end of 2019 and in the 2020 second quarter: global uncertainty was found to reach a peak at the end of 2019 according to the WUI, and at mid-2020 according to the GEPU. These different dynamics may be ascribed to the fact that, being based on a more specialised source (the Economist Intelligence Unit), the WUI was able to fully anticipate the transmission of the Chinese pandemic shock to the rest of the world; on the contrary, being based on generalist and widely distributed national newspapers, the GEPU just recorded the shock when it happened worldwide.

Figure 2 shows the dynamics of the European Economic Policy Uncertainty index (EEPU). As GEPU, EEPU is based on a newspaper article measure of uncertainty.[3] It must be noted that, differently from the two global uncertainty indexes analysed in Figure 1, EEPU reached its maximum peak not in 2020 but in 2016-2017, that is, concurrently with the Brexit decision and the activation of Article 50 of the EU Treaty. However, the impact of COVID-19 on EU uncertainty is still quite significant: it overcame the impact produced by the peak of the 2007-2009 financial crises as well as the impact associated with the EMU sovereign debt and the banking sector tensions in 2011-2012.

Figure 2: Uncertainty dynamics in Europe from 1999 to 2020 (EEPU, quarterly data)



Source: Authors' elaboration (see https://www.policyuncertainty.com for the original time series.)

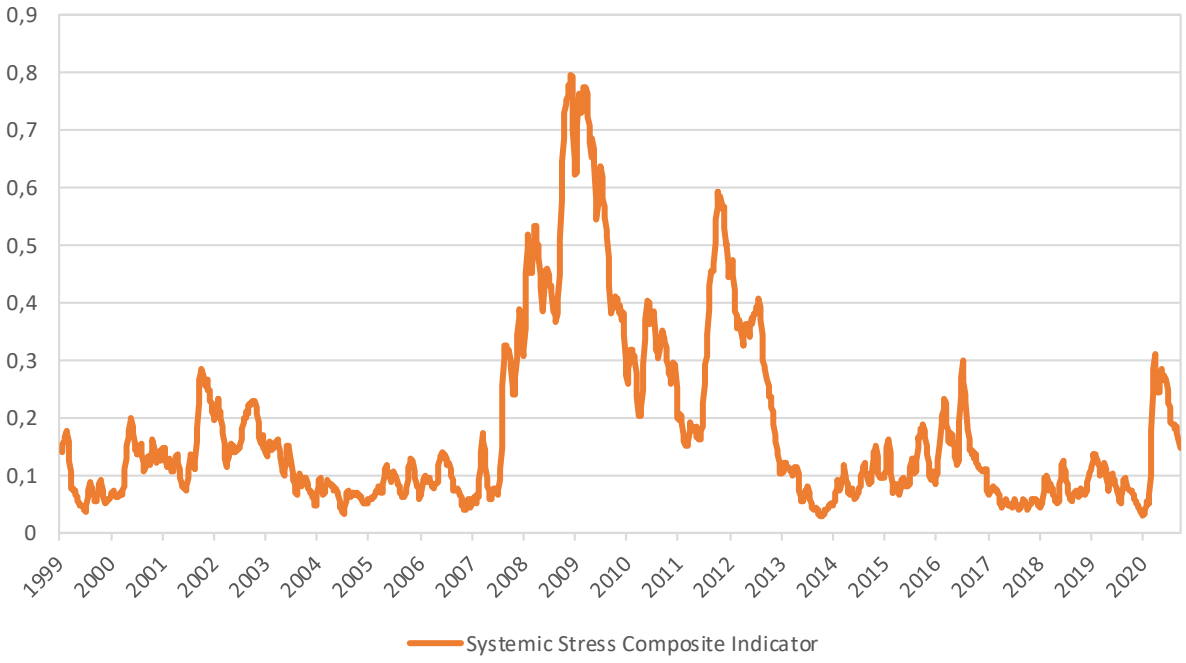
[2] A detailed analysis of the uncertainty dynamics is provided, among others, by Baker et al. (2016).

[3] The index is based on two newspapers per country (Le Monde and Le Figaro for France, Handelsblatt and Frankfurter Allgemeine Zeitung for Germany, Corriere Della Sera and La Stampa for Italy, El Mundo and El Pais for Spain, and The Times of London and Financial Times for the United Kingdom). The index is built as the average of the relative number of monthly uncertainty-related articles from each of these ten newspapers. See https://www.policyuncertainty.com/europe_monthly.html.

Other interesting indicators that illustrate the evolution of uncertainty in response to significant shocks and that strictly interact with monetary policies are based on volatility measures relating to financial markets data. These indicators are useful for policymakers because they better capture the conditions of financial stress, and thus they can offer early signals about the growing risk of systemic crises. The European Central Bank (ECB) utilises a composite indicator of systemic stress in the financial sector with reference to the euro area (Systemic Stress Composite Indicator: SSCI).[4]

The SSCI is plotted in Figure 3 for the 1999-2020 sample. Compared to the EEPU index (cf. Figure 2), the SSCI leads to a slightly different ranking across the increases in uncertainty caused by the crisis episodes. It reached its maximum peak during the 2007-2009 international financial crisis. Then, the peak immediately below the maximum occurred during the 2011-2013 European sovereign debt and banking sector crises. Interestingly, the pandemic crisis is ranked just as the third peak; and the value of the increased uncertainty is largely below the first two. At least at first sight, this evidence can be interpreted as the consequence of the specific components of the ECB index. These components relate to five segments of the financial markets, namely the money market, the bond market, the equity market, financial intermediaries and the foreign exchange rate market.

Figure 3: ECB's SSCI from 1999 to 2020



Source: ECB - Statistical Data Warehouse (https://sdw.ecb.europa.eu/home.do).

Figure 4 allows us to refine our interpretation regarding the relatively moderate impact of the pandemic shock on financial uncertainty. It plots the bond-market and the money-market components of the SSCI. The bond-market component mainly captures the actual volatility of the 3-month Euribor rate and the index of the monetary financial institutions' emergency lending to the Eurosystem central

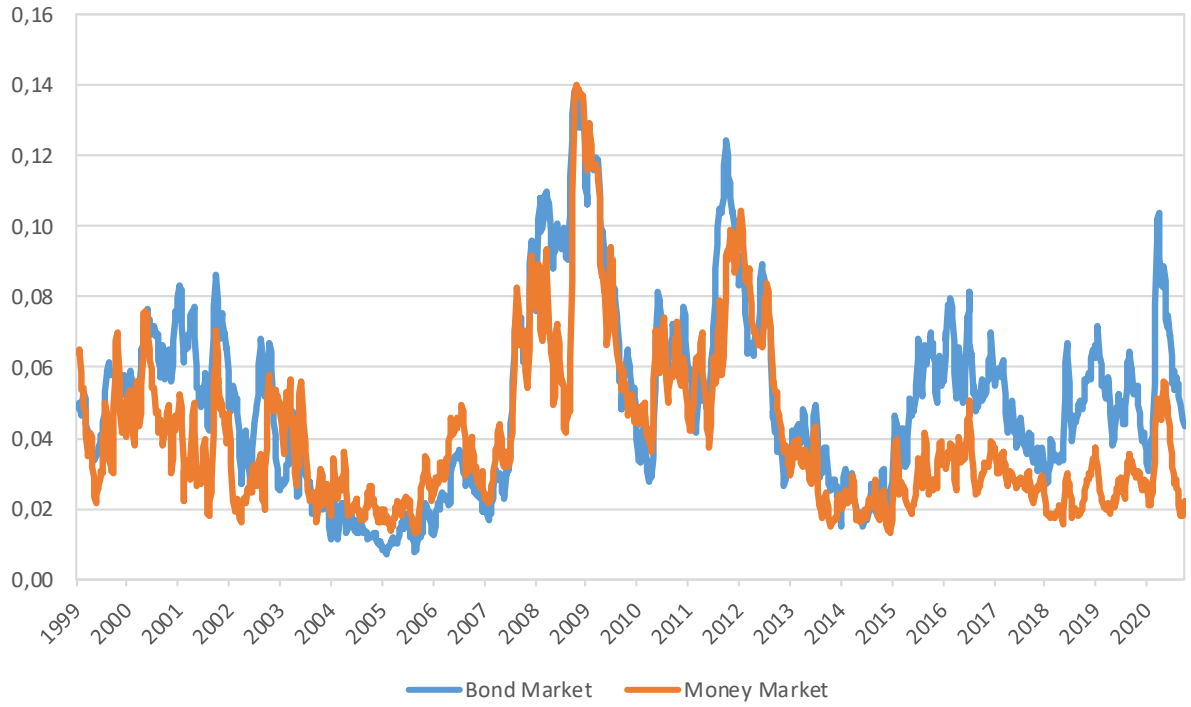
[4] See Hollo et al. (2012).

banks. Among other factors, the money-market component instead captures the actual volatility of the German 10-year benchmark and the various spreads in bond markets.

Apparently, Figure 4 shows a pattern which is very close to that of Figure 3: the aftermath of the 2007-2008 international financial crisis and, then, of the 2011-2013 European crises stand out with respect to the other shocks, the pandemic one included. However, the money-market component provides further significant evidence: indicators of volatility in the money market are relatively subdued after 2013, i.e., concurrently with the implementation of an expansionary unconventional monetary policy based on zero-interest rate policies and liquidity injections at different maturities.

Evidence from these components of SSCI shows that appropriate monetary policies can reduce uncertainty in some segments of the financial markets. This reduced uncertainty does not fully eliminate the peaks in volatility resulting from significant shocks; however, it accelerates the adjustment time. Figure 4 confirms this: the first wave of the pandemic shock resulted in a spike of the indicators, which were promptly absorbed. So far, the duration of the spike has been shorter than in the other two important critical episodes.

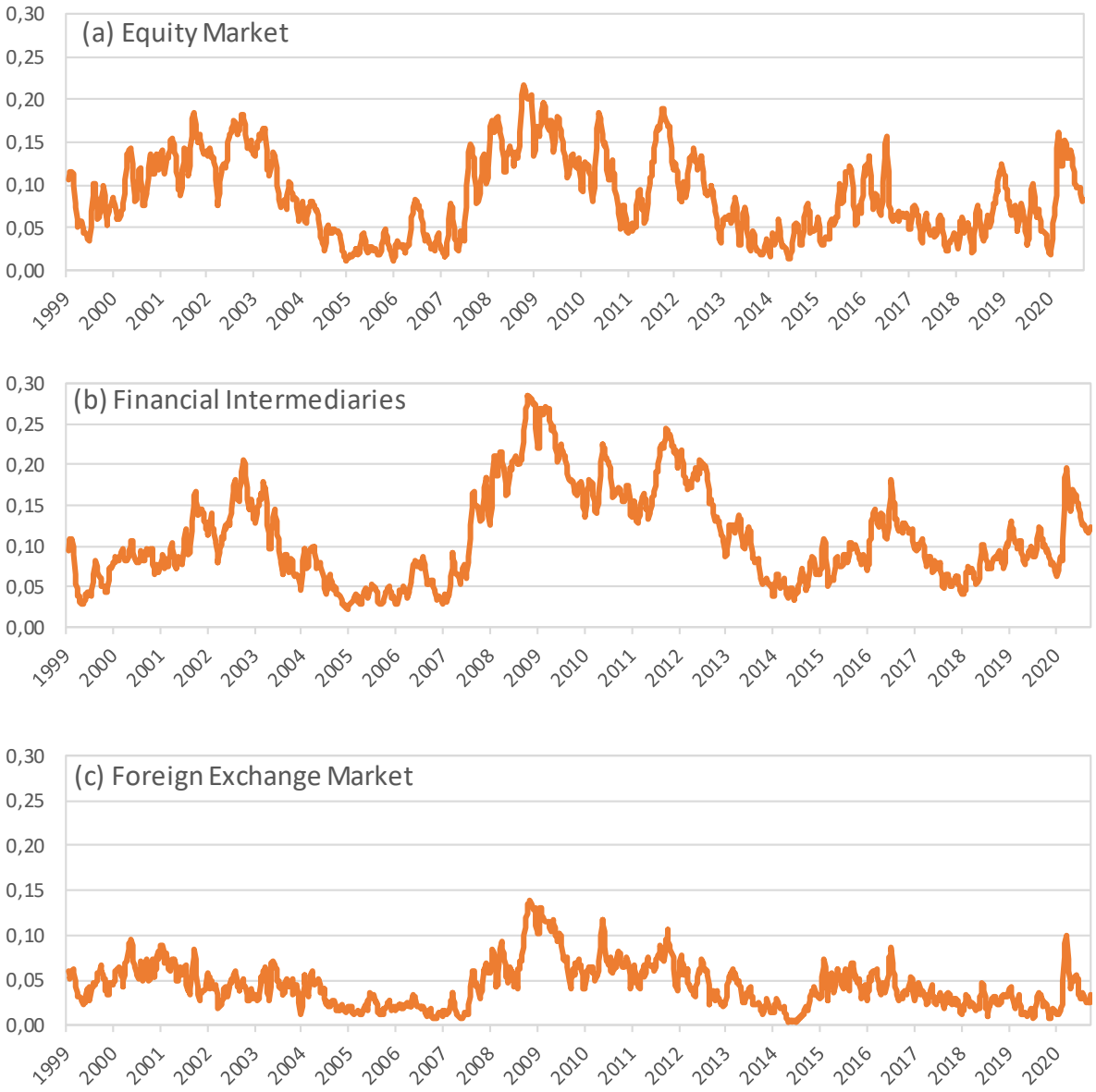
Figure 4: Bond-market and money-market components of the SSCI from 1999 to 2020.



Source: ECB - Statistical Data Warehouse (https://sdw.ecb.europa.eu/home.do).

The last observation is supported by the evidence offered in Figure 5, which still relates to the ECB's indicator under examination. Figures 5a and 5b show two additional SSCI components: the equity-market and financial intermediaries. The equity-market component captures, among other factors, the actual volatility of the stock market index for the non-financial sector; the financial intermediaries' component captures, instead, the volatility of the equity return of the banking sector together with the yield spreads between financial and non-financial corporations. Finally, Figure 5c refers to the actual volatility of the euro exchange rate with respect to other major currencies, and thus it mainly captures the international dimension of the stress measure.

Figure 5: Other components of the SSCI from 1999 to 2020



Source: ECB - Statistical Data Warehouse (https://sdw.ecb.europa.eu/home.do).

We can now place the previous analysis into a unitary interpretation. Let us recall that the descriptive evidence offered by Figure 1 with respect to the impact of the first wave of the pandemic shock on uncertainty is worldwide, whereas the different data of Figure 2 derive from the specific reference to the EU and those of Figures 3-7 are based on the ECB's composite financial indicator and refer to the pandemic's effect on financial volatility in the EMU. Our unitary interpretation of this variegated evidence is based on three elements.

(a) It would be a misinterpretation of our previous analysis to underestimate the peak of uncertainty caused by COVID-19: the WUI and GEPU index as well as the EEPU index show that this negative impact has been the strongest or one of the strongest in the last two decades.

(b) The partial discrepancy between the GEPU (largely, the strongest impact) and the EEPU (just one of the strongest) could be explained by the prompt and innovative reactions implemented by European policymakers and by those responsible for national fiscal policies.

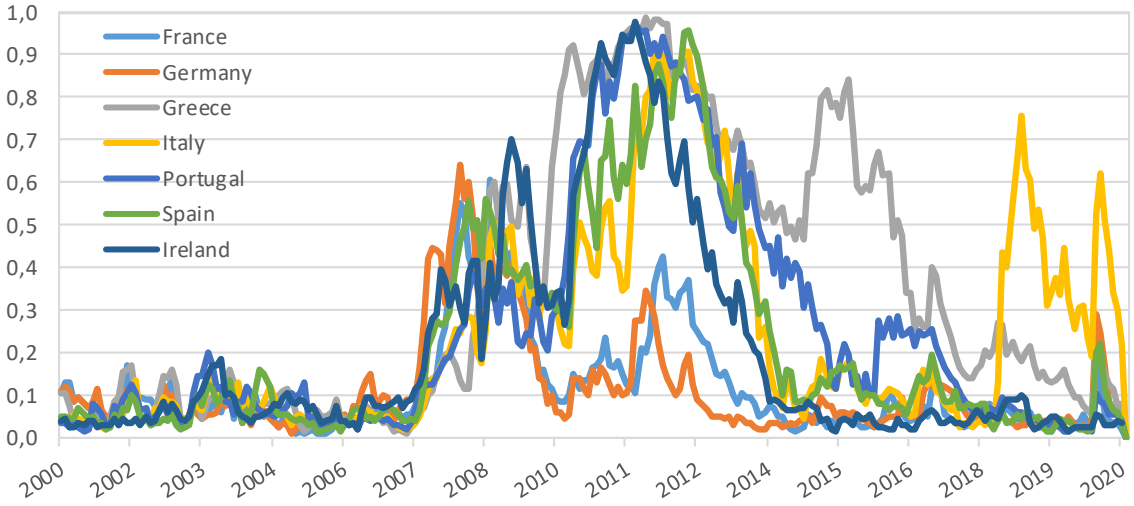
(c) At least with respect to the monetary policy, this tentative explanation is supported by the empirical evidence deriving from the ECB indicator and relating to the European financial markets.

Figure 6 allows us to extend point (c) to fiscal policy by examining an additional indicator of uncertainty that relates to possible sovereign stress in the EMU during the pandemic. This indicator is based on a wide set of stress symptoms that include measures of yield volatility and bid-ask spreads, apart from the yield spreads (cf. de Andoain et al., 2017). Figure 6 refers the indicator to single countries, and in particular it shows its peaking for Greece, Ireland, Italy, Spain and Portugal during the sovereign debt crisis. Note that Greece was under pressure for a longer period than other countries.

It follows that different EMU Member States had very different fiscal capacities before the first pandemic shock. Despite the current accommodative monetary policy and the low (even negative) interest rates, many of these EMU Member States will have to manage an enormous public debt in the post-pandemic phase due to their legacy and their public expenditures during the emergency. Hence, it is interesting to analyse the changes in the indicator in recent times. There were more substantial increases in Italy than in other countries. The first peak in 2018 reflects political uncertainty following the Italian elections. The second peak is instead related to the COVID-19 shock in spring 2020. The latter shows that Italy is now the weak link in Europe in terms of sovereign debt solvency; however, consistently with the other indexes, in recent months the relative indicator has returned to normal values. This evidence has two important implications for our analysis: it shows the effectiveness of ECB intervention in sovereign debt markets (cf. Section 4), but it also stresses that the interaction between European policies and uncertainty should take the public debt problem into account.

Given points (a) - (c) and the indicator of Figure 6, our provisional conclusion is that the prompt and innovative policy reactions implemented in the EU and the EMU weakened the peak of short-term uncertainty by shortening the adjustment time; however, in doing so, these reactions can worsen the long-term uncertainty in terms of public debt sustainability. If this provisional conclusion was correct, it would be crucial to analyse the different European policy initiatives undertaken in the last months in more detail in order to understand the relationships between these policies and the evolution of the uncertainty also in the light of the pandemic's second wave. We will pursue this objective in section 4. However, first it is worth strengthening our provisional conclusion by elaborating a VAR estimation of the impact that the higher uncertainty induced by the first wave of COVID-19 has had on European economic output and on its components (see Section 3).

Figure 6: Indicator of sovereign stress from 1999 to 2020



Source: ECB - Statistical Data Warehouse (https://sdw.ecb.europa.eu/home.do).

3. THE MACROECONOMIC IMPACT OF UNCERTAINTY INCREASES IN THE EU

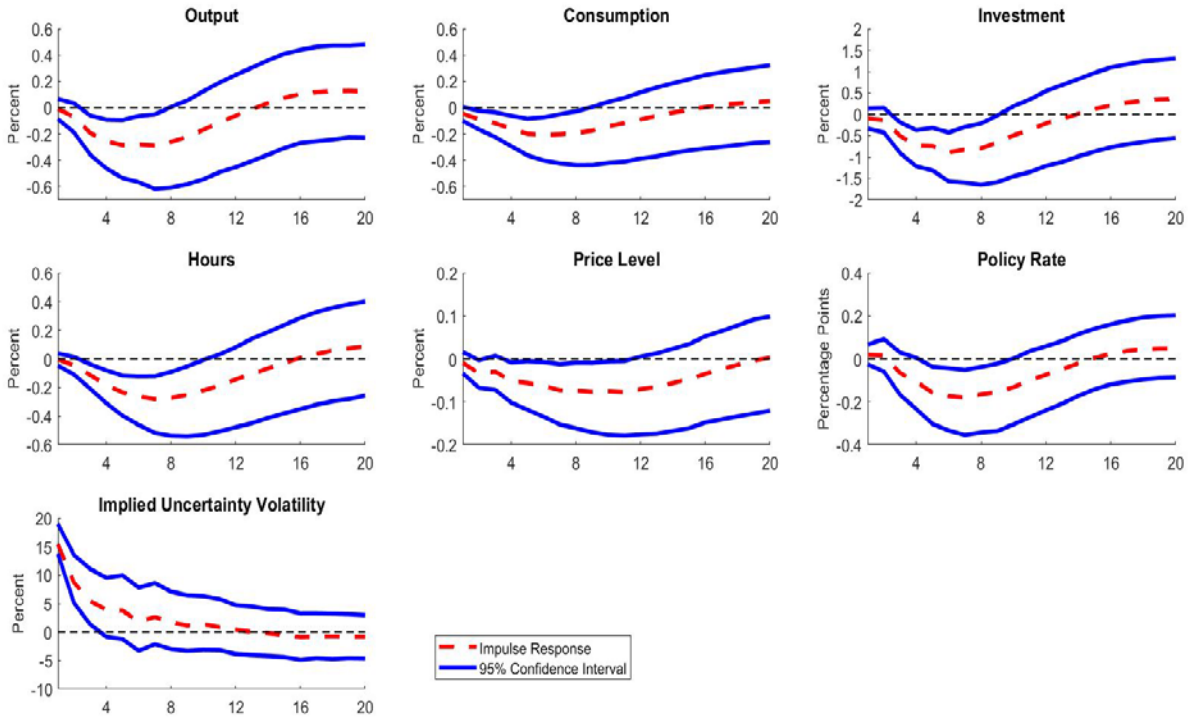
This section estimates the impact of higher uncertainty about the future on output and its components. Following Basu and Bundick (2017), we estimate a VAR by using a measure of uncertainty and other seven variables: gross domestic product (GDP), consumption, investment, hours worked, the GDP deflator, the M2 money stock, and the short-term interest rate. The M2 money stock is obtained from ECB statistics. Apart from the uncertainty measures, all the other variables are those used in Smets and Wouters (2003) updated to 2018.[5] The uncertainty shock is identified by assuming that uncertainty can have an immediate impact on output and its components[6].

We consider two measures of uncertainty: the EEPU (Figure 2 above) and the SSCI (Figure 3 above). Results related to the two uncertainty indexes are described in Figures 7 and 8, respectively, which plot the estimated responses to a one-standard deviation uncertainty shock. The shock increases the level of EEPU index and SSCI to about 15%. Both Figure 7 and 8 show that higher uncertainty causes significant declines in GDP, consumption, hours worked, and investment. All these variables decline together with a peak response occurring after about a year and half. The increase in uncertainty has a relatively greater impact on investments than on consumption. The former decrease by almost 2% at the peak, while the maximum reduction in consumption is less than 0.5%. This means that the decline in investments from the peak is roughly four times as large as the decline in consumption. Higher uncertainty is also associated with moderate deflation and lower policy rates, even if the two correlations are weakly significant only at the peak of the output fall. The impulse responses of GDP, consumption, hours worked, and investment are statistically indistinguishable from zero two years after the initial shock was observed.

[5] We use the automating update of the Smets and Wouters (2003) database available at the CEPREMAP Macroeconomic Observatory (see https://macro.cepremap.fr/).

[6] Formally, we use a Cholesky decomposition with the EEPU index ordered first.

Figure 7: Global uncertainty from 1999 (quarterly data) based on EEPU



Source: Authors' elaboration.

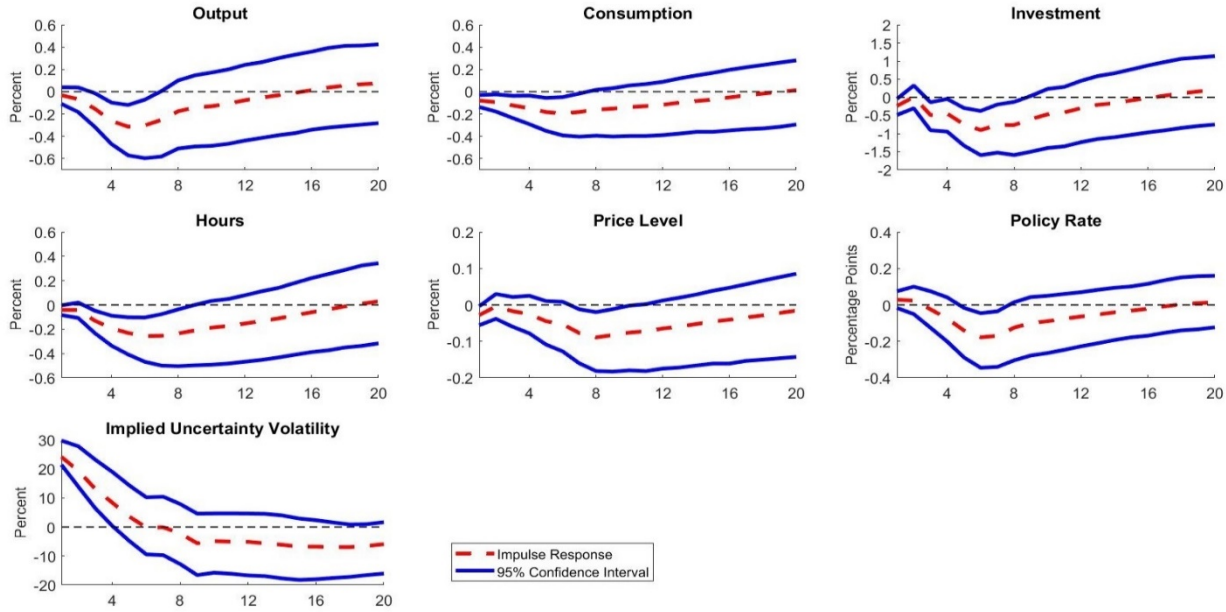
In sum, our VAR provides evidence that higher uncertainty causes declines in output, consumption, investment, and hours worked. In the case of the current COVID-19 crisis, the increase in uncertainty may generate additional adverse conditions impeding a rapid or a stable recovery from the recession. However, let us emphasise that we should be prudent in these statements. In fact, the economic rationale of the effects of uncertainty on the "real" economy is still open to debate.[7] It remains that several studies have attempted to identify the main channels through which uncertainty affects macroeconomic variables, explaining the evidence reported in Figure 2.[8]

Partial equilibrium analyses show that increases in uncertainty tend to make economic agents more cautious and, consequently, agents tend to postpone their consumption or investment and production decisions. In fact, uncertainty operates as a real options effect. In an economy populated by risk-averse consumers who face a stochastic income stream, higher uncertainty induces precautionary savings. Similarly, uncertainty increases the value of delay in firms' investments in the presence of convex adjustment costs or irreversible investments because reversing decisions is costly. The same can be true for hiring new workers when hiring or firing costs may occur. In general, when people are risk averse, an increase in uncertainty leads to higher risks for investors. The rise in risk premia leads to an increase in borrowing costs and negatively affects the investment level.

[7] The idea that uncertainty may cause recession goes back to Keynes (1936). However, there is not full consensus about the causality between uncertainty and growth (cf. for example: Pindyck 1991.) Some economists argue that recessions cause uncertainty, and not vice versa (see for example: Van Nieuwerburgh and Veldkamp, 2006; Fajgelbaum *et al.*, 2017.) We believe that it is important to analyse the complexity of this relationship.

[8] A detailed survey on the literature related to the economic impact of uncertainty is provided by Bloom (2014).

Figure 8: Global uncertainty from 1999 (quarterly data) based on SSCI

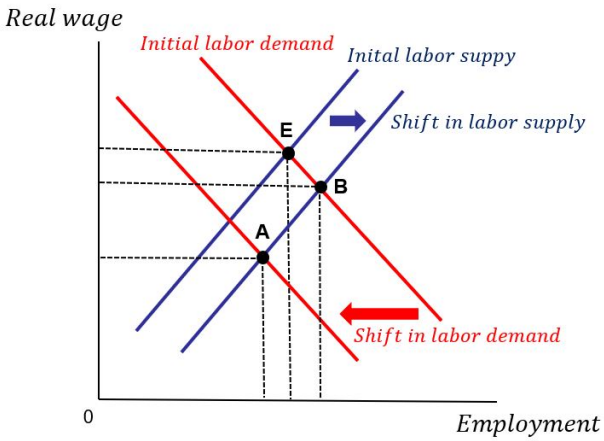


Source: Authors' elaboration.

It is worth noting that the translation of partial equilibrium results into a general equilibrium model is not trivial. In a flexible-price-general-equilibrium model, an increase in uncertainty leads agents to work more; and this induces a fall in real wages and an increase in the output instead of a reduction (as, in this case, the output is supply driven.) As Basu and Bundick (2017) note, the negative co-movement between uncertainty and output requires price stickiness to be observed. In such a case, in fact, mark-up increases lead to labour demand reductions that make it possible to observe an output reduction after an increase in uncertainty about the future and in labour supply. These two cases are illustrated in Figure 9.

The figure shows that an increase in precautionary savings involves a shift in the supply of labour to avoid a sharp drop in consumption. In the flexible pricing model, the increase in labour supply leads to a reduction in real wages and, then, to an increase in the level of production. The economy moves from the initial equilibrium in point E to the new one in point A, which is clearly inconsistent with the empirical evidence provided here. However, assuming there are sticky prices, firms are constrained in the price adjustments, the mark-up drops and the labour demand drops as well. The equilibrium moves from point E to point B, where employment and output changes are consistent with our empirical evidence.

Figure 9: Precautionary savings and sticky prices



Source: Adapted from Basu and Bundick (2017).

4. POLICY IMPLICATIONS

The aforementioned theoretical analysis and empirical evidence show that the first pandemic shock did not imply peaks in uncertainty as strong as those produced by the previous and recent crises. This fact can be explained by the effectiveness of the policies implemented, as well as by the persistency characterising this new uncertainty, which is not absorbed through a contingent peak and the subsequent short-term adjustments but indicates structural long-term changes.

The plausibility of our interpretation is strengthened by the divergent expectations with respect to the "shape" of the recovery. Leaving aside the Chinese economy, which is growing even in 2020, and focusing on the EU, the current economic debate is in fact swinging between two extremes: a "V" European recovery and a "U" medium-term European stagnation. The huge differences in the learned forecasts are a signal of the uncertainty persisting; and the EU economy risks falling into a kind of "square root" evolution: a quick but very short-term recovery (the 2020 third quarter recovery), which is largely unable to fully compensate for the previous depression, followed by a persistent long-term stagnation or weak growth.

If it was true that the post-pandemic European economy will be characterised by a structural long-term uncertainty whose perception and impact are temporarily weakened by effective policy initiatives, there would be various practical implications. Here, we will just focus on two of them, relating – respectively – to (i) the feasible evolution of centralised and national policies; (ii) the possible public interventions in the financial markets.

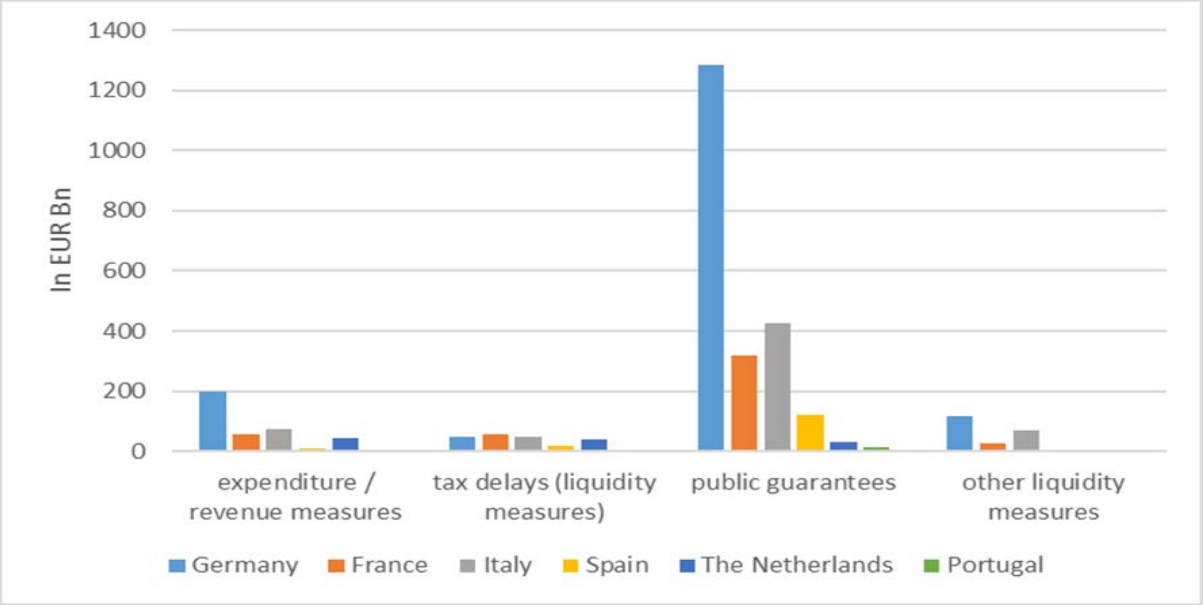
Regarding the first issue, the European Commission (EC) and the other EU centralised executive powers would have to reproduce the current policies that are characterised by a deep expansionary stance. The convergence between monetary policy and fiscal policies represents an innovation, at least in the EMU. In March 2016, the ECB decided to strengthen its asset purchase programme (APP) by increasing to EUR 80 billion its monthly purchases of public and private assets in the secondary financial markets, as well as its TLTRO III tool by re-financing a subset of European banks at negative interest rates; however, in the face of this strong liquidity expansion, the stance of the national fiscal policies remained – in the EU average – neutral or at most weakly expansionary.[9] On the contrary, today and – at least – in the next year, both these policies are strongly supporting and will strongly support the "real" economy.

Since spring 2020, the larger EU Member States have managed the economic repercussions of the first pandemic emergency by dramatically increasing their public expenditures and, therefore, their government debt/GDP ratio. Figure 10 provides some information about the fiscal measures implemented by six different EU Member States in the period between mid-March and early June 2020, corresponding – roughly speaking – to the peak of the first pandemic shock.[10] National fiscal measures were very significant in terms of GDP in all the countries examined, but mainly in Germany and Italy. These measures were allowed by the *de facto* suspension of the Stability and Growth Pact (SGP) and by the temporary tolerance of enlarged forms of state aid, as regulated by the different versions of the EU *Temporary Framework*.

[9] See EC (2016a and 2016b).

[10] The fiscal measures in the Member States consist of stimulus measures (mainly short-term work allowances and transfers) with a direct impact on the budget and liquidity measures without direct budgetary impact (mostly in form of public guarantees and tax delays.)

Figure 10: Public expenditures and liquidity measures in EU countries



Source: Buti and Messori 2020 (original source: EC).

Centralised expansionary fiscal and monetary initiatives are accompanying these domestic policies. Last spring, the EC offered EUR 540 billion to the EMU's countries by launching three new programmes (Support to mitigate Unemployment Risks in an Emergency [SURE], the European Stability Mechanism [ESM]'s precautionary line for health, and the European Investment Bank [EIB]'s recapitalisation to guarantee or finance investments); and, in cooperation with the European Council and the European Parliament, starting from 2021, it will implement the Next Generation – EU (NG-EU) and the new EU Multiannual Financial Framework for 2021-2027 (MFF) which will potentially allocate more than EUR 1.8 trillion to EU countries in seven years. In addition, by means of various programmes (improved APP, PEPP, improved TLTRO III, and PELTRO) in the March 2020 – mid-2021 period, the ECB will purchase financial assets for around EUR 1.8 trillion in the secondary financial markets, and in the period from mid-2020 to the beginning of 2022 it will refinance EMU banks for up to EUR 3 trillion.[11]

Given the current second wave of the pandemic shock in the EU, the expansionary convergence between the ECB's monetary policies and the centralised fiscal actions should be reproduced and – maybe – strengthened even in 2022. In particular, the ECB would have to extend a strengthened PEPP and an improved APP throughout 2022.[12] Moreover, it will become unavoidable to extend the *de facto* suspension of the SGP and the validity of the EU *Temporary Framework*.

However, despite the new national emergencies and the consequent additional need for public economic and social support, the reduction of the uncertainty would also require some changes in national fiscal policies. In the light of the evidence shown in Figure 10, we can maintain that the most fragile EU countries are fully exploiting their fiscal capacity and are even going beyond that; and that a number of EU "core" countries are approaching the critical threshold of 100% in their government debt/GDP ratio. Hence, an unqualified further increase in national public spending could trigger a new source of uncertainty in the EU: the actual sustainability of sovereign debt, particularly in the EMU

[11] See Benigno et al. (2020).

[12] We are confident that the ECB's Governing Council will take these decisions before the end of 2020 despite the prudent line set out in the last meeting (29 October). In any case, the re-investment until the end of 2022 of the "principal payments" from the bonds that were purchased under the PEPP, and that are at maturity, will eliminate the main risk of monetary tightening during the pandemic phase.

countries with a pre-pandemic high public debt and a low potential of growth. In order to prevent this new source of uncertainty from materialising, national fiscal policies could continue to have an expansionary stance but should be more selective and strongly connected with long-term, growth-stimulating programmes.

It then becomes crucial that – especially - the most fragile EMU Member States carefully calibrate the continuation of the short-term national expansionary policy initiatives, required for managing the economic and social impacts of the second wave of the COVID-19 pandemic. The initiatives of these Member States have to become more selective in the sense that each of them should positively interact, on a complementary basis, with the new initiatives implemented in the EMU (SURE, ESM, EIB), and with the strategic projects and components included in the respective National Recovery and Resilience Plan (NRRP) and in the related National Reform Programme.[13] The content of each NRRP must be assessed by the EC and approved by the European Council to allow for the actual utilisation of the national resources coming from the Recovery and Resilience Facility (RRF) – that is, the most important fund of the NG-EU (in the aggregate, around 90% of the total amount). Moreover, each NRRP is severely constrained by the detailed guidelines recently published by the European Commission (2020). Conversely, EMU initiatives impose some conditionality on the national access to their resources.

We may conclude that the future national short-term initiatives must become compliant with the strategic processes that each country agreed with the European institutions. This implies that:

(i) national fiscal policies should offer short-term financial support to the firms and households which are in temporary trouble due to the second wave of the COVID-19 pandemic, but

(ii) they should also be able to positively interact with the long-term policies aimed at triggering a sustainable economic and social development.

This conclusion shows that positive interactions between the short-term national fiscal policies and the national plans for the utilisation of the huge amount of resources made available by the various European programmes are a necessary condition to put the persistent uncertainty in the EU and the EMU under control. However, at least in our view, they are not a sufficient condition to structurally overcome the surplus of uncertainty due to the pandemic shocks. In this last respect, another crucial condition is represented by the re-composition of a significant part of the financial wealth allocated in the households' and institutional investors' portfolios of the most important EU Member States.

The above-mentioned observation introduces our second issue, i.e., the possible public incentives needed to strengthen the non-banking segments of the European financial markets. In order to clarify the point, it is worthwhile to recall some data relating to the main features of the EMU's financial markets at the peak of the recovery in the euro area after the international financial crisis (2007-2009) and the European crises (2010-2013).[14] We report liabilities of non-financial firms by different debt typologies (Table 1) and equities (Table 2) in the EMU and the US.

[13] According to the European Commission (2020), the NRRP and the National Reform Programme of each EU Member State are so strictly integrated as components of the European Semester that it is worthwhile to encourage Member States to prepare a single document. In the following, we assume that this opportunity will be implemented. Hence, by referring to the NRRP, we also include the National Reform Programme.

[14] We are referring to the EMU instead of the EU to overcome the empirical distortion due to the inclusion of the UK in official European statistics. It is well known that the UK, which has the most developed financial market in Europe, launched the process of withdrawing from the EU with the 2016 referendum and the consequent activation of art. 50 of the EU Treaty (March 2017). However, this process resulted in the UK formally leaving the EU only at the end of January 2020. Let us add that we identify the peak of the EMU recovery in the third quarter of 2018, since immediately after that the Italian economy entered a technical recession and the German economy risked doing the same. Hence, it seems appropriate to state that the EMU's economic growth weakened in the last months of 2018.

A descriptive comparison with the US shows that – at the end of 2018 – the EMU's non-financial firms depended on banking loans for their external financing four times more than the US' non-financial firms. Conversely, in the same year, the incidence of equities and market debts (mainly, corporate bonds) as sources of non-financial firms' external financing were more than four times larger in the US than in the EMU. Tables 1 and 2 also show that these huge differences observed in US and EMU financial markets are structural, i.e., the path of convergence between the two areas has been very slow in the last two decades.[15]

Table 1: Liabilities of non-financial firms: debt typologies

	US						Euro area		
	Debt securities			Loans			Debt securities	Loans	
	Corporate bonds	Commercial paper	Municipal securities and loans	Depository institution Loans	Other loans and advances	Total mortgages		MFIs Loans	Other credit Institutions Loans
2018-Q3	10.3%	1.2%	0.7%	4.0%	3.0%	1.5%	4.0%	11.8%	17.0%
2014-Q3	11.1%	0.5%	1.3%	2.1%	2.9%	1.0%	3.9%	14.1%	16.8%
2011-Q3	13.0%	0.5%	1.9%	2.1%	3.7%	2.2%	3.4%	18.1%	16.2%
2008-Q3	11.3%	0.6%	1.6%	3.0%	5.3%	3.5%	2.8%	19.1%	14.5%
2005-Q3	11.0%	0.5%	0.9%	2.4%	3.5%	2.8%	3.1%	15.6%	13.9%
2002-Q3	14.5%	0.7%	0.9%	3.9%	4.0%	2.3%	3.3%	17.7%	15.8%
1999-Q3	10.3%	1.2%	0.7%	4.0%	3.0%	1.5%	2.4%	16.0%	12.8%

Source: Messori (2019).

Table 2: Liabilities of non-financial firms: equities

	US					Euro area			
			Other liabilities			Equity			
	Corporate equity	Trade credits and advances	Taxes payable	FDI in US	Total miscellaneous liabilities	Listed shares	Unlisted shares and other equity	Trade credits and advances	Other liabilities
2018-Q3	60.1%	5.7%	0.4%	4.6%	8.5%	16.1%	38.5%	8.2%	4.5%
2014-Q3	58.6%	5.4%	0.1%	7.5%	9.5%	14.8%	36.8%	8.3%	5.3%
2011-Q3	49.4%	6.6%	0.2%	9.0%	11.5%	11.5%	35.3%	9.9%	5.6%
2008-Q3	50.2%	6.6%	0.2%	8.3%	9.5%	14.1%	34.3%	10.2%	5.1%
2005-Q3	55.2%	6.7%	0.4%	6.3%	10.2%	17.5%	35.1%	9.7%	5.1%
2002-Q3	45.7%	7.9%	0.6%	7.5%	12.0%	14.9%	31.7%	10.7%	5.9%
1999-Q3	60.1%	5.7%	0.4%	4.6%	8.5%	21.8%	31.4%	10.1%	5.5%

Source: Messori (2019).

[15] The only significant change derives from the reduction in the gap of banking loans from 1999 to 2018. However, note that this observed change was mainly due to the increase in the incidence of banking loans in the liabilities side of US non-financial firms.

It is important to note that the above-mentioned structural differences are not due to a lack of financial wealth held by the EMU's households with respect to the US' households. As shown in Table 3, in terms of its GDP, the aggregate of French households held a higher amount of financial assets with respect to the aggregate of US households at the peak of the EMU's recovery. The Italian figures were also very close to the top. Instead, the structural differences in the functioning of US and EMU financial markets were mainly due to the more binding constraints characterising the demand and the supply sides of the latter area. Even at the peak of the European recovery, 95% of the EMU's non-financial firms had less than 20 employees; and the large majority of the firms were under the proprietary control of a single family who also managed the business. As a result, the EMU's productive activities concentrated their external demand for financing on short-term and medium-term non-market debt instruments. On the other hand, households and institutional investors either had a high risk-aversion or had to comply with very prudential allocative rules. Consequently, in the EMU the supply of financing was primarily composed of highly liquid and low-risk financial assets (cash, guaranteed deposits, shares of mutual funds) (see also Table 4.) The resulting deep heterogeneity in the composition of the supply and demand for financing explained the dominant role played by banks in the EMU's financial markets.

Table 3: Household's financial wealth (Q3-2018)

	Financial assets (EUR, per capita)	Financial assets (% GDP)
France	91,940.9	208.1%
Germany	84,449.8	160.6%
Italy	78,278.3	191.4%
Spain	51,784.9	132.5%
Euro area	79,387.9	175.7%

Source: Messori (2019).

As theoretically shown a long time ago,[16] it is possible to justify the presence of banks in a general equilibrium model only if the non-financial firms, on the demand side, and the holders of financial wealth, on the supply side, are not able to meet directly on the market precisely because of the incompatibility between the time structure and the risk profile of their respective desired financial assets, or because of information imperfections. An intermediary is then necessary, one that is able to transform durations and to absorb risk gaps by taking over their management. Banks are traditionally specialised in this intermediation. Along these lines, we can state that uncertainty implies a failure in the price mechanisms so that the matching of supply and demand for financing is left for banks. If the objective is to strengthen market financing (through equities and/or corporate bonds), it will be necessary to reduce uncertainty in order to weaken the impact of investors' risk-aversion on the composition of their financial portfolios.

Table 4 highlights that this conclusion was strengthened by the recent macroeconomic difficulties and mainly by the pandemic shock. In the EMU, financial wealth holders reacted to uncertainty by increasing the relative weight of the most liquid components of their portfolios. The recent data emphasise that around 35% of the financial wealth held by the EMU's households is composed of cash and banking deposits. It follows that – *ceteris paribus* – the EMU's non-financial firms will still be

[16] Cf., e.g., Brainard and Tobin (1963), Tobin (1969), and, more recently, Diamond (1984).

relatively more dependent on the banking sector for their external financing in the post-pandemic phase of the recovery.

Table 4: Household's financial portfolio composition in the EMU

	Financial assets (EUR millions)	Deposits and currency (EUR millions)	Deposits and currency[(1)] (% of financial assets)
2020-Q2	26,070,328	9,010,367	34.56%
2020-Q1	25,140,326	8,764,897	34.86%
2019-Q4	25,926,324	8,663,686	33.42%
2019-Q3	25,760,360	8,539,512	33.15%
2019-Q2	25,330,848	8,485,517	33.50%
2019-Q1	24,807,330	8,337,919	33.61%
2018-Q4	24,117,350	8,240,650	34.17%
2018-Q3	24,394,336	8,106,996	33.23%
2018-Q2	24,374,930	8,081,528	33.16%
2018-Q1	24,130,788	7,948,712	32.94%
2017-Q4	24,144,180	7,916,059	32.79%
2017-Q3	23,865,308	7,805,373	32.71%
2017-Q2	23,687,888	7,783,515	32.86%
2017-Q1	23,483,086	7,691,926	32.76%
2016-Q4	23,167,808	7,657,826	33.05%
2016-Q3	22,920,750	7,529,086	32.85%
2016-Q2	22,623,038	7,501,569	33.16%
2016-Q1	22,457,878	7,394,087	32.92%

Source: Authors' elaboration on ECB data.

Note: (1) Deposits and currency as % financial assets.

This implication is not good news.[17] The EU's centralised fiscal policies based on the NG-EU and on its main programme (RRF) rely on the EC's new strategy, and thus focus on two fundamental issues: a) environmental sustainability and b) digital innovation.[18] Both these issues and their strict interactions require technical innovations and organisational changes which must be based on public investments and an expensive set of financial support and services for potential innovators. To have any chance of success, innovators must be able to adapt their enterprises to different but critical dimensional thresholds. Therefore, to implement the programme proposed by the von der Leyen Commission and to launch new and robust development in the post-pandemic phase, it is necessary that the financing

[17] Part of the following paragraph reproduces a passage from Messori (2019).

[18] See von der Leyen (2019).

of innovative trajectories is not quantitatively and/or qualitatively limited to self-financing and bank credit (Kremer and Popov, 2018).

This conclusion justifies our previous statement, i.e., that to overcome the surplus of uncertainty due to the pandemic shocks, it is necessary to achieve a re-composition of a significant part of the EMU's financial portfolios. Due to the uncertainty, households' risk aversion and institutional investors' constraints lead to financial portfolios that are too liquid. This hinders the market financing of innovations and organisational changes in the EU's productive system, and hence it weakens the potential of the post-pandemic economic and social development. What results is a vicious circle: to overcome the surplus of uncertainty, strong development would be necessary; to implement the latter, it would be necessary to re-compose the financial portfolios constrained by the surplus of uncertainty. To break out of the vicious circle, European and national policies should incentivise institutional investors to undertake riskier financial investments and should offer positive externalities for the expansion of the non-banking segments of the EMU's financial markets.

The European institutions have already approved the appropriate tool for pursuing these objectives: the Capital Markets Union (CMU). However, for now the CMU is just a bundle of norms waiting for the completion of the Banking Union;[19] it is instead the right time to transform these norms into an actual carrier of effective financial innovations.

[19] The CMU focuses on various areas of intervention such as: (a) broadening the spectrum of financing accessible to non-financial European firms, including small and small-to-medium-sized ones; (b) facilitating the access and use of non-bank segments of the market; (c) strengthening, to this end, the involvement of institutional and professional investors and – through them – of retail investors; (d) expanding banking functions and the financing of innovative activities. As emphasised by Lannoo and Thomadakis (2019), to implement these measures the EC set twenty targets and committed to translating them into thirty-three actions by 2019. Most of these legal-regulatory actions have actually been drawn up and some of them have been approved. However, the economic impact was quite modest.

5. CONCLUSIONS

The COVID-19 pandemic shocks are an important source of uncertainty which have impacted the European economies in several aspects. As discussed in section 2, this uncertainty is documented by various indicators. An interesting result drawn from these indicators is that the spike in volatility due to the first pandemic shock has been relatively contained with respect to those of the two recent crisis episodes – the 2007 international financial crisis and the 2011-2012 "doom-loop" between the European sovereign debt crisis and the crisis of the EMU banking sector. Recent financial market data show that this uncertainty has been reduced substantially. We believe this evidence demonstrates the importance of the European monetary and fiscal policies' prompt reaction.

Uncertainty shocks also have macroeconomic consequences which are distinct from the direct consequences of the lockdown and of the various restrictions associated with the pandemic. Our econometric analysis in section 3 based on euro area data shows that higher uncertainty causes declines in output, consumption, investment, and hours worked. In the case of the current COVID-19 crisis, the increase in uncertainty may generate additional adverse conditions impeding a rapid recovery from the recession.

The positive interactions between the short-term national fiscal policies and the national plans for the utilisation of the huge amount of resources are a necessary condition to put the persistent uncertainty in the EU and EMU under control and to reduce its economic consequences. However, we argued in section 4 that these interactions are not a sufficient condition for structurally overcoming the surplus of uncertainty due to the pandemic shocks. Furthermore, we stressed that European policymakers should become *forward looking*; despite the current accommodative monetary policy and the low (even negative) interest rates, policymakers should consider "today" the European public finance issue, since some of the EU and EMU Member States will have to manage an enormous public debt in the post-pandemic phase. European policies should take this problem into account, expecting more uncertainty ahead.

Finally, we argue that another crucial condition is represented by the re-composition of a significant part of the financial wealth allocated in the households' and institutional investors' portfolios of the most important EU Member States. Due to the uncertainty, households' risk aversion and institutional investors' constraints lead to financial portfolios that are too liquid. This hinders the financing of innovations and organisational changes in the EU's productive system, and hence it weakens the potential of the post-pandemic economic and social development. European and national policies should thus incentivise institutional investors to undertake riskier financial investments and should offer positive externalities for the expansion of non-banking segments of the EMU's financial markets.

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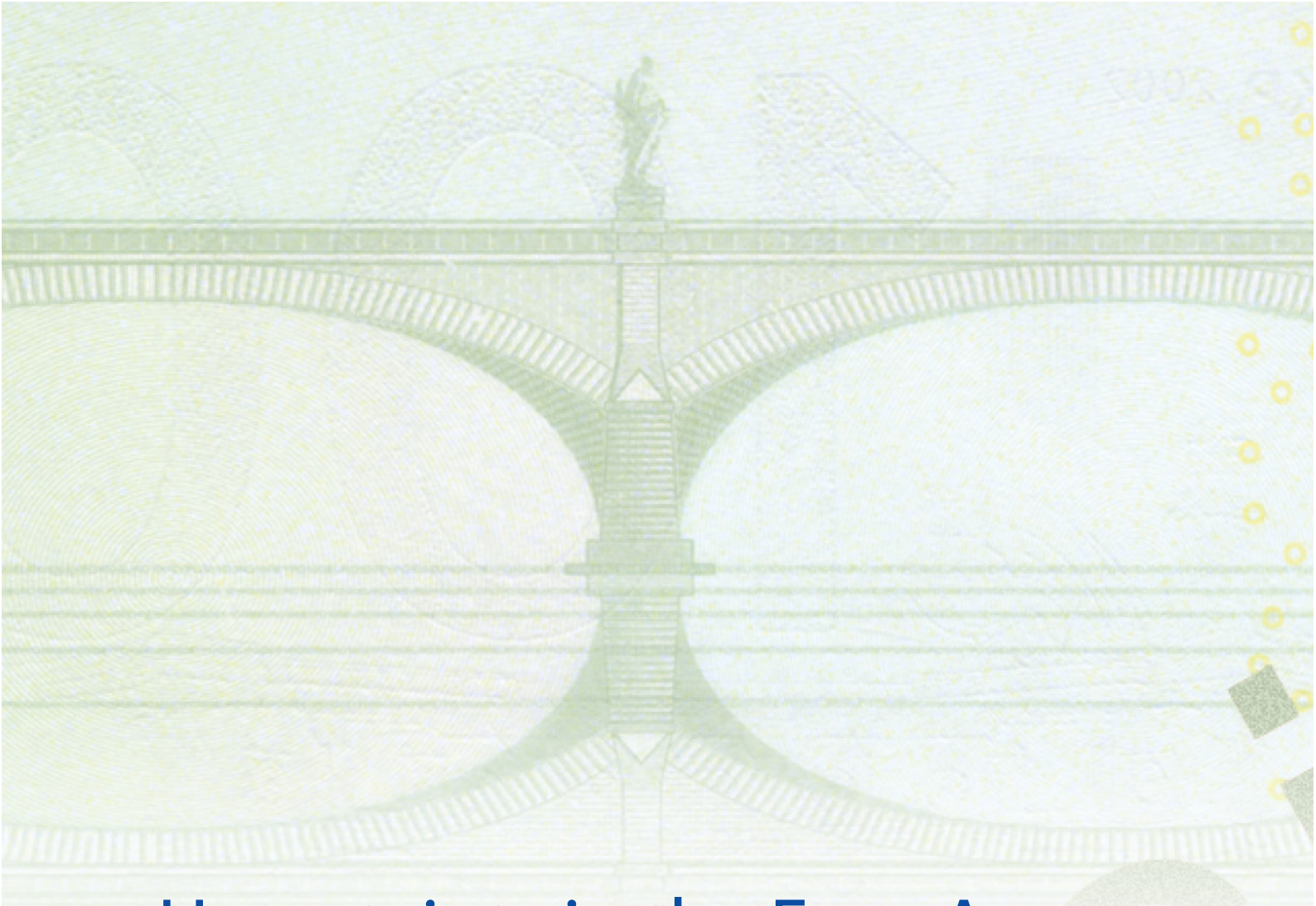

Uncertainty in the Euro Area during the First Wave of the COVID-19 Pandemic

Atanas PEKANOV, Stefan SCHIMAN

Abstract

Uncertainty - a state in which assessing future conditions by economic agents is hampered - rose sharply during the current pandemic. A bout of uncertainty can have similar effects like an adverse demand shock, dampening private consumption, investment and, hence, inflation. According to our own estimations, however, the pandemic-induced spike of uncertainty has caused little macroeconomic damage so far. The introduction of PEPP was a quick and decisive action that stopped uncertainty from rising further and probably contained its adverse economic effects.

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CONTENTS

LIST OF ABBREVIATIONS

DELVE	Data Evaluation and Learning for Viral Epidemics
DSGE	Dynamic Stochastic General Equilibrium
ECB	European Central Bank
ELB	Effective lower bound
EONIA	Euro Overnight Index Average
EP	European Parliament
EPU	Economic Policy Uncertainty Index
EU	European Union
GDP	Gross domestic product
HICP	Harmonised Index of Consumer Prices
HICPX	Harmonised Index of Consumer Prices excluding energy, food, alcohol and tobacco
NIRP	Negative interest rate policy
PEPP	Pandemic emergency purchase programme
QE	Quantitativ Easing
SPF	Survey of Professional Forecasters, ECB
TEU	Twitter-based Economic Uncertainty Index
TLTRO	Targeted long-term repo operations
VIX	(Chicago Board Options Exchange) Volatility Index
VSTOXX	Euro Stoxx 50 Volatility Index
ZLB	Zero lower bound

EXECUTIVE SUMMARY

- **Uncertainty – a state in which assessing future conditions by economic agents is hampered – rose sharply during the current pandemic.** This is true for all three kinds of uncertainty measures considered: traditional financial-market-based measures of economic uncertainty drawing on the volatility of stock prices; measures based on business expectations of the future economic situation; and measures based on the prevalence of words in newspapers and other media that refer to uncertainty.
- **A bout of uncertainty can have similar effects like an adverse demand shock, dampening private consumption, investment and, hence, inflation.** Uncertainty about future incomes, e.g. due to a heightened risk of becoming unemployed, may increase precautionary savings and therefore dampen consumption. Uncertainty about future revenues of firms may lead them to postpone costly and potentially irreversible investments and the hiring of new workers. Furthermore, banks may increase risk premia and, hence, credit costs, aggravating the negative effects on consumption and investment. The reduction in aggregate spending due to uncertainty dampens inflation.
- **According to our own estimations, however, the pandemic-induced spike of uncertainty has caused little macroeconomic damage so far.** After an initial surge, uncertainty levelled off more quickly than during the Global Financial Crisis 2008/09 – not least due to the decisive action of the ECB, in particular the (announcement of) PEPP and other interventions. The current rise in unemployment and the fall of inflation are predominantly due to the slow-down and shut-down of social and economic activities to contain the pandemic, not due to uncertainty shocks per se.
- **The introduction of PEPP was a quick and decisive action that stopped uncertainty from rising further and probably contained its adverse economic effects.** Another important monetary policy instrument to mitigate uncertainty is forward guidance. Forward guidance can be used to manage the expectations about the future decisions of the central bank, therefore reducing uncertainty and limiting the increase in risk premia. Another monetary policy option to counteract a shortfall of aggregate demand (uncertainty-induced or otherwise) is to further cut interest rates. However, with policy rates already below zero, further rate cuts bear the risk of adverse effects hindering the transmission of monetary policy. Instead (or additionally), the ECB might embark on a make-up strategy as part of its monetary policy strategy review – as recently adopted by the US Federal Reserve – tolerating higher inflation in the future to compensate for previous inflation shortfalls. Other options include further tiering and the expansion and extension of current TLTRO programs (by further cutting the rate on TLTROs).
- **In the current pandemic, credibly stabilising expectations involves an integrated approach that encompasses both epidemiological and economic aspects.** While monetary policy and fiscal policy can help, there is a direct and central role for health policy in stabilising expectations by communicating a coherent and credible strategy to tackle the pandemic. This is still challenging, given the changing circumstances and the many unknown aspects and nature of the COVID-19 virus, its spread and the effective measures against it.

1. INTRODUCTION

Uncertainty, broadly defined, characterises a situation in which economic agents have difficulties assessing with sufficient confidence current and future outcomes. In contrast to quantifiable risk, uncertainty (often denoted 'Knightian uncertainty', see Knight, 1921) is the situation in which even forming views of the probability distribution of certain events is difficult. The changing evaluation of the probability of specific outcomes in the future since the outbreak of the COVID-19 pandemic reflects this concept.

The coronavirus (COVID-19) pandemic has led to the most abrupt economic downturn in much of the advanced and emerging economies and it has unleashed a bout of uncertainty. This uncertainty materialises in a number of ways and affects the decision-making of individuals. First of all, the health aspects of this crisis are still not well understood – how and when can the coronavirus be contained, whether and when suitable medicine and vaccine will be available to fully overcome the risk, whether the virus will become less lethal and therefore reduce the risks it presents to the public. Secondly, it is not yet fully clear how uncertainty contributes to investment and consumption decisions and therefore affects the economy in the short run and which policies are best suited to credibly restore confidence of economic agents. Third, it is uncertain what long-term changes might be induced by the pandemic, e.g. concerning the relocation of production, changes to consumptions patterns, changes in work arrangements, digitalisation of numerous activities, etc.

Uncertainty affects the economy in several ways. First and foremost, there is a classical precautionary savings channel. Faced with an increase in uncertainty about the future, households increase their savings and, hence, decrease consumption. If prices are not flexible, this reduces aggregate demand. Secondly, firms postpone investment decisions, which are not easily reversible, until the economic perspective is clearer. Banks may increase risk premia, which makes credit financing costlier and aggravates the negative effects on investment decisions. Finally, firms may also decide to postpone hiring employers. Increased uncertainty decreases the value of matches between employers and employee, increases the option value of waiting (on behalf of firms) and, hence, firms respond by postponing – or eventually reducing – their hiring.

Based on our own calculations and in line with existing evidence, we find that uncertainty shocks tend to be disinflationary. An unexpected increase in uncertainty – like during the current pandemic – works like an adverse demand shock, raising unemployment and dampening inflation. On the other hand, we also find that uncertainty shocks are not the primary source of the current disinflation, but that it is rather due to genuine demand shocks arising from the scaling down of social and economic activities to contain the pandemic.

Uncertainty can also affect the effectiveness of different policies. It potentially weakens the transmission channels, thus hampering the recovery. On the other hand, credible economic policies can reduce uncertainty and thereby restore their effectiveness. The transmission mechanism of monetary policy can therefore be impeded by heightened uncertainty. Inflation uncertainty can also impede the transmission mechanism by distorting the communication effects of monetary policy announcements.

2. MEASURES OF ECONOMIC UNCERTAINTY

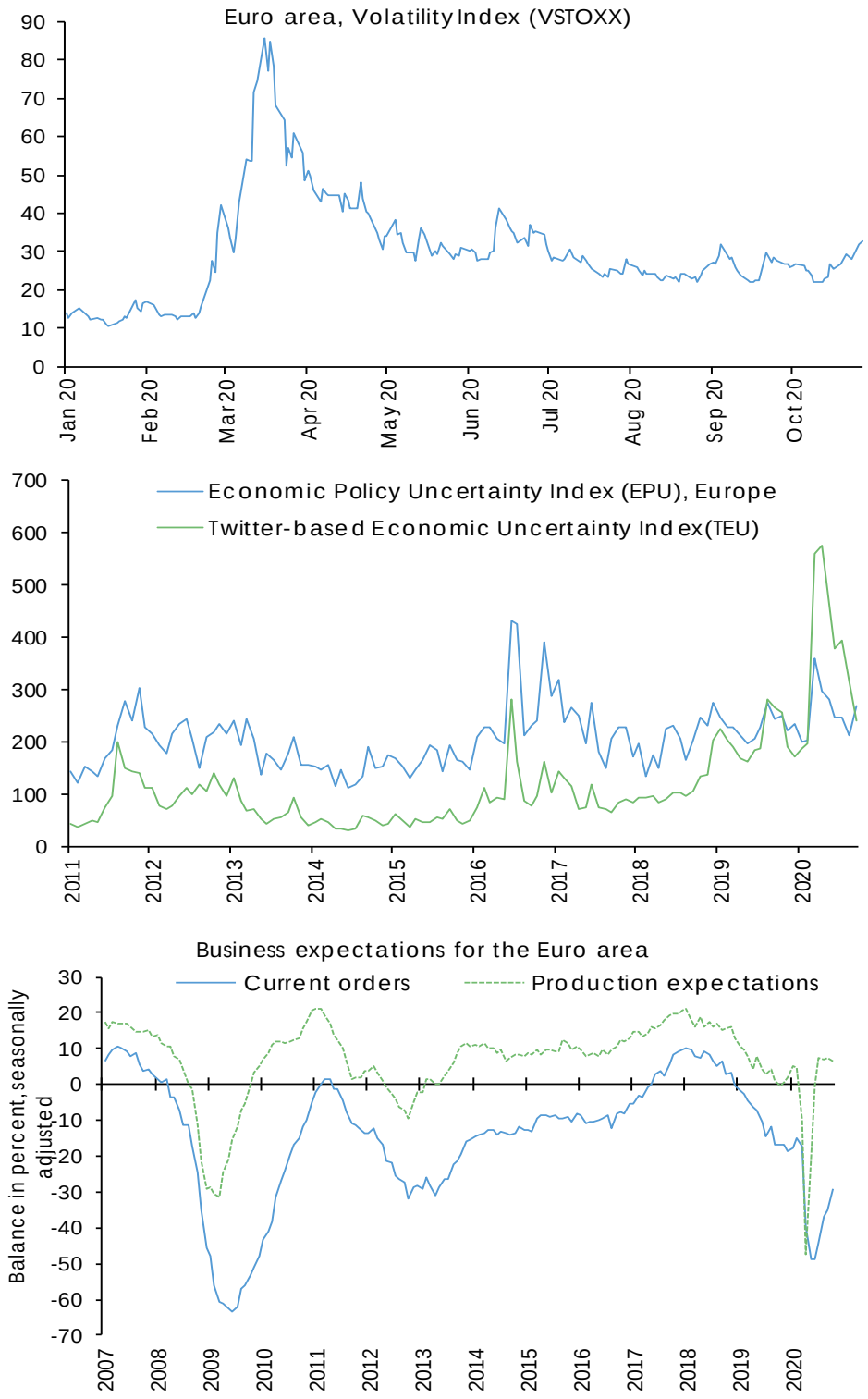
The economic literature uses various indicators as proxies for describing economic uncertainty. We use (i) indicators based on the occurrence of specific words such as "uncertainty" in media, newspapers or social media, (ii) surveys, asking respondents about their expectations on macroeconomic variables, asking firms about expected revenues or households about expected income and unemployment, and (iii) financial market indicators including, e.g., the volatility index VIX for the United States (US) and VSTOXX for the euro area. Further indicators include the dispersion of shocks from structural models (as described in Fernandez-Villaverde et al., 2015) or information obtained from big data.[1]

Each of these indicators has a specific focus and therefore neither of them is the perfect indicator for overall macroeconomic uncertainty, but they are useful proxies. Financial market-based indicators have already been used for a while in the economic literature and are robustly related to gross domestic product (GDP) downturns (Leduc and Liu, 2016). Surveys of professional forecasters, firms, households and banks can also be useful to document current levels of uncertainty (Bloom, 2009). This is done by measuring the disagreement among survey participants, reporting the variance of their expected outcomes for the future regarding, e.g., GDP, inflation and other variables. A higher variance means more disagreement and diversity regarding the future economic outlook and therefore more uncertainty. Whether this measure of uncertainty is leading economic downturns and can therefore be useful to forecast them, or lagging and, hence, only documents them, is however less clear. Newspaper and social media related indicators have been introduced more recently, but have gained considerable importance in recent years, as they enable researchers to document uncertainty in almost real-time on a daily basis (Baker et al., 2016; Altig et al., 2020).

Forward-looking uncertainty measures can shed light on changes in the perceptions of economic agents. The change of perception can have significant effects on the short-run costs of an uncertainty shock, frontloading economic losses. Three types of indicators can be used to measure this: forecaster disagreements indicators, newspaper-based indicators and firm surveys on subjective uncertainty. Newspaper indicators, based on words and titles of articles, can furthermore be decomposed in separate topics, e.g., regarding fiscal policy or healthcare, and can be useful for anticipating changes in demand sentiments by households and firms. Business expectation surveys on the other hand present the perceptions of firms in real-time and can therefore be useful to inform about how current economic developments will affect the supply side in the future.

[1] For an overview of how information from big data can be obtained by machine-learning methods see Fouliard, et al. (2019), https://conference.nber.org/conf_papers/f130922.pdf.

Figure 1: Selected measures of uncertainty



Sources: Business cycle survey of European Commission, http://www.policyuncertainty.com/index.html, https://www.stoxx.com, Macrobond.

Note: Economic Policy Uncertainty Index (EPU) is a daily index which reflects the frequency of newspaper articles with one or more terms about "economics," "policy" and "uncertainty" in newspapers. Twitter-based Economic Uncertainty Index (TEU) uses English-language tweets with keywords related to Uncertainty as well as keywords related to the Economy or related to Equity Markets.

The increase in uncertainty in the euro area after the outbreak of the COVID-19 pandemic has been unprecedented and very steep. Figure 1 presents a number of selected measures of uncertainty. These indicators spiked at the end of February, when the COVID-19 virus began to spread beyond the Chinese borders, hitting especially hard some EU Member States. Most measures surged even further amidst the imposition of lockdowns in March. Financial markets-based indicators – such as the euro area volatility index VSTOXX – increased rapidly in the first weeks of March. The VSTOXX reached its peak on 16–18 March 2020, with values close to the spike of 16 October 2008, during the Global Financial Crisis.

The announcement of the European Central Bank (ECB)'s pandemic emergency purchase programme (PEPP) seems to have contained the rise in uncertainty. After it was announced in the evening of March 18, the VSTOXX decreased over the following two weeks. Then the index fluctuated around an average of 32, which is significantly higher than the pre-pandemic average since 2010 of around 20. The tendency since March has however been downwards until the summer, when the index stabilised. During October however, the Economic Policy Uncertainty Index for Europe started to increase again.

The indices, developed by Baker et al. (2016) and further expanded in Baker et al. (2020), focus on newspaper and social-media mentions of uncertainty and are presented in a longer perspective in Figure 1, but show a similar development. A Twitter based index of uncertainty has reached its historical peak in March and April 2020 and has receded in the following months, but by July 2020 was still at higher levels than at any previous period. Interestingly, the newspaper-based Economic Policy Uncertainty Index (EPU) for Europe has also reached very high levels, however these were even higher in June 2016 around the surprising outcomes of the Brexit referendum and in November 2016, around the US Presidential elections.

Business expectations for the euro area, have also plunged abruptly in historical context in March 2020 – faster than during the Great Recession[2]. However, they have not turned to levels as low as in 2009. We report only the first moment regarding business expectations for the euro area (average expectations of respondents), since the variance and other moments, which could be useful to analyse the change in uncertainty, are not publicly available.

[2] Barrero and Bloom (2020) look into the US Survey of Business Uncertainty and the UK Decision Maker Panel to report firm-level subjected outcomes in the aftermath of COVID-19 and find that the worst-case scenario reported for firms has increased from expected 0% sales growth before the pandemic, to a reduction of -15% after the start of the pandemic.

3. EFFECTS OF UNCERTAINTY ON ECONOMIC OUTCOMES IN THE EURO AREA

In this section, we discuss recent euro area developments, the possible (theoretical) effects of uncertainty for those and its actual effects estimated with an empirical model. The discussion of recent developments in subsection 3.1 includes estimates of the output gap as a central indicator of the business cycle, inflation, and growth and inflation expectations and their revisions. In subsection 3.2 we outline the channels through which uncertainty may have contributed to these developments and cite the relevant literature. In subsection 3.3 we present our own empirical estimates on the impact of uncertainty in the current crisis (we find that the effects on unemployment and inflation are negligible). Finally, in subsection 3.4 we present some further findings on inflation.

There is an extensive economic literature on uncertainty and how it affects economic activity, output and inflation. Uncertainty can refer to a very complex underlying phenomenon and can have very different dimensions. Uncertainty, broadly defined, can be the situation in which economic agents have difficulties assessing with sufficient confidence current and future outcomes. In contrast to risk, uncertainty (often denoted Knightian uncertainty, see Knight, 1921) is the situation in which even forming views of the probability distribution of certain events is difficult. The changing evaluation of the probability of specific outcomes in the future since the outbreak of the COVID-19 pandemic reflects this concept[3].

3.1. Recent developments in the euro area

Comprehensive statistics are already available on the evolution of standard macroeconomic variables in the first two quarters of 2020 – the two quarters where the shock was most pronounced. These point to an already materialising effect not only in terms of the expected very strong GDP decline, but also in terms of downward pressures on inflation. According to the latest results from the ECB Survey of Professional Forecasters for Q3 2020, inflation expectations for 2021 and 2020 have fallen, but also long-term inflation expectations have decreased amidst the current economic situation. Unemployment is still more subdued in the euro area context, but this is also driven by the short-term work subsidy schemes that have been in place in most countries and which have so far stabilised employment in comparison to a counterfactual without such measures. Additional surveys also provide information about the distributional consequences of the COVID-19 shocks throughout the population[4]. Decomposing the role of uncertainty and its relative contribution to these developments is however challenging and there is still few quantitative evidence regarding this question.

The COVID-19 pandemic has deeply affected economies worldwide and in the euro area. Currently available estimates of the euro area output gap for 2020 point to the severity of the economic losses. Figure 2 presents the output gap estimates for the euro area provided by the International Monetary Fund (IMF) World Economic Outlook, by the European Commission and by the Federal Reserve Bank of New York. The former two estimates report output gaps – i.e. economic activity below what the economy can potentially produce – of –5.0% and –7.3% respectively on an annual basis. The other estimate is quarterly and shows an output gap of –4.3% for Q1 and –16.1% for Q2 respectively.

[3] An additional and separate phenomenon is risk aversion. It does not reflect a change in risk or uncertainty, but a change in preferences on behalf of economic agents regarding how much they are willing to take. For a study analysing how changing risk aversion affects output in the euro area, see Benchimol (2014).

[4] For real time survey evidence from the UK, US and Germany showing the different immediate labour market impacts of COVID-19 see Adams-Prassl et al. (2020).

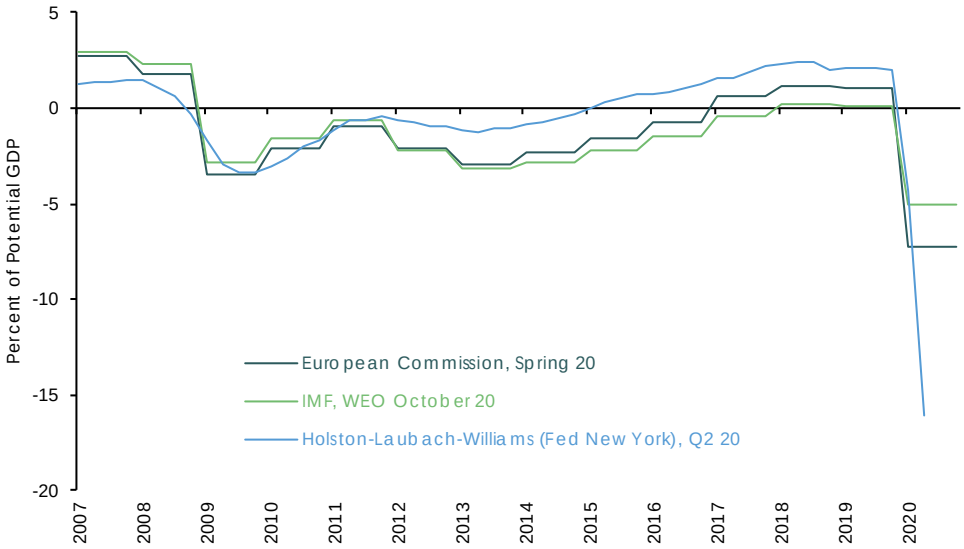
The significant and abrupt increase in uncertainty may have contributed to these losses. Preliminary estimates by the ECB suggest that heightened uncertainty in the euro area has contributed to around "one-fifth of the decline in activity in the first half of 2020, notably in the second quarter, with a particularly strong impact on fixed capital formation".[5]

A shortfall of aggregate demand exacerbates downward pressure on price. Furthermore, it can lead to stagnating wages, as due to the lower expected demand employees would have difficulties to negotiate wage increases. This can be seen in the euro area data regarding inflation and core inflation. It has dropped in the aftermath of both the Global Financial Crisis in 2008-2009 and during and after the euro area sovereign debt crisis. Similarly, headline harmonised index of consumer prices (HICP) inflation has dropped from 1.2% in February 2020 to 0.7% in March, 0.3% in June and turned negative in September (–0.3%). Part of these changes in headline inflation can be explained by energy prices, as core inflation (inflation excluding energy, food, alcohol and tobacco) did not move significantly in the months after the imposition of lockdown measures. Core inflation dropped sharply in August and September 2020, reaching the historically lowest level of 0.4% and 0.2% respectively, probably driven by significant value-added tax (VAT) reductions in Germany and summer sales measures in other euro area countries.

Inflation expectations in the euro area have generally been revised downwards in the quarters since the start of the pandemic. Current inflation expectations for the euro area for 2020 are at 0.4% according to the ECB's Survey of Professional Forecasters (SPF) and at 0.3% according to the ECB June staff macroeconomic projections, with expectations for 2021 and 2022 of 0.8% and 1.3% accordingly (See Table 1 for a comparison). Inflation expectations for 2021 and 2022 have been revised downwards from the Q2 release of the SPF to the Q3 release by 0.2 and 0.1 percentage points to 1.0% and 1.3%, respectively. Inflation expectations for HICP inflation excluding energy, food, alcohol and tobacco (HICPX) has also been revised downwards by 0.2 percentage points for both years. Throughout the past two releases of the SPF the cumulative downward revision amounted to 1.4 percentage points for overall HICP and 1.2 percentage points for HICPX, with respondents assessing the risks of further revisions to the downside. What is more, long-term (i.e. until 2025) inflation expectations in the most recent release of the survey have also been revised downwards from 1.7% to 1.6%. This is the lowest estimate of long-term inflation expectations ever recorded in the survey. The variance of SPF inflation forecasts also increased for 2020, 2021 and 2022. In both the Q2 and Q3 survey releases, there was a reduction in average inflation expectations, as discussed above, but inflation expectations also became less-centred around the mean (Figure 6).

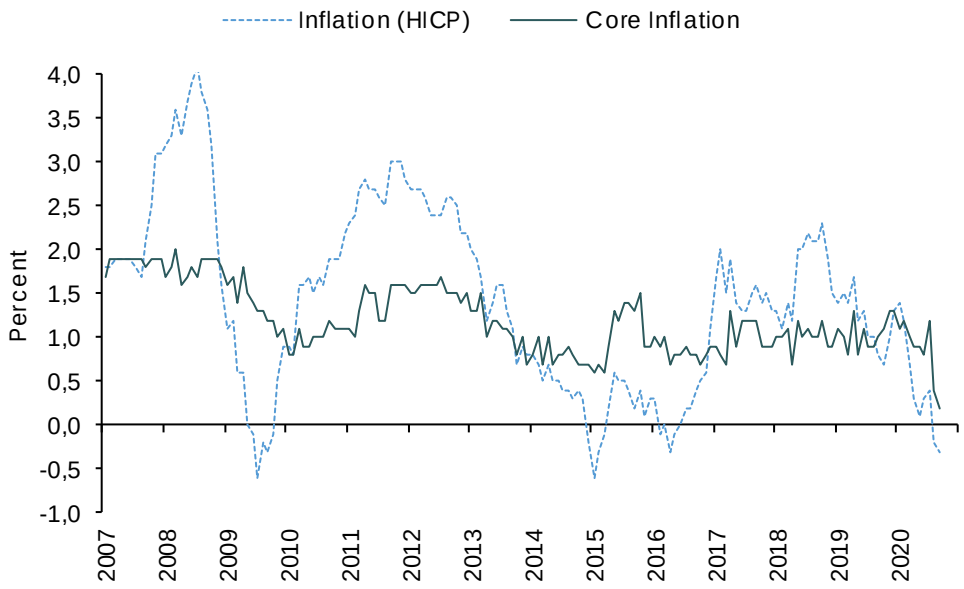
[5] The impact of the recent spike in uncertainty on economic activity in the euro area; https://www.ecb.europa.eu/pub/economic-bulletin/focus/2020/html/ecb.ebbox202006_04~e36366efeb.en.html.

Figure 2: Output gap estimates for the euro area



Sources: European Commission, Federal Reserve New York, IMF, Macrobond.

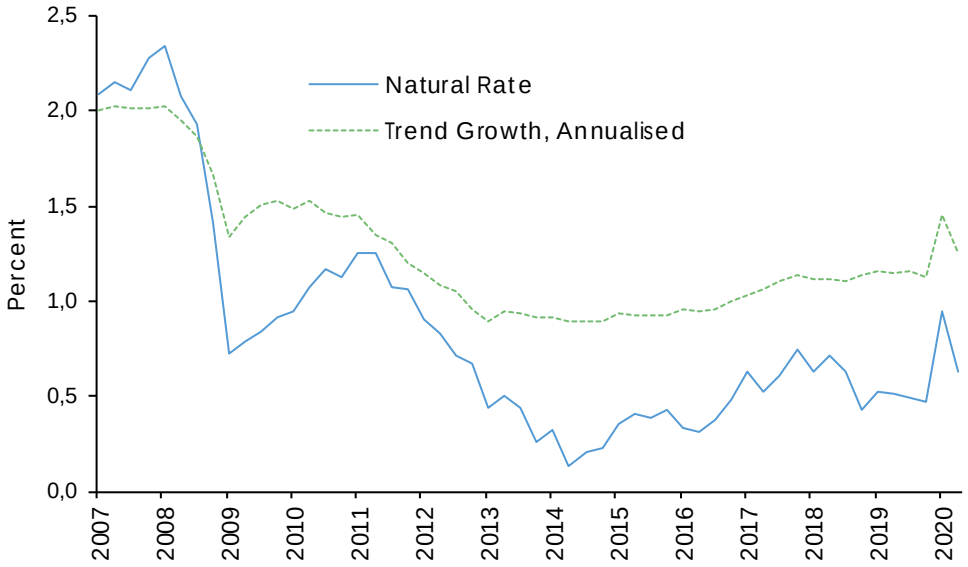
Figure 3: Inflation and core inflation in the euro area



Source: Eurostat.

Note: Core Inflation excludes energy, food, alcohol and tobacco.

Figure 4: Natural rate of interest in the euro area



Source: Holston-Laubach-Williams, Federal Reserve Bank of New York, Measuring the Natural Rate of Interest, (https://www.newyorkfed.org/research/policy/rstar).

Table 1: HICP expectations according to various surveys

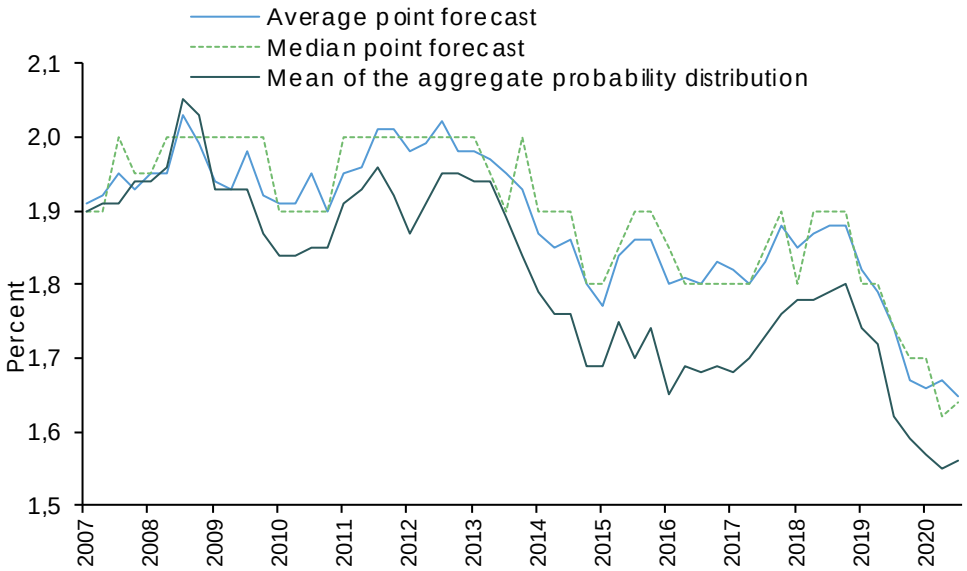
	Survey horizon			
HICP inflation	2020	2021	2022	Longer term
SPF, Q3 2020	0.4	1.0	1.3	1.6
Previous SPF, Q2 2020	0.4	1.2	1.4	1.7
Eurosystem staff macroeconomic projections, June 2020	0.3	0.8	1.3	–
Consensus Economics, June 2020	0.3	1.0	–	1.8
Euro Zone Barometer, June 2020	0.4	1.2	–	1.7

Source: ECB, Survey of Professional Forecasters, Q3 2020.

Note: Longer-term expectations refer to 2025 in the SPF and the Consensus Economics survey and to 2024 in the Euro Zone Barometer. Consensus Economics and Euro Zone Barometer longer-term expectations are from April 2020 survey.

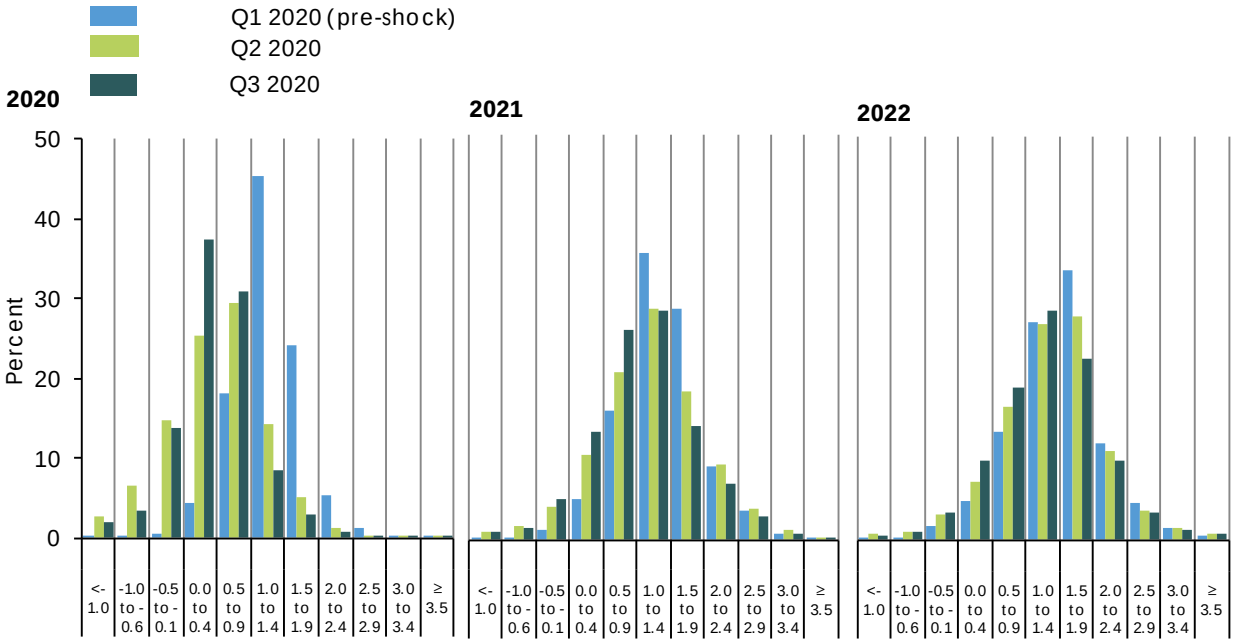
Finally, the natural rate of interest, as reported by the Federal Reserve Bank of New York, following the approach by Holston et al. (2017), has also decreased significantly throughout the past months since the onset of the COVID-19 pandemic. This equilibrium interest rate – and its sudden change – is often used in standard macroeconomic models as a proxy for an exogenous or an endogenous macroeconomic shock. This natural rate of interest is the interest rate, consistent with full employment, and its decrease also reflects affects the ability of monetary policy to achieve the primary mandate through conventional interest rate cuts. The rapid decrease of the interest rate does not directly reflect changing uncertainty patterns, but more broadly the economic developments, and is linked to the output gap estimates, also by Holston, Laubach and Williams (2017), reported below.

Figure 5: Long term inflation expectations



Source: ECB, Survey of Professional Forecasters.

Figure 6: Distribution of expected inflation for 2020, 2021 and 2022



Source: ECB, Survey of Professional Forecasters (Q3 2020).

Note: The variance of SPF inflation forecasts also increased for 2020, 2021 and 2022. In both the Q2 and Q3 survey release.

3.2. Possible effects of uncertainty on economic outcomes

How does uncertainty contribute to such economic developments? First, uncertainty can contribute to a decline of demand through an increase of precautionary savings. An increase in uncertainty about the future state of the labour market and the corresponding higher risk of unemployment raise private households' uncertainty about their future income. In order to avoid that, consumption gets abruptly restrained by lower income case of future unemployment, consumption can partly be lowered today to increase savings for later and, hence, to smooth consumption in the longer term. This fall in aggregate demand then lowers output, which might increase unemployment and result in lower inflation.

Increased uncertainty can also lead firms and private households to postpone costly decisions. These included, e.g., expenditures on durable goods (e.g. cars) and real estate by private households or on investment and hiring new workers by firms. These decisions often involve an assumption on behalf of individuals on their future incomes or by firms on their future revenues, so an increase in uncertainty can lead to revisions of such decisions and their postponement, decreasing spending and investment in the present[6]. Furthermore, heightened uncertainty leads to an increase rise in the risk premium causes a fall in equity prices and a deferral of new investments.

In the absence of sufficient countercyclical monetary and fiscal policy, a reduction in private spending dampens aggregate demand and inflation. Accordingly, Leduc and Liu (2016) find that uncertainty shocks are a sort of aggregate demand shocks. Basu and Bundick (2017) and Fernandez-Villaverde et al. (2015) point out that the negative effects are amplified at the zero-lower bound (ZLB), when monetary policy is in a liquidity trap and, hence, unable to stimulate an increase in consumption and investment. Additionally, in a globalised economy, uncertainty shocks at either the global level or from another economy, can affect economic activity significantly[7]. Bloom (2014) and Castelnuovo (2019) provide a more detailed review on the channels through which uncertainty can drag economic activity, described in what follows.

Existing studies have addressed the relationship between uncertainty and output, inflation and (un)employment through both empirical and theoretical lenses. Baker, Bloom and Davis (2016) argue that uncertainty has contributed to the prolonged economic downturn and the persistent increased levels of unemployment during and after the Great Recession. Using an empirical model, Leduc and Liu (2012, 2016) find that a shock to economic uncertainty, as measured by the VIX index, raises unemployment, dampens consumer spending and inflation. In standard dynamic stochastic general equilibrium (DSGE) models, nominal rigidities – the fact that nominal prices do not adjust fast enough after different shocks – lead to aggregate demand deficiencies (see, e.g., Fernández-Villaverde et al., 2015, and Basu and Bundick, 2017). When introducing search frictions to this framework[8], firms take into account the fact that hiring decisions are costly and they may postpone it in periods of heightened uncertainty (Den Haan et al. 2020; Freund and Rendahl 2020).

Dietrich et al. (2020) implement a New Keynesian DSGE model to study the interaction of aggregate demand with the current pandemic-induced uncertainty. The model simulations include a new shock of productivity in the economy and an uncertainty shock, which is modelled by an

[6] Basu and Bundick (2017) argue that higher savings resulting from lower spending can lead to higher investment, but only if prices are sufficiently flexible (see also Freund and Rendahl (2020) for a discussion).

[7] For a study on how US uncertainty shocks from both the real economy and financial markets affect the euro area economy see Benchimol and Ivashchenko (2021).

[8] A searching-and-matching framework is the leading modelling approach to dealing with questions of labour markets and unemployment; it emphasizes that jobs arise from an important matching process between employees and employers, when the value of an employment relationship for both sides is positive.

increase in the variance of expected future productivity. The combination between uncertainty and negative expectations about the future results in a sharp reduction of aggregate private spending and in front-loading the economic losses even before the full economic effects of a lockdown are realised. The response to this outcome in terms of monetary and fiscal policy thus becomes crucial for overcoming a deep recession. This has also been observed through the initial months after the outbreak of the COVID-19 virus in advanced economies. The reactions of central banks and government support measures has contributed significantly to reducing uncertainty indicators, as also discussed above[9].

3.3. An empirical assessment for the euro area

This section provides an empirical assessment of the macroeconomic effects of uncertainty shocks and their contribution to macroeconomic outcomes in the euro area. To this end, we require (i) a measure of uncertainty and (ii) a measure of the exogenous component of uncertainty, i.e. the component of uncertainty that is not shaped by other economic developments.

For our measure of uncertainty – we choose the VSTOXX, i.e. the volatility index of the Euro Stoxx 50, which is the euro area counterpart of the VIX for the US. Regarding the second part, we apply Leduc and Liu's (2016) approach to the euro area. We set up a four-variable vector autoregression (VAR) that includes the VSTOXX, the euro area unemployment rate, the Euro OverNight Index Average (EONIA) and the year-on-year change of the Harmonised Index of Consumer Prices (HICP).

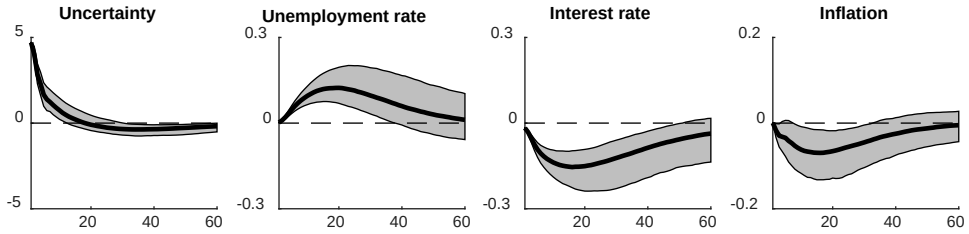
The data are monthly and range from January 1999 to August 2020. This makes 248 observations, because 12 observations are lost due to the transformation of the HICP. The VAR is estimated with a constant term, six lags and with Bayesian techniques employing a Normal-Wishart prior with Minnesota-style shrinkage of the prior parameter variance-covariance matrix[10].

The exogenous component of uncertainty – the uncertainty shock – is identified via a Cholesky decomposition of the error variance-covariance matrix. As VSTOXX is ordered first in the variable vector, a shock to uncertainty can have immediate effects on all other variables, while uncertainty itself is contemporaneously exogenous to other macroeconomic shocks. Figure 7 shows that there are hardly any immediate – i.e. within the same month – effects of uncertainty shocks except to uncertainty itself. Hence, it is not essential to order VSTOXX first in the variable vector.

[9] For some initial summaries on the monetary and fiscal policy measures in the euro area amidst the COVID-19 induced recession see Pekanov (2020), for an assessment of their effects see Lane (2020a) and IMF (2020).

[10] The results are robust to using a diffuse prior, but the impulse responses are fuzzier because it is subject to overfitting.

Figure 7: Impulse responses to an uncertainty shock



Source: Authors' own elaborations.

Note: Black lines: median responses to an increase of the structural residual in the uncertainty equation by one standard deviation over 60 months. Grey areas: corresponding 90% confidence bounds.

Ordering VSTOXX last – which means to restrict the contemporaneous effect on other variables except uncertainty to zero but (reasonably) allowing uncertainty to be affected by other macro shocks within the same month – leaves the impulse responses (and other results) practically unaltered. From this we conclude that the results do not depend on the position of the variables, in particular of VSTOXX, in the variable vector.

On the behaviour of uncertainty shocks beyond impact we obtain the same finding as Leduc und Liu (2016): uncertainty shocks work essentially like aggregate demand shocks. A bout of uncertainty increases unemployment, prompts the ECB to cut interest rates and curbs inflation.

Table 2: Sign and zero restrictions (on impact)

	Uncertainty	Unemploy-ment rate	Interest rate	Inflation rate
Uncertainty shock	+	0	0	0
Aggregate demand shock	0	+	-	-
Monetary policy shock		+	+	-
Aggregate supply shock		+	+	+

Source: Authors' own elaborations.

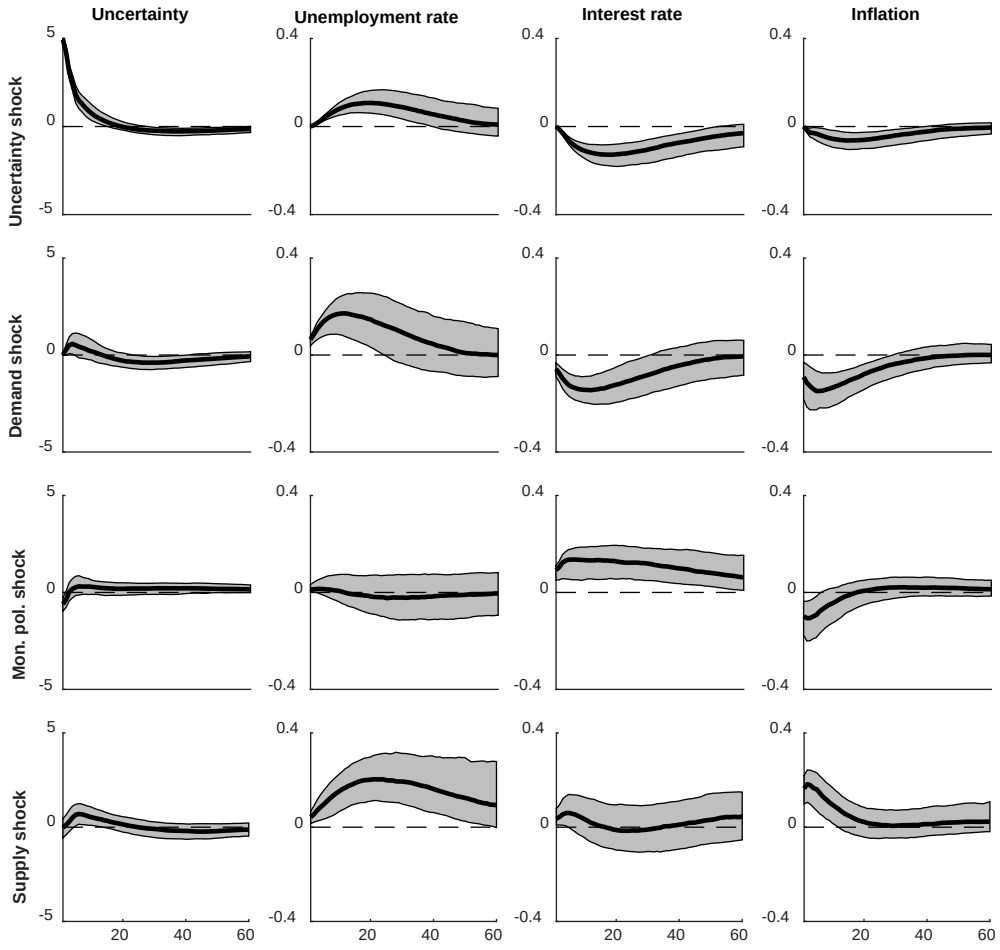
In a next step, we investigate further macroeconomic shocks next to uncertainty shocks. With the variables at hand we can identify aggregate demand shocks, aggregate supply shocks and monetary policy shocks by means of sign restrictions on the impulse responses (see Table 2). These identifying sign restrictions or variants of it have been widely used in the applied macro-econometric literature (see, e.g., Fry and Pagan, 2011).

To identify uncertainty shocks, we use the results from the previous exercise and impose zero restrictions on the immediate response of all variables except uncertainty itself, which is required to respond positively. Since we have learned that uncertainty shocks are a sort of demand shocks, we disentangle them more thoroughly from other aggregate demand shocks by restricting the latter to have no immediate effect on uncertainty. The (immediate) effects of monetary policy and of aggregate

supply shocks on uncertainty are left unrestricted. We estimate the model with the method of Arias et al. (2018) and, again, with a constant term, six lags and a Minnesota prior.

The impulse responses are shown in Figure 8. Again, beyond impact, uncertainty shocks behave like demand shocks. The effects of monetary policy and aggregate supply shocks on uncertainty are weak. Unexpectedly restrictive monetary policy (as shown in the figure) tends to lower uncertainty on impact, while adverse supply shocks tend to raise it with some delay. We use this identification scheme to investigate the role of these shocks during two periods of pronounced uncertainty: the Great Recession 2008/09 and the current recession.

Figure 8: Impulse responses to several macroeconomic shocks



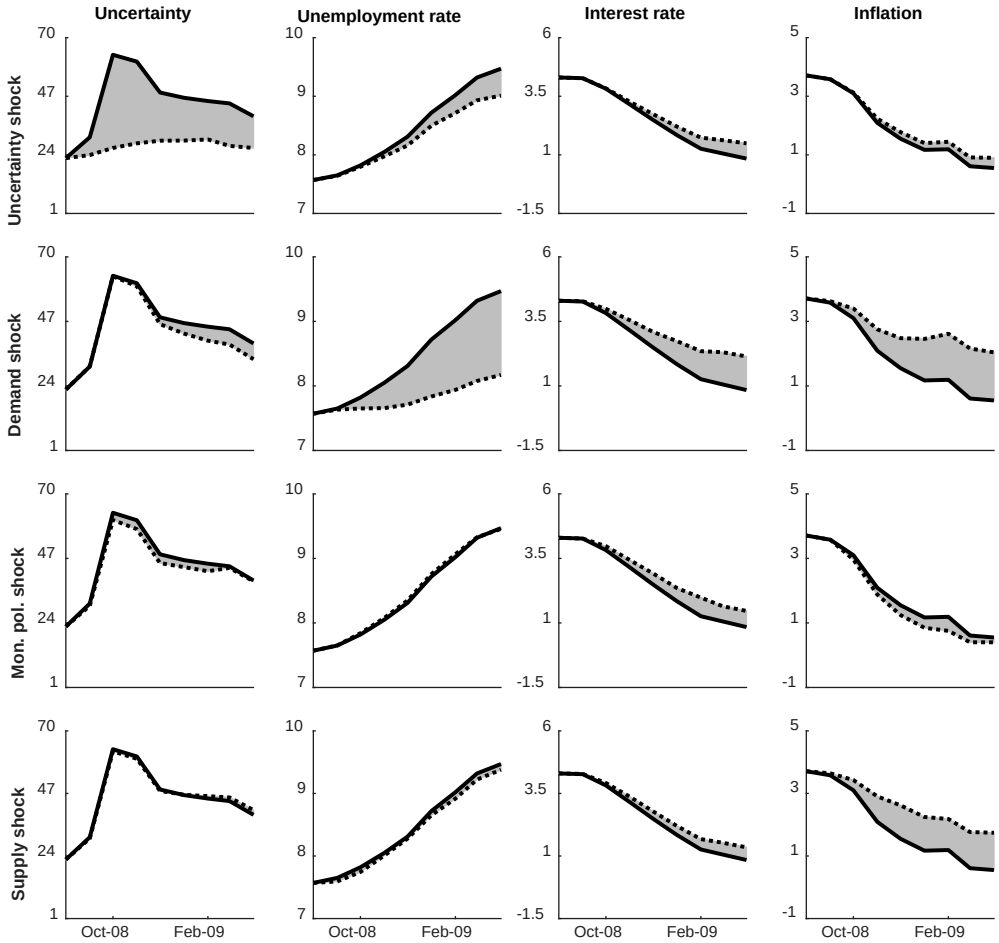
Source: Authors' own elaboration.

Note: Black lines: Median responses. Grey areas: Corresponding 68% confidence bounds.

Figure 9 shows the results for the Great Recession from August 2008 to April 2009. The realisation of the VSTOXX (first column) indicates that the Great Recession was heralded by a significant bout of uncertainty. From September to October 2008 the VSTOXX jumped from 31 to 63 points at a monthly average. This is to a large extent identified as an exogenous shock to uncertainty by our model, which seems plausible given that Lehman Brothers failed on 15 September 2008. Figure 9 also shows that uncertainty remained at an elevated level for several months and that other aggregate demand shocks gained some relevance for that.

The historical decomposition also shows that the significant rise in unemployment during the Great Recession was demand-driven; uncertainty shocks had a certain stake in that. The fall in inflation was also due to demand shocks, but also due to aggregate supply shocks. Overall, within the 8-month period shown in Figure 9, monetary policy surprises were expansive – without them, the interest rate would have been higher and inflation somewhat lower[11].

Figure 9: The Great Recession 2008/09



Source: Authors' own elaboration.

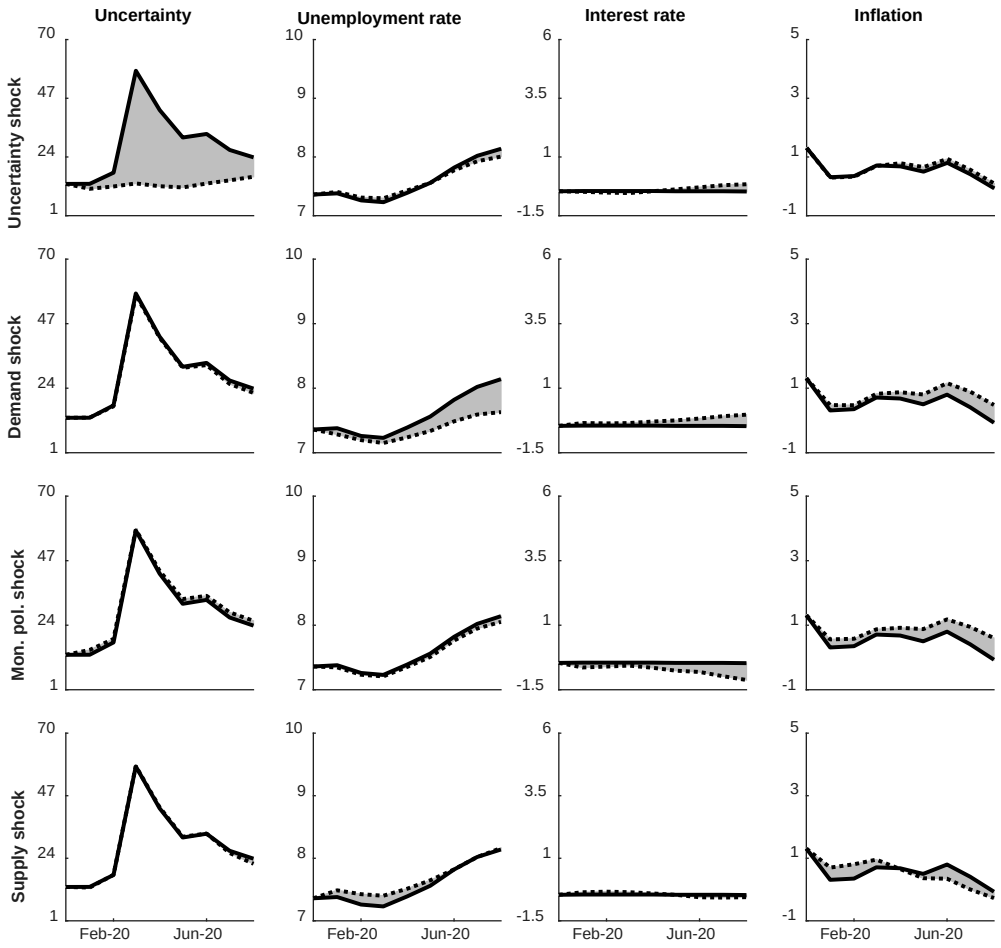
Note: Black solid lines: Realised data. Black dotted lines: Counterfactual scenario without the shock mentioned in the row label. Grey areas: Contribution of the shock mentioned in the row label.

The current recession, which is decomposed in Figure 10, was heralded by an even larger bout of uncertainty than the Great Recession. From February to March 2020 the VSTOXX surged from 18 to 58 points at a monthly average. On the other hand, uncertainty has levelled off more quickly than during the Great Recession and other aggregate demand shocks played a comparably minor role. This could

[11] Badinger and Schiman (2020) document that the Great Recession was characterised by a series of unexpected interest rate decisions of the ECB. Expansive shocks occurred in October 2008 and January 2009, restrictive shocks in November and December 2008 and March and April 2009.

be due to the swift and generous response of monetary and fiscal policy mitigating negative effects on aggregate demand.

Figure 10: The current recession



Source: Authors' own elaboration.

Note: Black solid lines: Realised data. Black dotted lines: Counterfactual scenario without the shock mentioned in the row label. Grey areas: Contribution of the shock mentioned in the row label.

The other three variables considered all changed by a substantially lesser extent than during the Great Recession. For inflation and the interest rate this might be attributable to the fact that they were already at a very low level before the current crisis. However, in contrast to the Great Recession, interest rates decisions seem to have been unexpectedly restrictive over the past few months. According to our estimates, in the absence of unexpected interest rate decisions, EONIA – and, hence, the ECB deposit facility rate – would have decreased to below -1% instead of remaining at -0.5%. Presumably, the ECB abstained from cutting interest rates further due to lower bound considerations. Instead it pursued quantitative easing policies on a very large scale.

Not only interest rates and inflation changed by a smaller amount during the current recession than during the Great Recession. The unemployment rate increased by "only" 0.9 percentage points from February to August 2020, while it surged by 1.9 percentage points from August 2008 to April 2009 (both increases were mainly due to demand shocks). This is further evidence that this time monetary and

fiscal policy has so far been more effective in containing the economic consequences of the crisis than during the Great Recession.

3.4. Further findings on inflation

To better understand the underlying inflation processes additional information may be useful and could be deduced from real-time inflation expectations surveys available for the US. Dietrich et al. (2020) gather empirical evidence on households' expectations by surveying US households at a daily frequency about their expectations regarding output and inflation developments in the next months, starting from March 2020. While at the beginning of the survey period the average expected change in output is relatively moderate, this changes throughout the month and at the end of March the expected output losses are around 15%. Furthermore, there are high inflation expectations – on average, inflation is expected to reach 5% for the next year (while in reality actual US CPI inflation has been modest). This result is also marked by very high uncertainty and is expected to be very persistent. This puzzling result can also be related to the finding by Candia et al. (2020) that individuals often have supply-side interpretations of inflation and relate it to worsening economic activity. After a certain point however, these inflation expectations, as reported by the Federal Reserve Bank of Cleveland have turned and have decreased considerably since the summer. Dietrich et al. (2020) also evaluate, using the responses from the survey, the short-run impact of COVID-19. Due to the bad news shock about the future, the natural rate of interest drops by 800 basis points, with one quarter of this being due to uncertainty and the rest due to the output loss of around 6%, which also translates into 6% lower consumption.

Coibion et al. (2020) also gather real-time data on inflation expectations in the US in a larger survey with more than 10,000 respondents, which analyses how local lockdowns due to COVID-19 causally affects households' spending and macroeconomic expectations. The authors report that households living in counties that went into lockdown earlier expect the unemployment rate over the next twelve months to be 13 percentage points higher and continue to expect higher unemployment at horizons of three to five years. They also expect lower future inflation, report higher uncertainty, expect lower mortgage rates for up to 10 years, and have moved out of foreign stocks into liquid forms of savings. It is interesting that while in the first weeks after the start of the COVID-19 the expectations were more dispersed and on average pointed to higher inflation, they dissipated up until the summer months and now point to the disinflationary pressures, also expected due to our theoretical considerations above.

On the inflationary side, there might be mechanisms that could lead to small upside price pressures as well. While globalisation has mostly pushed prices downwards in recent decades, calls for de-globalisation and re-shoring in terms of relocating supply chains back to the European Union to increase their resilience might lead to price increases in certain sectors. The contribution of this phenomenon would however most probably be quantitatively small and would therefore not outweigh the disinflationary factors discussed above.

Overall, the arguments above, combined with different statistical data so far, as well as empirical and theoretical studies from the literature, seem to point to strong disinflationary effects of the current crisis. This, however, is to a large extent not due to uncertainty per se – which has been contained by decisive monetary policy action – but rather due to real economy effects connected with distancing and closing measures, leading to lower demand and higher unemployment, precautionary savings combined with the possibility of some moderate inflationary effects (re-shoring). The overall result will most likely be that inflation will be considerably lower than without the COVID-19 pandemic and its accompanying uncertainty.

4. POLICY OPTIONS

To address the ongoing economic downturn optimally, policy-makers need to understand well the demand, as well as the supply side character of the shock. There are good reasons to believe that the economic recession, induced by the COVID-19 shock predominantly has the characteristics of a demand shock, reducing both output and inflation[12]. This makes monetary and fiscal policies suitable tools to tackle the crisis. Accordingly, many monetary and fiscal policy measures have already been successfully implemented. Uncertainty, however, may weaken the effectiveness of different economic policies such as monetary and fiscal interventions in comparison to normal times.

Uncertainty shocks themselves can be similar to aggregate demand shocks. Hence, also in this case, monetary policy could be the first tool to be used to accommodate them as in normal times – cutting interest rates down helps to reduce unemployment and also to increase inflation and does not involve difficult trade-off for policymakers. However, in the COVID-19 recession there are good reasons to anticipate also partly supply-side effects through supply chain disruptions and labour shortages in the future. Such economic shocks are usually more difficult to address by standard monetary and fiscal policies, as they typically lead to the conflicting outcome that both unemployment and inflation rise, making monetary policy not a suitable tool to respond to them.

Monetary policy can and has been the first line of macroeconomic response to the ongoing economic downturn. Standard monetary tools have however already been extensively used in the recent decade in the euro area and interest rates have gone below zero. The question how much below zero they could go before they reach the effective lower bound (ELB) and further interest rate decreases start becoming counter-productive is still open. In the current environment of very low interest rates, there is an active academic discussion whether further interest rate cuts and/or a negative interest rate policy (NIRP) will lead to the effects observed in normal times. The effective lower bound (ELB) can make monetary policy less efficient and thus presents a constraint on conventional monetary policy. Our own calculations, however, suggest that the ECB could have lowered the deposit facility rate to below –1%.

By introducing the PEPP, the ECB acted early and decisively to counteract market stress. It later introduced flexibility in terms of the capital key for asset purchases and by expanding the PEPP in June. In case of a further deteriorating economic outlook and accompanying decrease of inflation, which are realistic given the rapid recent resurgence of the virus and amidst new containment measures and potential lockdowns, further measures might be enacted by the ECB. One option would be to expand the amount of asset purchases under the PEPP and increase the amount of TLTRO the ECB is currently undertaking. These forms of QE have already proved to halt growing uncertainty and stabilise the economy. Their more direct, classical effects on credit growth and therefore on investment and consumption in the current environment of high uncertainty, forced savings and possible closings of some sectors are however still to be assessed. Importantly, QE works through affecting expected future real interest rates and these have already reached very low levels, so the potency of further monetary expansions might be more limited.

To stimulate the economy, the ECB could further decrease interest rates, embarking on a comprehensive negative interest rate policy (NIRP). The extent to which negative interest rates could be useful to stimulate the economy have been the subject of significant discussions in recent years. Some empirical studies on NIRP (e.g. Rostagno et al. 2019; Boucinha and Burlon 2020; Demiralp

[12] Studies, such as Fornaro and Wolf (2020) and Guerrieri et al. (2020) have analysed the demand and supply decomposition of the COVID-19 pandemic and discuss different channels through which the shock has been amplified.

et al. 2019; Altavilla et al. 2019) find the beneficial effects from negative interest rates on lending and on the economy as a whole, which can be expected in a theoretical framework. Negative interest rates propagate through the yield curve, increasing demand for longer term assets and therefore leading banks to expand lending. Boucinha and Burlon (2020) also consider two arguments against negative interest rates: shifts into cash and downward pressures on bank profitability. They conclude that there is "limited transmission of negative deposit rates to retail deposits, especially of households, which can, however, dent bank profitability". According to the authors, in the euro area, negative interest rates have also reduced government bond yields significantly, while they had a broadly neutral impact on bank profitability so far, as the negative effect on net interest income has been offset by positive effect on borrower creditworthiness. The empirical findings in Boucinha and Burlon 2020, combined with the detailed empirical evaluation of ECB non-standard policies in the aftermath of the Global Financial Crisis, examined by Rostagno et al. (2019), suggest that negative interest rates have supported loan growth to firms and have contributed to the euro area pre-pandemic expansion, while supporting inflation expectations. But the papers also warn that protracted periods of negative rates can have the potential to hinder the transmission of monetary policy. The theoretical concept of negative interest rates having an overall negative effect on the economy – the "reversal interest rate" – has been developed and presented in Brunnermeier and Koby (2019), with a similar discussion in Eggertsson et al. (2019). Heider et al. (2019) also examine some of the shortcomings of introducing negative interest rates for bank lending.

Given these theoretical considerations, a future reduction of interest rates by the ECB has to be evaluated along three criteria[13]. Firstly, the implementation of NIRP needs to be feasible in that the financial system is able to cope with it efficiently. Secondly, the implementation of NIRP needs to be effective in stimulating and helping the economy – meaning that the benefits of this approach should be clearly higher than the potential costs and risks to the transmission mechanism. Finally, such measures need to be appropriate – meaning further expansionary economic policy from the central bank is required and suitable to fulfil the mandate and reach the inflation target.

Monetary policy might, however, not always be the optimal tool to address economic losses under certain circumstances. These mainly revolve around the dispersion of the economic shock and losses. If those are very dispersed and unequal between different sectors of the economy and types of workers and firms, monetary policy will have difficulties to effectively restore effective demand. As discussed by Woodford (2020), a very uneven shock results in monetary policy being unable to eliminate "effective demand" shortfalls, since if some sectors are completely closed, monetary policy interventions cannot effectively compensate them, independent of the size and instruments used. In such situations, only fiscal policy can provide the targeted and sectoral-level interventions to maintain the income levels of workers in the closed sectors, as this is a misallocation problem, not one induced by lack of aggregate demand.

But even fiscal policy might have difficulties in addressing negative output gaps fully. As long as some sectors are fully closed and the substitutability between sectors is inelastic, even fiscal policy cannot recover aggregate demand to its pre-pandemic levels, as discussed in Guerrieri et al. (2020). That might mean that fiscal multipliers are lower even at the ZLB, unlike in other, more normal, recessions. Fiscal policy, however, still has the crucial role of social insurance in such a situation, but its effectiveness in terms of stimulus might be hindered.

[13] For these considerations see Vlieghe (2020): https://www.bankofengland.co.uk/speech/2020/gertjan-vlieghe-speech-assessing-the-health-of-the-economy.

Possible deterioration in macroeconomic and financial conditions might put the ECB under pressure to act by further quantitative easing. If the ECB decides to wait longer before actually implementing it, this would need credible communication that will in itself reduce market pressures. The importance of communicating this and holding to such state-dependent policy has already been implied in some speeches by ECB representatives[14]. In light of a worsening situation and given the conditions that require further easing according to the Governing Council are fulfilled, the ECB will have the opportunity to expand the overall envelope of the PEPP, to expand TLTROs or to introduce further interest rate tiering measures. Even if still unclear to what extent the overall envelope of PEPP needs to be expanded, the ECB can signal it is willing to do that by explicitly expanding weekly purchases until a decision is made, given the changing economic and financial markets situation. The announced TLTRO III programme can also be expanded or extended in time (currently the minimum interest rate of –1% is planned to be implemented until June 2021). This will signal that the ECB provides support for longer and could increase take-up rates at the incoming TLTRO bid submitting dates by banks.

Since the main channels of effect of an uncertainty shock work through forward-looking behaviour, it is important for economic policy to stabilise expectations about the future economic prospects. An example of a currently very important policy in this regard is forward guidance, which aims at stabilising expectations about the future decisions of the central bank. Forward guidance can be used to manage the expectations of individuals regarding their income and employment, therefore reducing uncertainty and limiting the increase in risk premia. To estimate the role of monetary policy, Dietrich et al. (2020) use a standard experiment about a news shock about future productivity – although this supply shock happens in the future, it is anticipated and therefore aggregate demand contracts already today. Monetary policy can be effective in attenuating this reaction if its cuts interest rates sharply. If, however, monetary policy does not respond because it is bound by the zero lower bound, a recessionary period ensues.

Regarding the ongoing monetary policy review of the ECB and concerning current discussions regarding the mandate of major central banks of advanced economies, the COVID-induced uncertainty and economic downturn poses important questions. Faced with further deterioration of inflation and possible deflationary pressures, the ECB needs to consider whether it should adopt a make-up strategy, tolerating higher inflation in the future to compensate for previous inflation shortfalls. A make-up strategy, similar to the recently announced average inflation targeting by the US Federal Reserve or to a pure price-level targeting approach, could raise inflation expectations and therefore help the central bank fulfil the mandate faster. There are, however, a number of caveats in a monetary union with heterogeneous countries. The ECB would need to conduct comprehensive research, similar to the US Federal Reserve and the Bank of Canada.

Furthermore, to ensure credibility, monetary and fiscal policies might need to be state-dependent. In the current context of changing economic and healthcare circumstances, policies need to be very flexible and adjust according to the present and future evolution of the pandemic. According to the Royal Society DELVE Initiative report on Economic Aspects of the COVID-19 Crisis in the UK: "An important lesson from economic theory is that a policy that does well in environments with lots of uncertainty often features state dependence, meaning that policy is contingent on and changes with the realisations of uncertainty. In the context of the COVID-19 pandemic, smart policy in many cases should be dependent on the state of the epidemic and the economy and, in particular, change if

[14] See Philipp Lane (2020b) Speech at the Jackson Hole Symposium: https://www.ecb.europa.eu/press/key/date/2020/html/ecb.sp200827~1957819fff.en.html and Fabio Panetta "Asymmetric risks, asymmetric reaction—monetary policy in the pandemic" speech: https://www.bis.org/review/r200922f.htm.

epidemic and economic markers cross certain thresholds."[15] This would mean that economic policies require both more planning and preparedness by policymakers to make changes as they explicitly make their plans state dependent.

In the current pandemic, a credible policy to stabilise expectations would involve a coherent and integrated approach that encompasses both the epidemiological and the economic aspects of lockdowns and other non-pharmaceutical measures. To do that, a number of economic-epidemiological models have been introduced in recent months to analyse the trade-offs between savings lives and saving livelihoods (Acemoglu et al., 2020; Eichenbaum et al., 2020; Kaplan et al., 2020). These epi-macro models aim to study the joint path of disease and the economy and inform policymakers of the different repercussions of policies. A combined approach of analysing both health and economic outcomes is crucial also for reducing uncertainty. Even though monetary policy and fiscal policy can help, there is a direct and central role for health policy in stabilising expectations by communicating a coherent and credible strategy. This is still challenging, given the changing circumstances and the many unknown aspects and nature of the COVID-19 virus, its spread and the effective measures against it, but nevertheless will remain crucial in reducing uncertainty and improving economic prospects.

[15] For the full report, see https://rs-delve.github.io/reports/2020/08/14/economic-aspects-of-the-covid19-crisis-in-the-uk.html.

5. CONCLUSION

Uncertainty has increased dramatically with the outbreak of the current pandemic. According to our estimations and in line with other empirical investigations (Carriero et al. 2020) we find that – while bearing similarities to aggregate demand shocks – uncertainty shocks themselves were not dominant drivers of the ensuing economic recession. Instead, the recession was caused by the spread of the virus affecting consumption and investment patterns and the slow-downs and shut-downs of social and economic activities in order to contain the pandemic. The relatively limited role of uncertainty shocks in terms of economic effects is not least due to effective containment measures of monetary and fiscal policy makers. The PEPP has reassured financial markets that the ECB is willing to counteract the crisis comprehensively.

The sharp downturn in economic activity has led to disinflationary pressures. Expectations about future inflation and therefore about the ECB achieving its target have worsened. While monetary policy can contribute to stabilising financial markets and therefore ensuring eased credit conditions, it is still unclear to what extent it can contribute to stimulating the economy. With regard to stimulus and helping a future recovery, fiscal policy, which could be better targeted, might continue to have a central role.

In the current second wave of the COVID-19 pandemic it is equally important that policy makers implement stabilising measures to contain uncertainty. Monetary policy has various tools available if financial conditions worsen, market stress intensifies, or inflation continues to fall. The ECB could expand the overall envelope of PEPP, it could expand TLTROs and/or introduce further interest rate tiering measures. It could cut interest rates further, if it has verified that banks can cope with it. Furthermore, it could follow a make-up strategy, tolerating higher inflation in the future to compensate for previous inflation shortfalls, if it sees fit amending its current monetary policy strategy. This can help recover longer-term inflation expectations closer to the target.

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Uncertainty and Monetary Policy in the Euro Area

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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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CONTENTS

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

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.

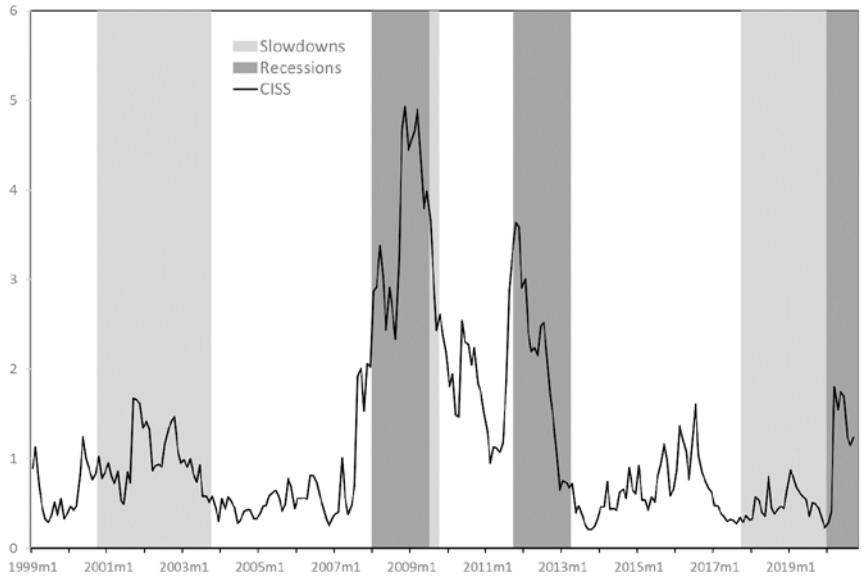
The ECB proposed an aggregate measure called the composite indicator of systemic stress (CISS). The CISS is computed for the euro area but also does not only focus on stock price volatility. This index encompasses 15 market-based financial stress measures that are split equally into five categories, 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.

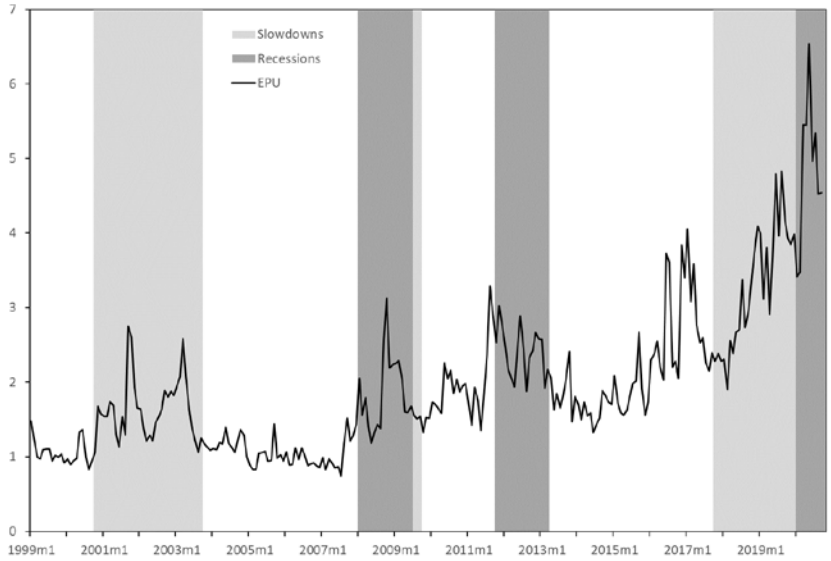
Figure 1: The evolution of financial uncertainty: the CISS



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).

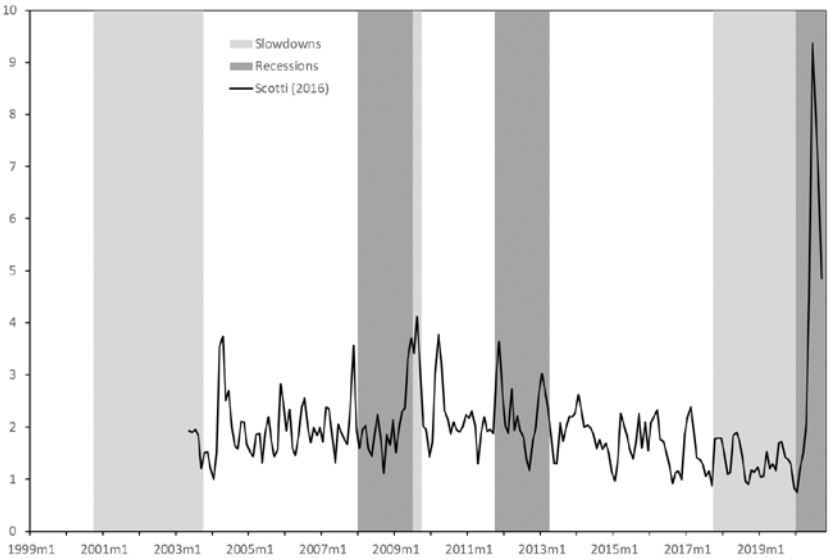
Figure 2: The evolution of economic policy uncertainty: the EPU



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.

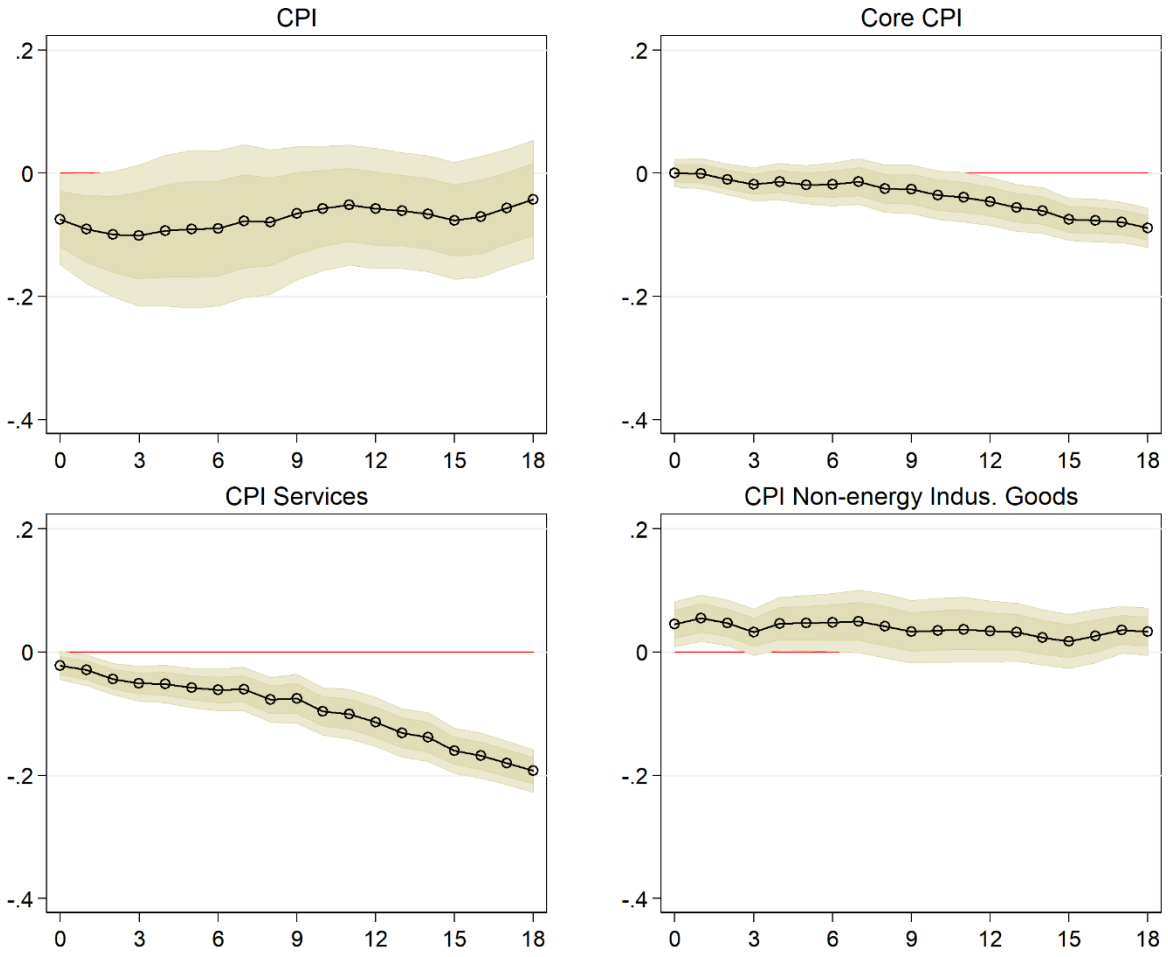
3. THE EFFECT OF UNCERTAINTY ON EURO AREA INFLATION

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.

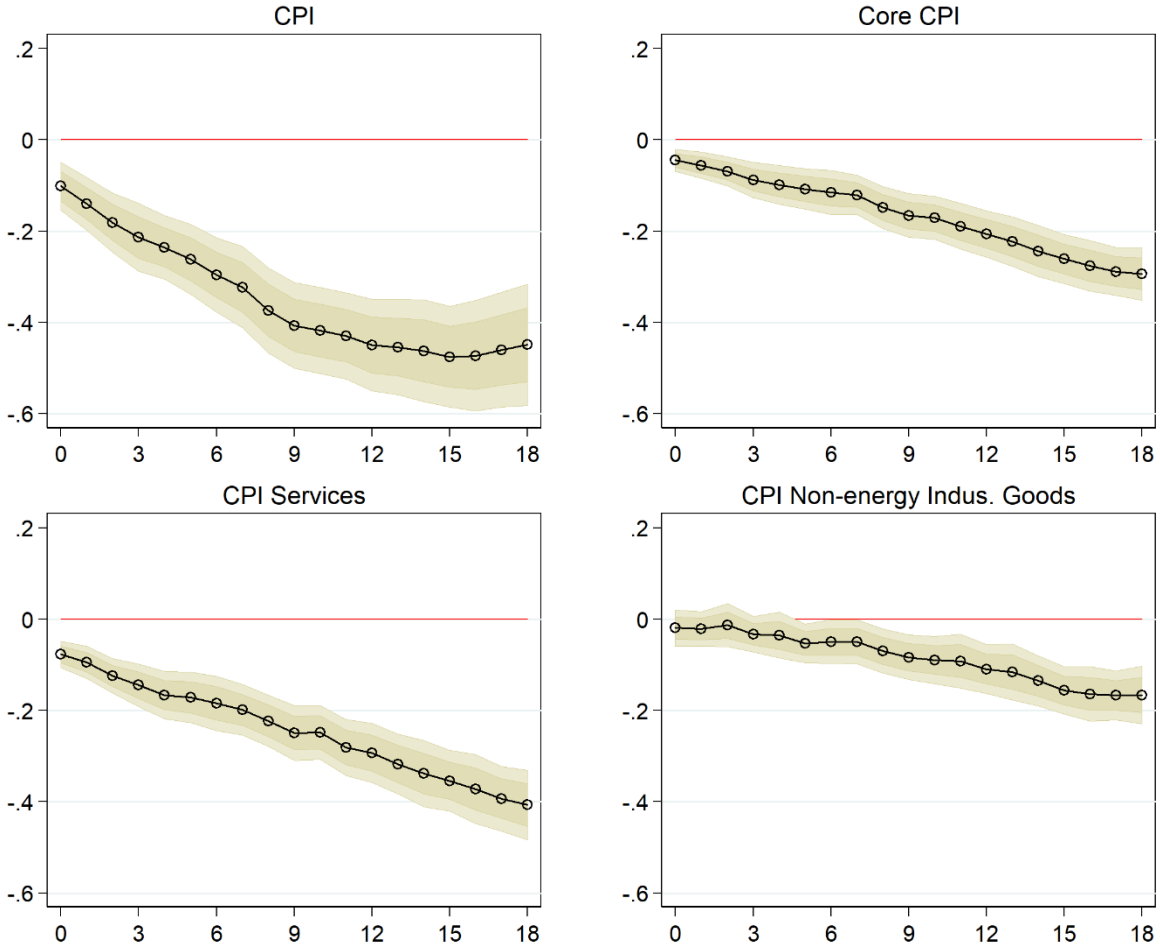
Figure 4: The effect of CISS uncertainty on inflation



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

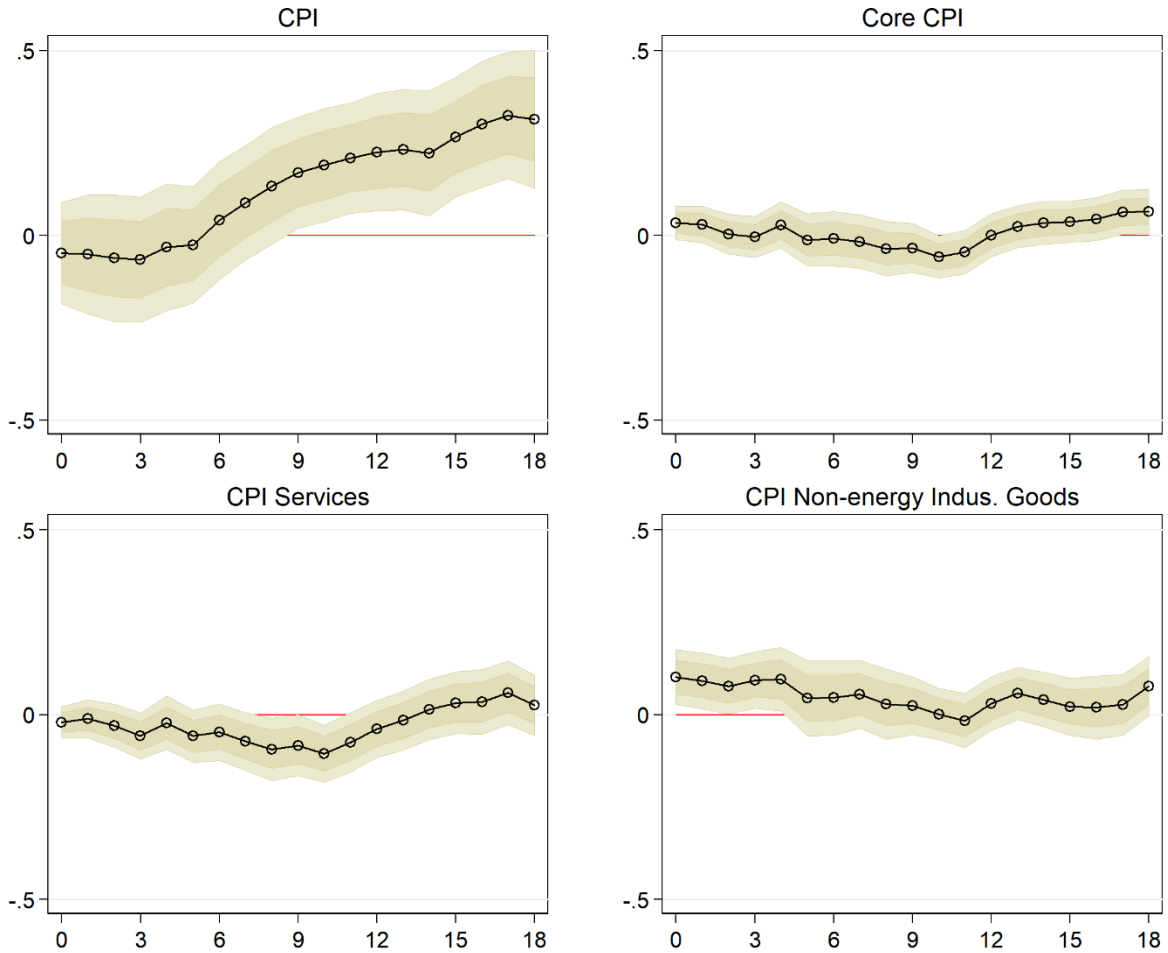


Source: Authors' estimates. Shaded areas represent 68 and 90% confidence intervals.

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.

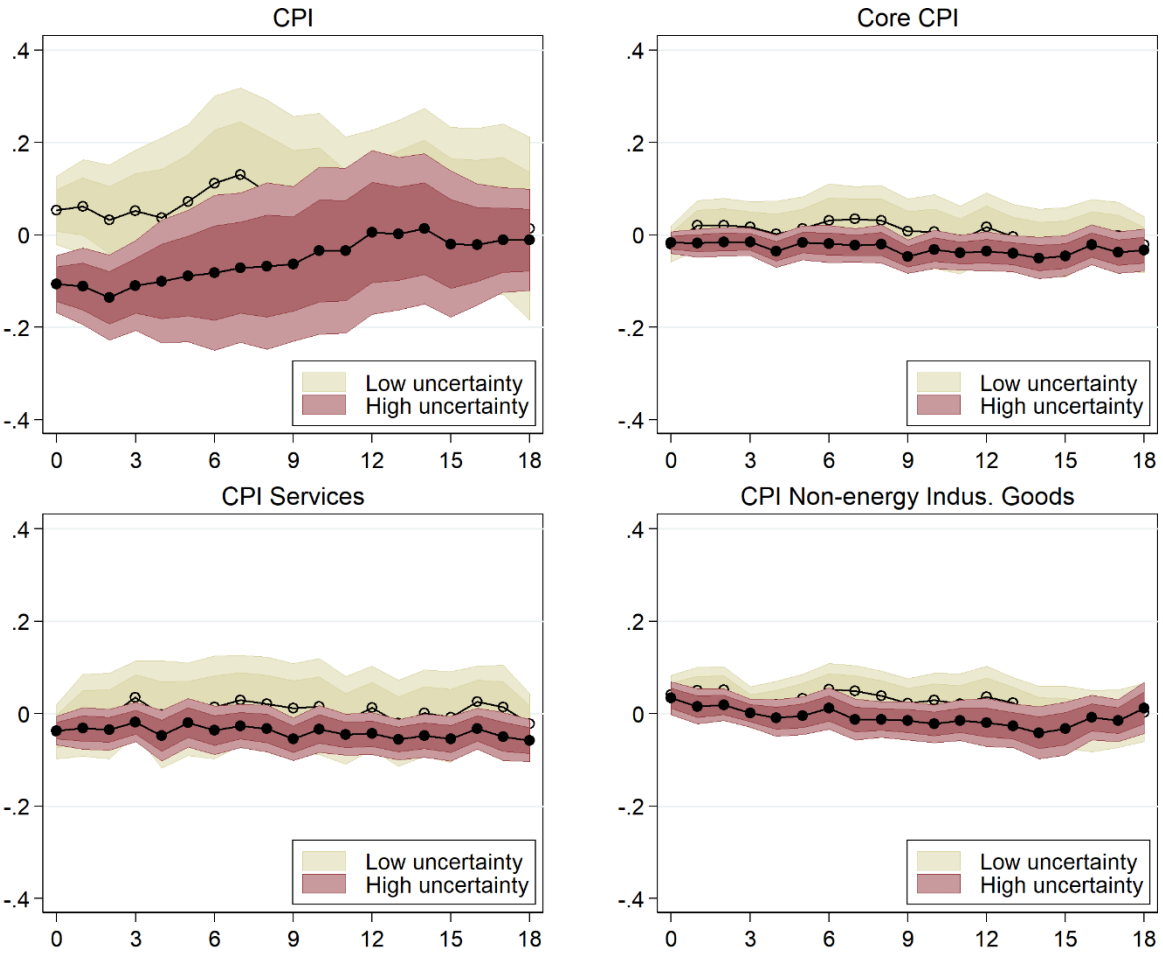
The linear effect of monetary policy on the inflation indicators is exhibited in the Annex (Figure 10). As expected, we find that a restrictive monetary policy has a negative effect on inflation. The effect is short-lived for the headline index but is significant at longer horizons when we consider the 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.

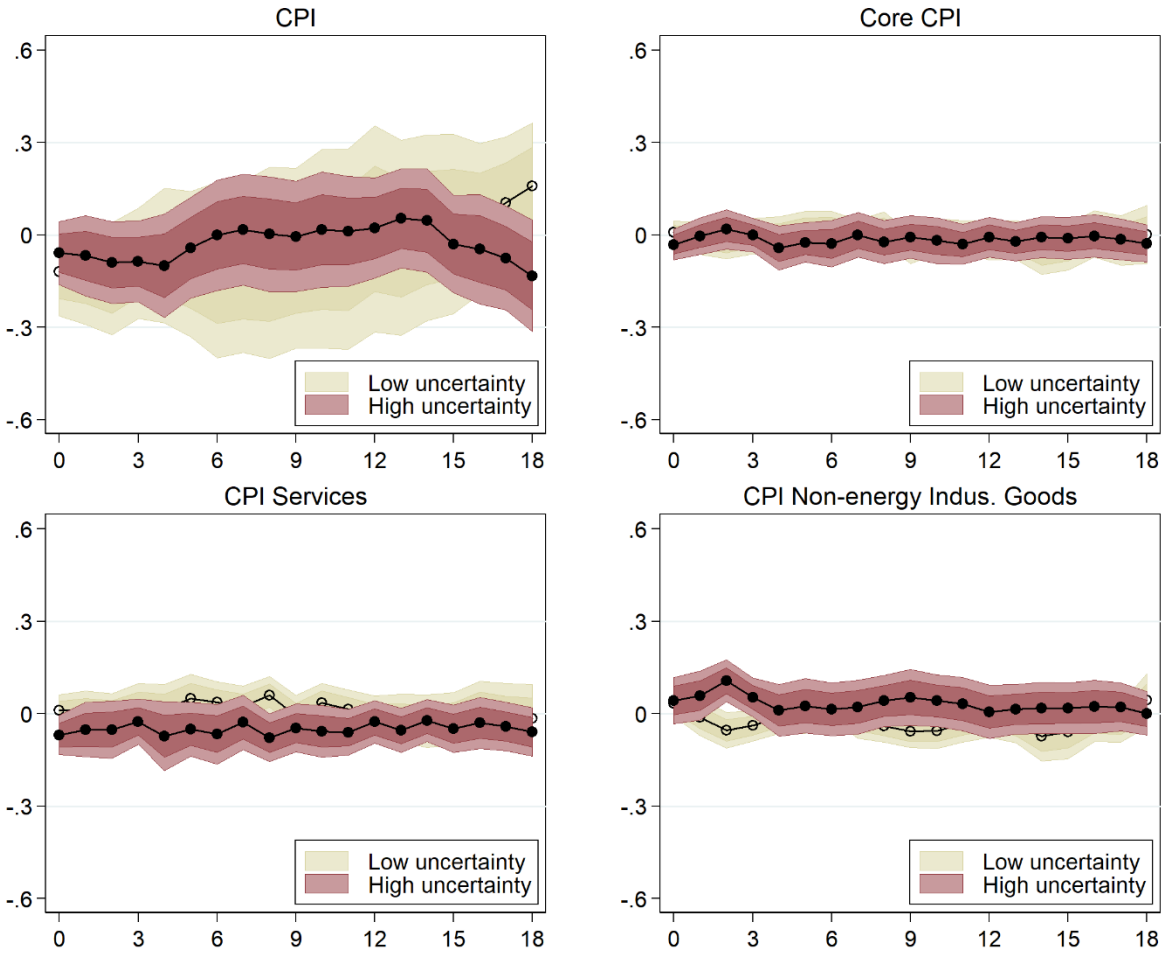
Figure 7: The state-dependent effect of monetary policy to the CISS



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

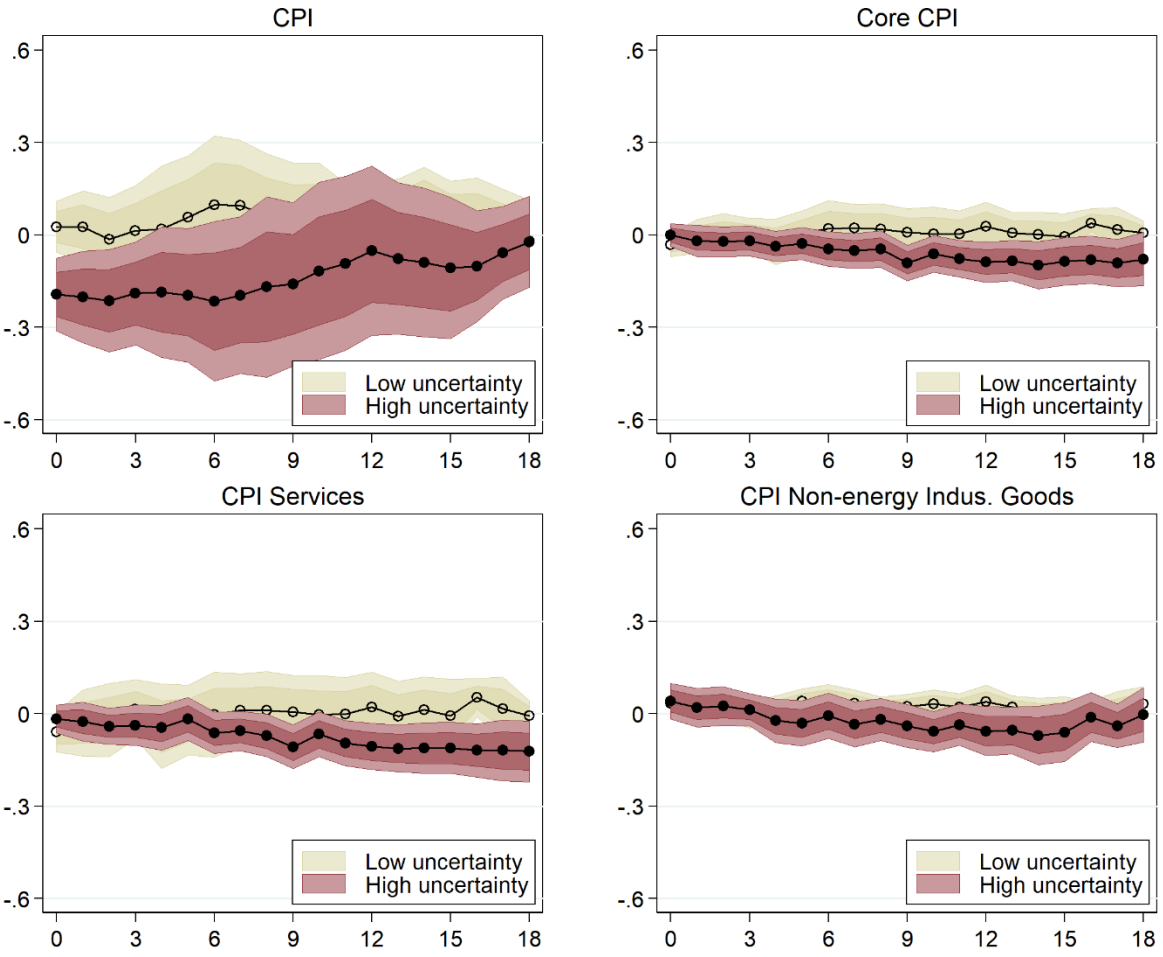
It seems here that the short-term effect of monetary policy is stronger when uncertainty is high. The other results are shown in Figure 8 and Figure 9. The state-dependent effect of monetary policy estimated conditional on the EPU or the Scotti (2016) index does not suggest any difference. The level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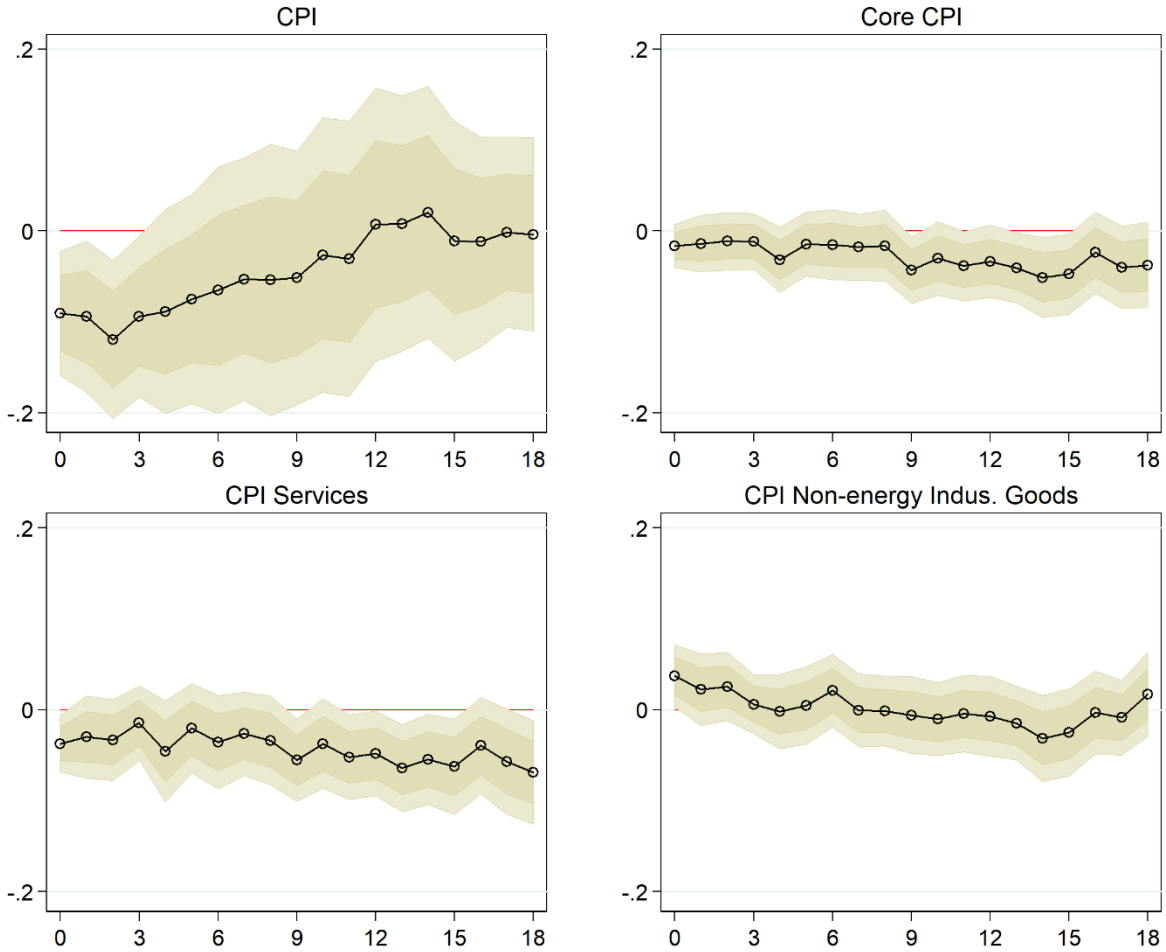
ANNEX

Figure 10: The linear effect of monetary policy on inflation



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

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