

IN-DEPTH ANALYSIS

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Monetary Dialogue Papers, November 2020



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



Policy Department for Economic, Scientific and Quality of Life Policies  
Directorate-General for Internal Policies  
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## **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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## LIST OF ABBREVIATIONS

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

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## 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 consumption 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 employees. 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.<sup>1</sup>

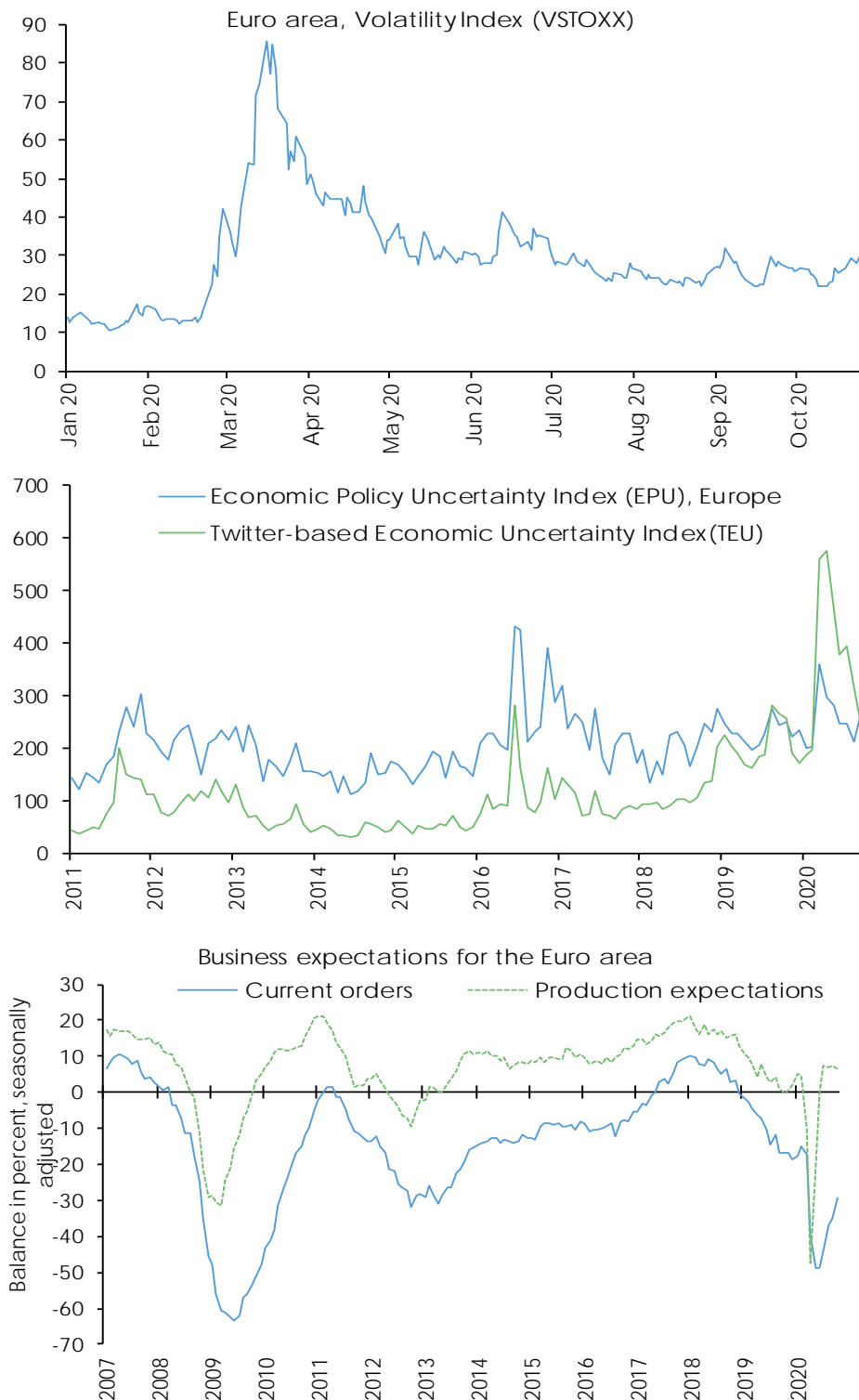
**Each of these indicators has a specific focus and therefore neither of them is the perfect indicator for overall macroeconomic uncertainty, but they are useful proxies.** Financial market-based indicators have already been used for a while in the economic literature and are robustly related to gross 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.

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<sup>1</sup> 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](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.stox.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<sup>2</sup>. 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.

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<sup>2</sup> 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<sup>3</sup>.

#### 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<sup>4</sup>. 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.

<sup>3</sup> 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).

<sup>4</sup> 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”.<sup>5</sup>

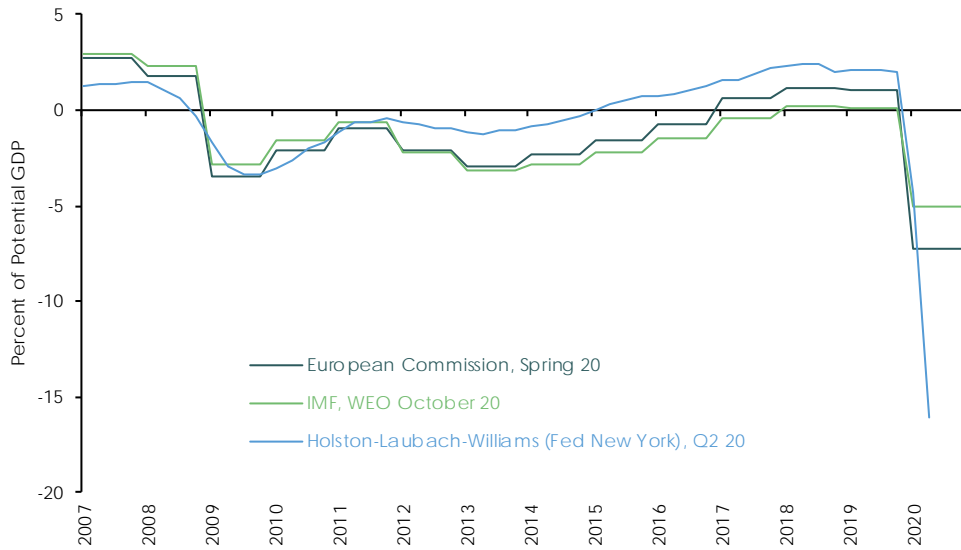
**A shortfall of aggregate demand exacerbates downward pressure on price.** Furthermore, it can lead to stagnating wages, as due to the lower expected demand employees would have difficulties to negotiate wage increases. This can be seen in the euro area data regarding inflation and core inflation. It 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).

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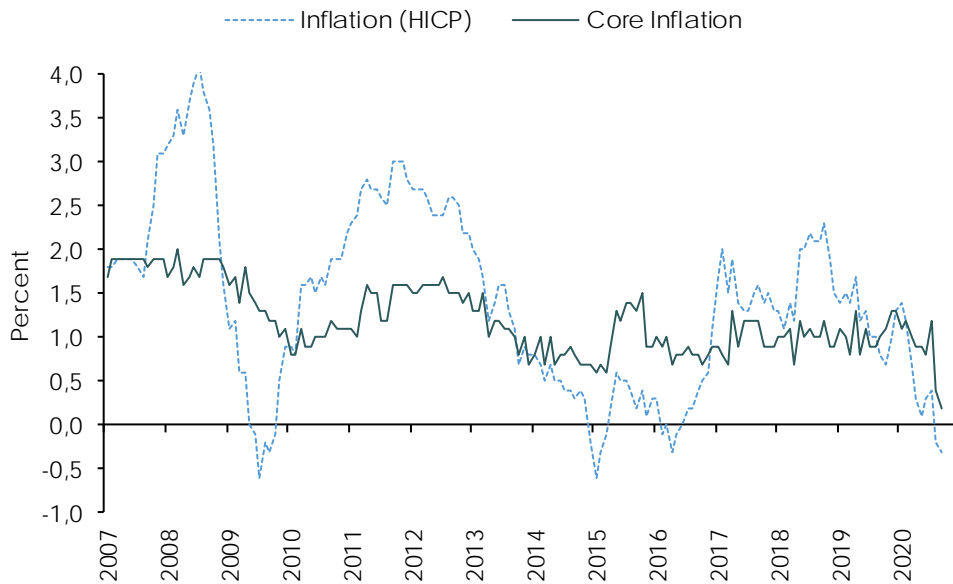
<sup>5</sup> The impact of the recent spike in uncertainty on economic activity in the euro area; [https://www.ecb.europa.eu/pub/economic-bulletin/focus/2020/html/ecb.ebbox202006\\_04~e36366efeb.en.html](https://www.ecb.europa.eu/pub/economic-bulletin/focus/2020/html/ecb.ebbox202006_04~e36366efeb.en.html).

Figure 2: Output gap estimates for the euro area



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

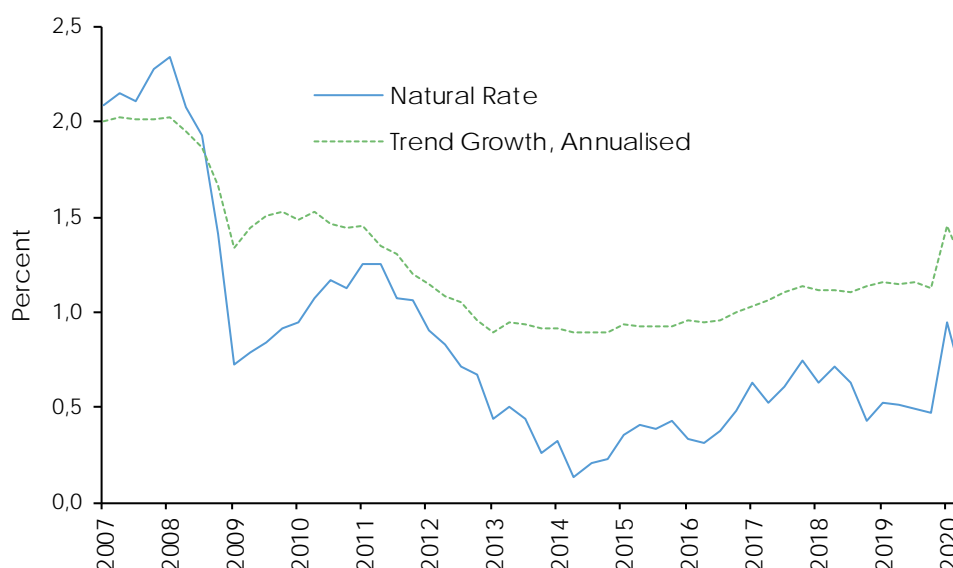
Figure 3: Inflation and core inflation in the euro area



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

HICP inflation	Survey horizon			
	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

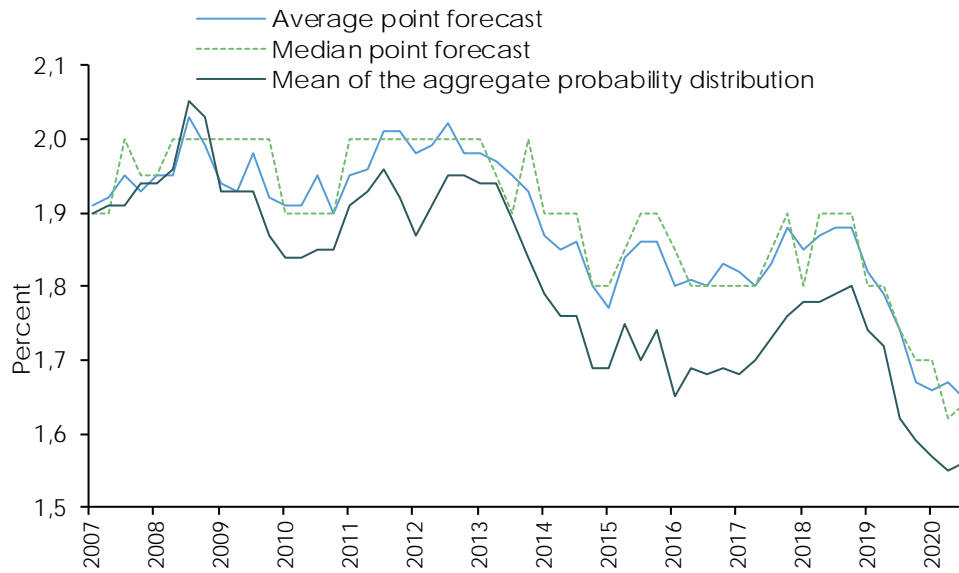
Source: ECB, Survey of Professional Forecasters, Q3 2020.

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 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.

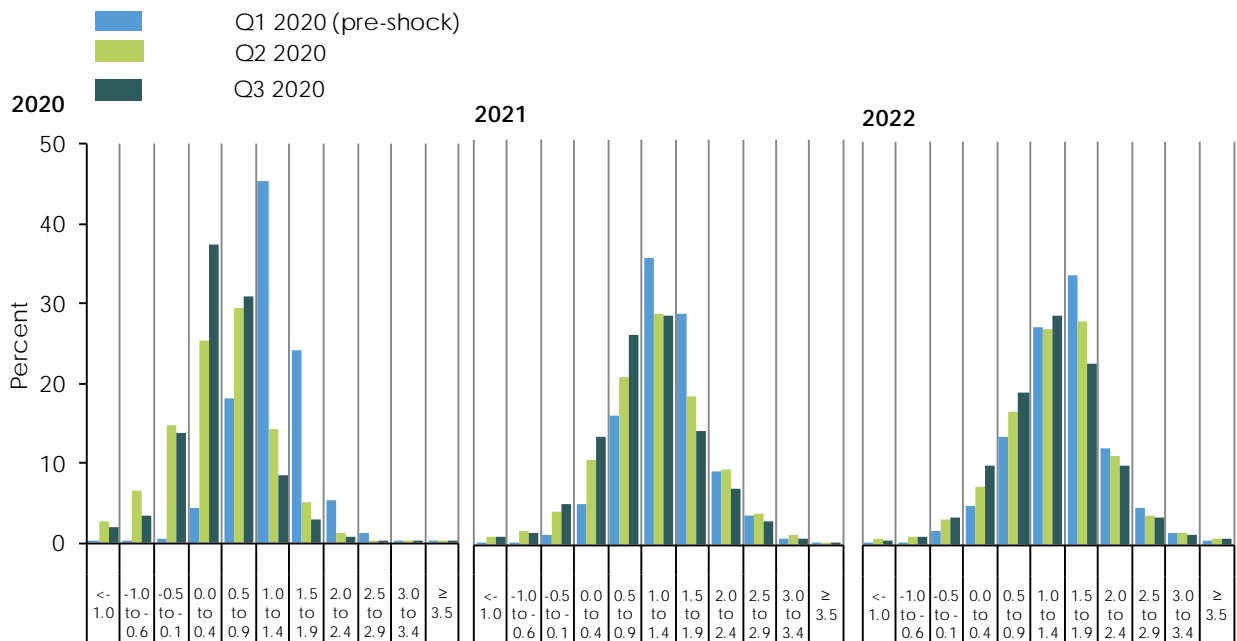


Figure 5: Long term inflation expectations



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<sup>6</sup>. 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<sup>7</sup>. 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<sup>8</sup>, 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

<sup>6</sup> 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).

<sup>7</sup> 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).

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

### 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<sup>10</sup>.

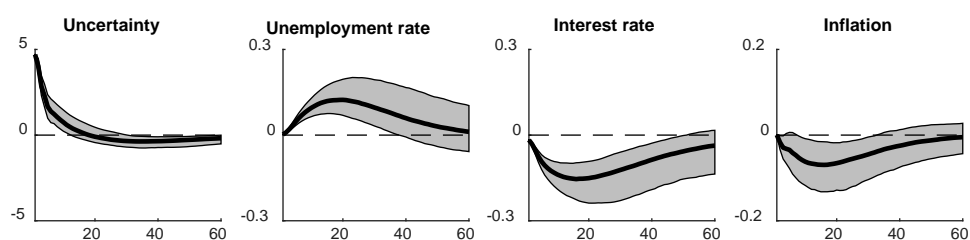
The exogenous component of uncertainty – the uncertainty shock – is identified via a Cholesky decomposition of the error variance-covariance matrix. As VSTOXX is ordered first in the variable vector, a shock to uncertainty can have immediate effects on all other variables, while uncertainty itself is 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.

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<sup>9</sup> 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).

<sup>10</sup> 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	Unemployment rate	Interest rate	Inflation rate
Uncertainty shock	+	0	0	0
Aggregate demand shock	0	+	-	-
Monetary policy shock		+	+	-
Aggregate supply shock		+	+	+

Source: Authors' own elaborations.

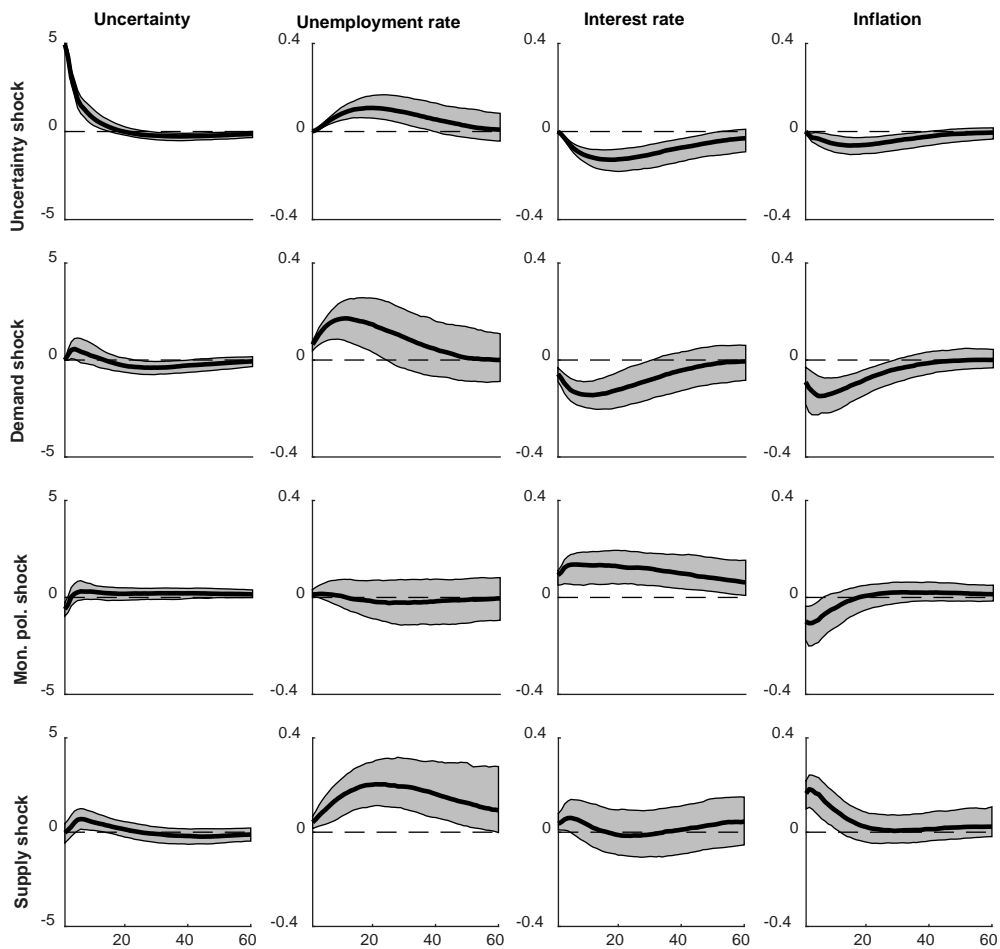
In a next step, we investigate further macroeconomic shocks next to uncertainty shocks. With the variables at hand we can identify aggregate demand shocks, aggregate supply shocks and monetary policy shocks by means of sign restrictions on the impulse responses (see Table 2). These identifying sign restrictions 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 2020/21.

Figure 8: Impulse responses to several macroeconomic shocks



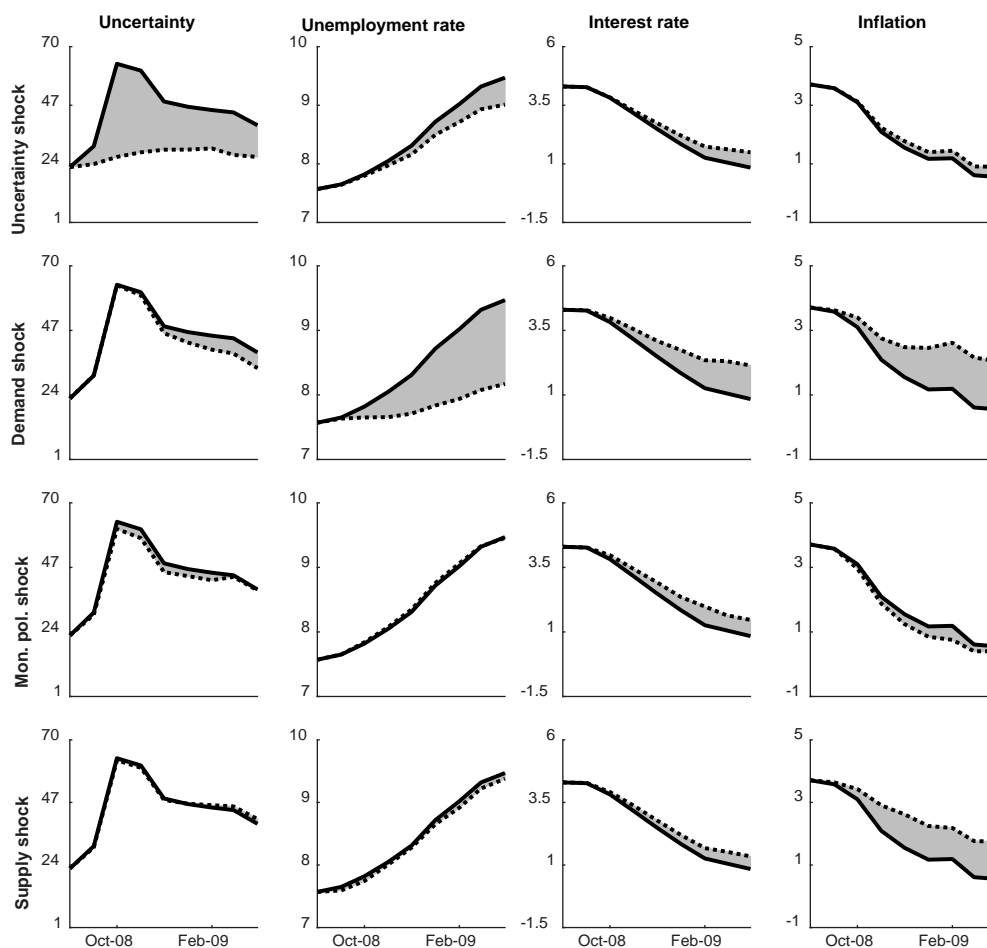
Source: Authors' own elaboration.

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<sup>11</sup>.

Figure 9: The Great Recession 2008/09



Source: Authors' own elaboration.

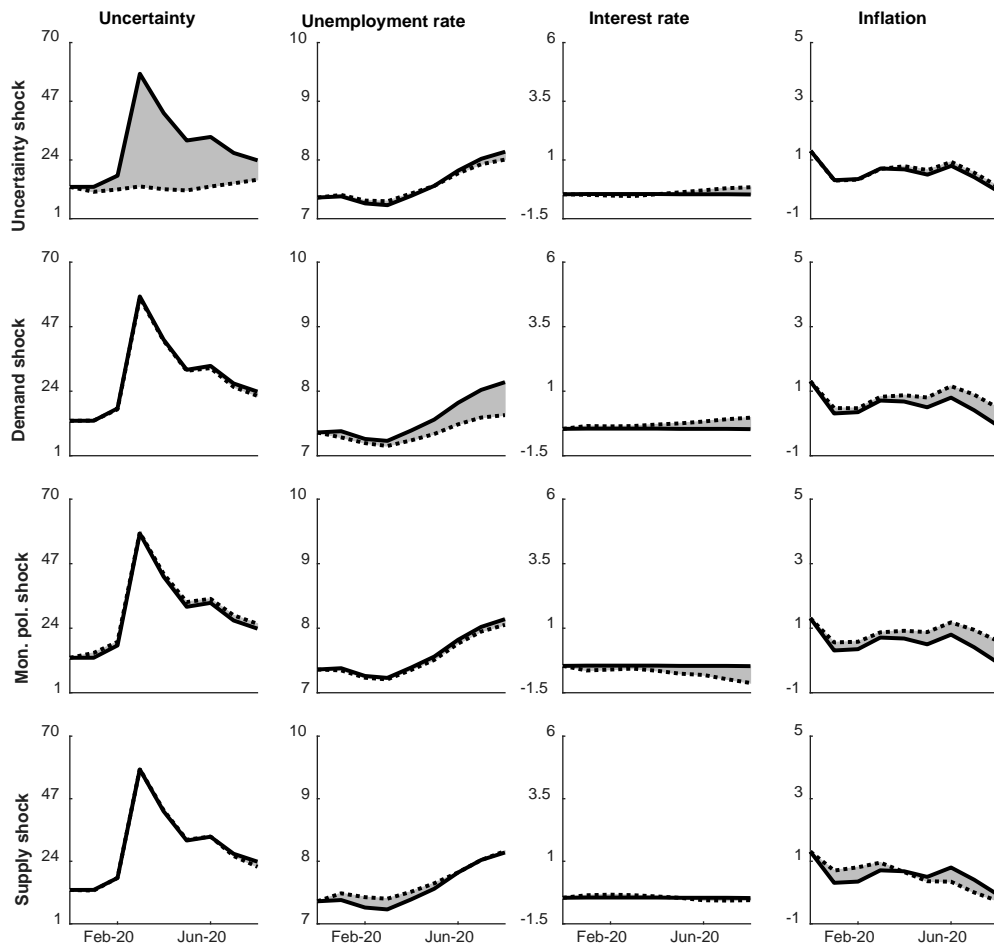
Note: Black solid lines: Realised data. Black dotted lines: Counterfactual scenario without the shock mentioned in the row label. Grey areas: Contribution of the shock mentioned in the row label.

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

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

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

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<sup>13</sup> 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<sup>14</sup>. 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 it 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

<sup>14</sup> 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.”<sup>15</sup> 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.

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<sup>15</sup> 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 - 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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