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A Comprehensive MacroEconomic Uncertainty Measure for the Euro Area and its Implications to COVID-19

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ABSTRACT: This paper develops a new data-driven metric to capture MacroEconomic Uncertainty (MEU) in the euro area. The measure is constructed as the conditional volatility of the unforecastable components of a large set of time series, accounting for the monetary union as well as cross-country heterogeneity. MEU exhibits the largest spike at the time of the COVID-19 outbreak and is noticeably different from other more financial-oriented and policy-driven uncertainty measures. It also reveals a significant increase in inflation uncertainty in 2021-2022. Our BVAR-based analysis shows that an unexpected increase in the MEU has a negative and persistent impact on euro area's industrial production, accounting for 80 percent of its reduction during the first wave of COVID-19, therefore supporting the interpretation of COVID-19 shock as a macroeconomic uncertainty shock. Public debt increases in response to this uncertainty shock. Finally, an increase in MEU negatively affects Emerging Europe countries, contributing the most to the decline in their economic activity during this COVID-19 period.

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A Comprehensive MacroEconomic Uncertainty Measure for the Euro Area and its Implications to COVID-19

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1 Introduction

"*There is no doubt that the economic situation we face today is characterized by profound uncertainty. Looking into the future has rarely been harder.*"

Christine Lagarde (President of the ECB), June 13th, 2020.

The impact of uncertainty was a crucial issue during the Global Financial Crisis (GFC) and most recently in light of the COVID-19 outbreak, which is well reflected in the above-mentioned quote by Christine Lagarde, the President of the ECB. Nevertheless, the empirical evidence on the role of uncertainty shocks on euro area's real economic activity in the context of COVID-19 is still limited. This is partly because uncertainty is not directly observable, therefore, needing to rely on some proxies to quantify its impact, but also given the characteristics of this shock. To this end, we develop a new measure to trace the evolution of macroeconomic uncertainty in the euro area covering this episode. The measure allows us to compare the magnitude of macroeconomic uncertainty during the COVID-19 to other historical episodes. In addition, we quantify the role played by this specific shock to macroeconomic variables in euro area, compared to other possible alternative measures of uncertainty, in recent macroeconomic fluctuations. Lastly, the measure also captures the post-first wave and the "return to normality", where the effects of monetary, (national and euro area-wide) fiscal, and supervisory policies may have helped curb uncertainty.

In this paper, we specifically utilize the feature of the euro area as a monetary union to measure its aggregate macroeconomic uncertainty. To do so, we follow Jurado et al. (2015) to exploit a large set of macroeconomic and financial variables from its 19 member countries together with those at the euro area level (for example, several bilateral exchange rates with Euro, euro area bond yields and money market rates at different maturity, monetary aggregates, etc).[1] The measure, therefore, does not simply depend

[1] Croatia, which joined the euro area on Jan 1st, 2023, is not included in our analysis.

on a single observable economic indicator (as stressed in Grimme and Stöckli, 2018). We hence contribute to the literature on measuring macroeconomic uncertainty in the euro area with a data-rich objective measure of uncertainty. Our measure complements to survey-based indicators (such as, Survey of Professional Forecaster's (SPF) density forecasts) as well as other subjective forecasts of market participants, newspaper-based indicators, or those using only stock prices (stock volatility), *etc.*

Specifically, we calculate this new measure, as the euro area aggregated measure of MacroEconomic Uncertainty (labeled as *MEU*), by first estimating the volatility of the unexpected forecast errors for each country-specific variable from 19 countries as well as for each euro area-level variable. Then we aggregate over these individual uncertainty measures to obtain the macroeconomic uncertainty for the euro area. By doing so, we take into consideration the inner heterogeneity of the sample of countries, but also common euro area variables are included. The data are in monthly frequency and cover the period from 2003 to 2021-2022. We then draw meaningful comparisons across countries and with more financial-oriented uncertainty measures such as the euro area version of VDAX (EAVSTOXX), the Country-Level Index of Financial Stress (CLIFS) by Duprey and Klaus (2015), Composite Indicator of Systemic Stress (CISS) by Holló et al. (2012). We also compare our measure with the Economic Policy Uncertainty (EPU) for the euro area (EPUEA) from Baker et al. (2016).

In addition, we make use of an euro area Bayesian VAR (BVAR) to analyze the impact of an unexpected increase in uncertainty, using a Cholesky identification as considered in Bloom (2009) and Jurado et al. (2015) to ease comparison. Through the lens of this model, we investigate how possibly the COVID-19 shock has impacted the economy through macroeconomic uncertainty, also compared to alternative uncertainty indices. We also look at the responses of debt and the impact of euro area uncertainty on Emerging Europe economies. Ultimately, we also extend the sample to 2022 to analyze the "post-COVID-19" MEU index and thus check the robustness of our results.

Our results show noticeable differences in the dynamics of our macroeconomic uncertainty measure in comparison with other indices. Also, we find significant dissimilarities during the GFC and sovereign debt crisis compared to the most recent COVID-19 shock. Our index increased by 40 percent (i.e, moving from around 0.95 to 1.33) in a quarter, between January 2020 and April 2020, and declined only in October 2020 to pre-pandemic levels. For an informative comparison of the magnitude, the historical average before 2020 was of 0.86 and between mid-2007 and the end of 2010 being of 0.93.[2] Our measure also reveals a significant increase in *inflation* uncertainty in 2021-2022.

Importantly, other popular uncertainty measures, more related to financial stress, are not always tightly linked to uncertainty about macroeconomic fundamentals. These are less of service in empirically explaining the drop in economic activity in the recent COVID-19 episode. Differently, our measure, as tailor-made for measuring macroeconomic uncertainty in the euro area, explains a much larger share of this reduction in economic activities. Specifically, we show that most of the substantial drop in industrial production in 2020 can be explained *only* by our macroeconomic uncertainty shock, e.g. accounting for about 80 percent of the decline. The percentage is also much larger, for instance, than its contribution to the decline during GFC/sovereign debt crisis. This result hence favors the interpretation of the COVID-19-induced shock as an uncertain shock, echoing the finding of Miescu and Rossi (2021) and Dietrich et al. (2022) for the US. We also find that in response to an increase in MEU, public debt increases and only fade away gradually. Finally, we show that a shock to MEU negatively affects Emerging European countries, contributing the most to the decline in their economic activities during this COVID-19 period.

The paper is structured as follows. Section 2 provides a brief literature review focusing on macroeconomic uncertainty. Section 3 describes the data and provides the empirical methodology following Jurado et al. (2015). Section 4 presents the measure of

[2]In the GFC period, MEU spikes from 0.86 in mid-2007 to 1.1 in end-2009, before falling to 0.88 in end-2010.

MEU in the euro area , while section 5 analyses the impact of macroeconomic uncertainty shocks from a BVAR model perspective. Section 6 concludes.

2 Literature review

There is a large literature on the measure of uncertainty and its impact, especially for advanced economies. While we pay more attention here to indices based on objective measures, a more extensive review of other methodologies to construct uncertainty measures, such as a survey-based or news-based approach, can be found in Jurado et al. (2015). We also do not look specifically at financial uncertainty measures *à* la Ludvigson et al. (2015) and their impact (see Colombo and Paccagnini (2020) among others), or economic policy uncertainty (EPU) index by Baker et al. (2016), or uncertainty at the firm, industrial or sectoral level as discussed by Castelnuovo et al. (2022) and Bachmann et al. (2013).[3] Here, we mainly cover the relevant contributions as foundations of our analysis and key applications, moving later to a macro-uncertainty analysis more specific to the euro area and the literature on COVID-19-induced uncertainty.

Uncertainty: Starting with the influential work of Bloom (2009), the author develops a model with a time-varying second moment using firm-level data for the US, then uses it to simulate a macro uncertainty shock. The author finds that stock-market volatility is strongly linked to macro uncertainty. Nevertheless, this is not always the case for euro area countries, particularly in recent times as will be shown in our analysis. Instead, Jurado et al. (2015) indices account for both macro and financial variables, and estimate the macroeconomic uncertainty as the conditional volatility of the unforecastable component of the future value. In a VAR exercise following Bloom (2009), they show that macro uncertainty shocks have more substantial effects on production and hours worked than stock market volatility shocks. Caldara et al. (2016) also confirm in their VAR

[3]See for instance, Ferrara et al. (2017) for a comprehensive comparison of the most widely used uncertainty measures.

exercise that macro uncertainty shocks are an important source of macroeconomic disturbances and they have even more substantial effects on the macroeconomy if combined with financial shocks.

Ozturk and Sheng (2018) instead look at uncertainty for 45 countries (also building a synthetic aggregate global index) measured by using individual survey data from the Consensus Forecasts, i.e. based on subjective forecasts of market participants. They also separate idiosyncratic and common uncertainty components for each country. The latter is not covered by forecast disagreement of national forecasters for the national economies. Their overall measure for the US has the highest correlation (0.79) with the one constructed by Jurado et al.(2015), and this is due to the common component. Interestingly, only the common uncertainty seems to produce large and persistent negative responses in real economic activity in the US by using a VAR similar to Bloom (2009).

Euro Area Uncertainty: Gieseck and Largent (2016) construct a measure of overall uncertainty, encompassing several indicators of financial market uncertainty, economic policy uncertainty (EPU) and forecast dispersion (i.e., principal components). This measure apparently captures rather the forecastable component. We instead remove this component from the measurement of uncertainty, following Jurado et al. (2015) and measuring macro uncertainty as the conditional volatility of *unforecastable* disturbances.

Bobasu et al. (2021) also used the Jurado et al. (2015) approach to compile a measure of *global* uncertainty, i.e., for fifteen key euro area trade partners, from 1995 to 2019, therefore not including the pandemic period. They show that a global uncertainty shock can have a relevant impact on euro area activity, for instance industrial production declines by around 0.15 percentage points on impact.[4] They also find that economic uncertainty explains a significant part of the variation of euro area industrial production, especially since the global financial crisis. It is good noting that they use an index for

[4]They use as baseline a proxy SVAR methodology but also draw a comparison with a Cholesky identification with global uncertainty placed second after equity prices. The latter setup generates slightly milder dynamics.

external euro area countries (trade partners). This is not comparable with our MEU, which is an internal measure that takes information about euro area members and euro area itself as a whole. It is instead closer in narrative to our interpretation for the spillovers of MEU to Emerging Europe.

On the application for the euro area, Meinen and Roehe (2017) report how uncertainty, measured in different ways, affects negatively investment dynamics in four major euro area countries (Italy, Germany, France, and Spain). They include in the set (implied) stock market volatility, a survey-derived measure of expectations dispersion, a newspaper-based indicator of policy uncertainty, and two indicators for (econometric) unpredictability. In the case of a small open economy in euro area, such as Lithuania, Comunale (2020) also looks at the impact on investments of shocks in uncertainty, by using the index made available by Gieseck and Largent (2016). The author finds an negative impact as in Meinen and Roehe (2017) but in the case of more innovative investments. It is good noting that the uncertainty measures in those papers are defined based on a narrower set of information than the measure proposed here. Lastly, Grimme and Stöckli (2018) make use of such measure based on Jurado et al. (2015), i.e., comparable with ours, for Germany. The impact of uncertainty is also again looked through a VAR model with 6 variables (macroeconomic uncertainty, the DAX stock market index, the EONIA interest rate as a measure for monetary policy, an index for consumer prices (CPI), industrial production and investments). The authors find a non-negligible effect of macro uncertainty on the two real activity variables especially in the short to medium-run.

COVID-19: Our study is also related to the literature that analyzes the COVID-19 from the perspective of uncertainty shocks. Our results speak closely to the evidence found in Altig et al. (2021) for the US, comparing different uncertainty measures including one built from Jurado et al. (2015). In a Cholesky-identified VAR model for the US, a COVID-19-size uncertainty shock leads to a drop in industrial production

of between 12 percent and 19 percent (as percentage deviation from trend). By using different measures compared to ours for the US,[5] Baker et al. (2020) find also a year-on-year contraction in the US real GDP of nearly 11 percent as of 2020Q4 (in a 90 percent confidence interval extending to almost 20 percent).

Our result is also in line with the findings of Miescu and Rossi (2021) who show for the US that the COVID-19-induced shock can be interpreted as a structural uncertainty shock. Their evidence seems to align with our interpretation of the MEU being better at capturing the COVID-19 crisis. The IRFs based on their COVID-19-induced shock closely resemble those of an uncertainty shock but they are inconsistent with 'news'-type shocks, sentiment or various credit market indicators. Hence, they also exclude other potential first-order structural interpretations such as 'expectation' or 'financial' shock in the case of COVID-19. Similarly, Dietrich et al. (2022) argue that uncertainty shock is the main driver of the expected output loss in the US: without this shock, output falls by a mere 2 percent (rather than by 7 percent).

Nevertheless, the literature in the euro area context is still limited. Pekanov and Schiman (2020) analyze uncertainty in the euro area following the very first wave of COVID-19, by using market volatility (EAVSTOXX).[6] The authors find that, after an initial spike, uncertainty (measured by EAVSTOXX) levelled off more quickly than in the case of the GFC and cause a small macroeconomic damage.[7] Pellegrino et al. (2021) then shows that the impact of financial uncertainty shocks on the euro area macroeconomy (based on the VSTOXX index, a high-frequency measure of the implied volatility of the EAVSTOXX) increases at times of pessimistic expectations on the outlook, as in the case of the first COVID-19 wave. They estimate a loss of industrial production by

[5]The uncertainty measures considered in Baker et al. (2020) are: stock market volatility, newspaper-based economic uncertainty, and subjective uncertainty in business expectation surveys

[6]The EPU, Twitter-based Economic Uncertainty Index and business expectations are also described, albeit not used in the VAR application.

[7]They use the EAVSTOXX, as preferred measure, in a VAR together with 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 for the applications are from January 1999 to August 2020.

9.2% at peak due to financial uncertainty shocks. The issue with the market volatility is, however, that it mainly captures financial-related uncertainty and thus does not well capture the COVID-19-induced uncertainty, as we show below. Our measure suggests an even larger negative impact of macroeconomic uncertainty on the economy during the first wave of pandemic. Such a difference emphasizes the importance of measuring macroeconomic uncertainty when assessing its impacts on the macroeconomy.

3 Data and Methodology

This section first presents a large monthly database that we construct for the euro area. Second, it discusses the methodology to measure the macroeconomic uncertainty. Last, it describes the Bayesian VAR model specification to evaluate the impact of uncertainty shocks.

3.1 A large monthly database on euro area

We first construct a large database with almost **1,500** monthly macroeconomic and financial indicators, encompassing 19 euro area countries. Our sample starts from January 2003 with data coming from different sources: Eurostat, OECD, ECB SDW, and BIS. The detail of the dataset is presented in the Online Appendix A.

The database includes both country specific data and euro area-wide data. Regarding the former, to facilitate the presentation, we categorize the country-specific indicators into four groups. First, data relates to real economic activity: industrial production and its components, car registration (including different types of vehicles), and total turnover index (in real term) (with different type of retail sales), unemployment rates, hours, and trade with world (i.e., import and export for different types of goods). Second, data reflects price movements: producer price index and HICP (and their components), nominal effective exchange rate, long term rate, and wages. Third, survey data and

leading indicators: economic sentiment indicator, confidence indicators components, and leading indicators. Last but not least, country-specific financial data including loans, deposits, debt securities (at different maturities), share prices, and spreads.

For the euro area-wide database, we include euro area bond yields and money market rates at different maturity, Dow-Jones euro area Stoxx index (and its components), monetary aggregates M1, M3, and currency in circulation, and several bilateral exchange rates with Euro. Hence, the computed macroeconomic uncertainty index for the euro area consider the inner heterogeneity of the sample of countries, but also include common components.

3.2 Measuring euro area macroeconomic uncertainty

As discussed above, we base on the approach proposed by Jurado et al. (2015) to construct an objective and data-driven measure of euro area macroeconomic uncertainty, taking into account its inner heterogeneity.

Briefly, the construction includes two steps.[8] First, we measure the h-period ahead uncertainty for each monthly variable y_{it} in the database aforementioned. This is achieved by the conditional volatility of the *unforcastable* component of the future value

$$U_{it}(h) = \sqrt{E[(y_{it+h} - E(y_{it+h})|I_t)^2|I_t]} \tag{1}$$

where $E(y_{it+h})|I_t$ is the expected value of y_{it+h} conditional on the information set at I_t, i.e., the forecastable component. In order to remove the forecastable component, we specify an approximate factor structure as in Bai and Ng (2006)

$$y_{it+1} = \beta_i(L)y_{it} + \alpha_i(L)\mathbf{Z}_t + v_{it+1} \text{ with } v_{it} = \sigma_{it}\epsilon_{it} \text{ and } \epsilon_{it} \sim N(0,1) \tag{2}$$

where $\mathbf{Z}_t$ capture common factors. For each element of $\mathbf{Z}_t$ is assumed to be serially

[8] The reader is referred to Jurado et al. (2015) for a detailed presentation of the methodology.

correlated and well represented by a univariate AR(1) process,

$$z_t = \varphi z_{t-1} + v_{zt} \text{ with } v_{zt} = \sigma_{zt}\epsilon_{zt} \text{ and } \epsilon_{zt} \sim N(0,1) \tag{3}$$

To capture the uncertainty of y_{it}, we apply the stochastic volatility process. Specifically, the log volatility σ_{it+1} of the idiosyncratic shock v_{it} is allowed to be time-varying:

$$log(\sigma_{it+1})^2 = \gamma_i + \phi_i log(\sigma_{it})^2 + \tau_i \eta_{it+1} \tag{4}$$

where $\eta_{it+1} \sim N(0,1)$. Similarly, the log volatility σ_{zt} of each common shock $v_{zt} = \sigma_{zt}\epsilon_{zt}$ is modelled as:

$$log(\sigma_{zt})^2 = \gamma^z + \phi^z log(\sigma_{zt-1})^2 + \tau_z \eta_{zt}, \text{ where } \eta_{zt} \sim N(0,1). \tag{5}$$

The 1st-period-ahead error is $V_{it+1} = y_{it+1} - E(y_{it+1})|I_t = v_{it+1}$ whose volatility is σ_{it+1}. From which we can obtain the conditional volatility of the h-period-ahead error $E[(V_{it+h})^2|I_t]$ recursively from the volatility of one-step-ahead prediction errors: $E[(V_{it+1})^2|I_t]$.

In the second step, we construct the macroeconomic uncertainty for the euro area by aggregating individual uncertainty measures in the database, i.e., variable by variable:

$$U_t(h) \equiv plim_{N_y \to \infty} \sum_{i=1}^{N_y} w_i U_{it}(h) \equiv E_w[U_{it}(h)] \tag{6}$$

We use simple average to obtain our baseline aggregate uncertainty, but also do a robustness check with the first principal component of the individual uncertainty measures.[9]

[9]Please note that the MEU for the euro area is not built as an average of members' uncertainty but taking into consideration all country-specific and common-euro area variables together. This is to extract all the information from a wider set of data. The country-specific MEU indices, reported in appendix and discussed in the text, are calculated as average of *only* the specific variables' uncertainties for that country and euro area common exchange rates.

3.3 BVAR application

To look at the impact of uncertainty on macroeconomic variables, with a special interest to the COVID-19 period, we make use of a simple BVAR, taking two Cholesky orderings from the literature to ease comparison.[10] Specifically, these order uncertainty as either before or after variables capturing economic activities, i.e., we look at this variable as either mostly exogenous or endogenous at time t.

Our baseline is here defined as in Bloom (2005), with the Cholesky ordering as follow:

$$\begin{bmatrix} log(Stock\ price) \\ Uncertainty \\ Interest\ rate \\ log(Price) \\ Unemployment\ rate \\ log(Industrial\ production) \end{bmatrix}$$

Christiano, Eichenbaum, and Evans (2005) is treated in our paper as an alternative identification for robustness puroposes.

$$\begin{bmatrix} log(Industrial\ production) \\ Unemployment\ rate \\ log(Price) \\ Interest\ rate \\ log(Stock\ price) \\ Uncertainty \end{bmatrix}$$

[10] Specifically, we are interested in investigating the impact of our novel measure of macroeconomic uncertainty while controlling for the same identification as used in previous studies, to ease comparison. One can also consider alternative identifications such as sign restrictions or identification with heteroscedasticity, but we leave these for future explorations.

For the BVAR exercises we use monthly data for these series (2003m6-2021m11) with checks compared to 2019 (pre-COVID-19) and post-first wave (up to the end of 2022).[11] We use 3 months-period ahead uncertainty measures with other horizons as checks. We apply 4 lags,[12] the constant is included, and the distribution is Normal-Wishard.

As robustness checks, we use shadow rates as in Krippner (available up to 2021m9) instead of Euribor 1y for interest rates and look at the setup with core HICP or without unemployment.[13] Lastly, we employ a BVARX with the inclusion of the Kilian's global economic activity index (Kilian, 2009; 2019; and Kilian and Zhou, 2018) as an exogenous variable to count for possible impacts of global factors into the euro area economy.[14] Nevertheless, it is worth noting that we already take into account "common factors" in developing uncertainty measure, which would likely capture also the influences of global factors.

In another exercise, we include debt-to-GDP ratio (or real debt) in the baseline framework to study the fiscal-related implication of uncertainty shocks. The fiscal variable is ordered last in the Cholesky identification, i.e., shocks to debt-to-GDP affect other variables with a lag while other shocks can affect debt-to-GDP contemporaneously.

Lastly, we analyze the impact of macroeconomic uncertainty, measured by the MEU, to Emerging European economies (EMEU)[15] with block exogeneity, i.e., their own series cannot influence uncertainty in the euro area. In this case, we have both euro area and country/region specific variables, for the latter we include industrial production, HICP inflation, Euribor 1y and the uncertainty index. The country/region specific variables are their own industrial production and HICP inflation.

[11] The full set of results with data up to 2020 (first COVID-19 wave) is available upon request.

[12] The number of lags applied is selected by the widely applied criteria BIC or AIC.

[13] An additional check that also excludes interest rates is available upon request.

[14] The index is derived from a panel of dollar-denominated global bulk dry cargo shipping rates and may be viewed as a proxy for the volume of shipping in global industrial commodity markets. See Kilian and Zhou (2018) for a discussion on advantages of this index compared with measures of global real GDP or global industrial production.

[15] EMEU consists of 6 countries: Bulgaria, Czechia, Croatia, Hungary, Poland, and Romania. As reported above, Croatia is not included in euro area in this paper, but it is part of the EMEU.

4 MacroEconomic Uncertainty for the euro area (MEU)

Our index for MacroEconomic Uncertainty for the euro area (MEU) is shown in Figure 1. The measure indicates a spike in uncertainty driven by the GFC and partially by the sovereign debt crisis. However, they both reflect larger uncertainty in financial markets rather than in macroeconomic variables. This is indeed better captured by different kind of uncertainty indicators as we see in Figure 2. Our MEU is able, instead, to expose very well the macroeconomic uncertainty spike due to the first wave of COVID-19 in 2020, which is in line with the notion that the COVID-19 shock is both large and unforeseeable. Volatilities in economic activities surged substantially, reflecting uncertainty in the nature of virus together with its scale of infection and fatalities, in capacity of healthcare facilities, in vaccines development, as well as the uncertain impacts of stringency measures on firms production and their future performance. Our index moved from around 0.95 to 1.33 in the space of a quarter, between January 2020 and April 2020, and declining only in October 2020 to pre-pandemic level. For an informative comparison of the magnitude, the historical average before 2020 was of 0.86 and between mid-2007 and the end of 2010 being of 0.93. Still, at some periods during the sovereign debt crisis, the maintenance of the Euro was also at risk, possibly creating large macro uncertainty (beyond financial uncertainty). However, we do not see a spike in the aggregate MEU (only in some countries like Greece as discussed below). This is likely because of three main reasons: first, the measure uses an extensive variety of series and for all the members, hence uncertainty could have been materialized only in a restricted set. Secondly, during the sovereign debt crisis, some macro volatilities could have been predicted, therefore not being considered in the MEU, which is the conditional volatility of the unforecastable components. Last but not least, policy actions could have helped stabilize the spillover of sovereign debt crisis into macroeconomic uncertainty.

Given that the measure is constructed from a large dataset encompassing euro area

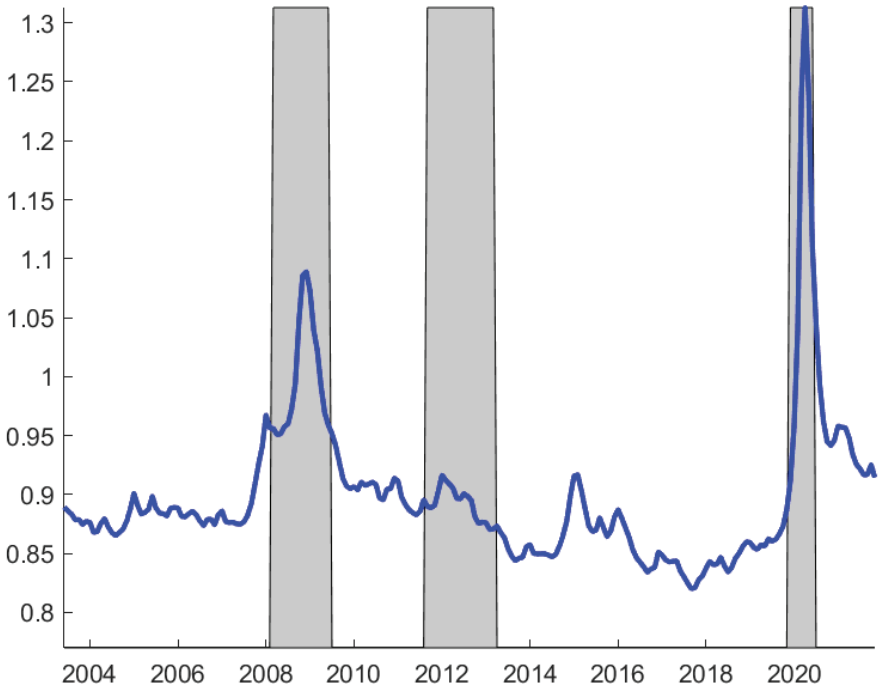
countries, it can be considered a common macro-uncertainty measure for the area. In addition, we can construct the country-specific macro-uncertainty index by aggregating the country-variable specific uncertainty measures (as listed in Table 1) together with uncertainty of bilateral exchange rates between euro and other currencies, as shown in Online Appendix in Figure 13. These country-specific measures, however, are computed by using a much smaller number of series and the coverage varies across countries (see Figure 12 in Online Appendix). Nevertheless, jointly estimating all variables in the euro area allows us to utilize information from other countries in identifying common factors affecting the members (regional/global factors). As a result, the country-specific measure of uncertainty will capture both country-specific uncertainty and common uncertainty in the euro area. By comparing the country macro-uncertainty measures, we can feature differences between them and with the overall euro area MEU. In general, the country-specific MEUs are relatively close on average, between 0.81 and 0.93 but the differences increase during times of stress.[16] The heterogeneity is evident during the sovereign debt crisis, as the MEU for Greece did indeed spike more than the aggregate. A related situation happened in Cyprus afterwards, with a clear idiosyncratic component due to its own banking crisis in 2012-13. Interestingly, the heterogeneity can be spotted also for the MEU during the COVID-19 crisis.[17] For instance, Malta and the Baltic states were initially less affected, which is then reflected in a much smaller MEU. Nevertheless, in the Baltic States the MEU has approximately the same level as during the GFC when they were especially hit hard and their exit from euro area/fixed exchange rate regime was a real possibility (Purfield and Rosenberg, 2011).

Then we compare the MEU with some well-known and used measures in the literature and their correlations, as in Figure 2. The EAVSTOXX captures the volatility of euro area stock market and part of a consistent family of volatility indices (e.g., the VDAX

[16]Moreover, the volatility within countries is also heterogeneous, spanning from 0.64 to 1.70.

[17]The MEU in 2020 peaked in April and ranged from 0.94 to 1.64 across member states, while the euro area MEU was 1.33.

Figure 1 – The MacroEconomic Uncertainty for the euro area (MEU)



Note: Figure shows the 3-period ahead macroeconomic uncertainty. Its correlations with the 1-period, 6-period, and 12-period ahead MEU are 0.97, 0.98, and 0.89. The shaded areas represent periods of recession in the euro area, based on the chronology of euro area business cycles from EA Business Cycle Network.

as expected volatility in the next 30 days for the DAX, or the VIX based on S&P 500 index options). The Composite indicator of systemic stress (CISS) for the euro area, as described in Holló et al. (2012), is an indicator which uses information from equity, bonds, exchange rate volatilities, banks and payments systems, and weights more when stress happens in several markets at the same time.

The CLIFS is based on Duprey and Klaus (2015) and includes six, mainly market-based, financial stress measures that capture three financial market segments: equity markets, bond markets and foreign exchange markets. They use Markov switching

models to identify episodes with high financial stress, based on these variables, with substantial decline in economic activity. In addition, when aggregating the sub-indices, the CLIFS takes the co-movement across market segments into account. Lastly, we look at the Economic Policy Uncertainty (EPU) for the euro area (EPUEA) from Baker et al. (2016), constructed by extracting newspaper coverage of policy-related economic uncertainty. These indicators are mainly related to financial uncertainty (EAVSTOXX, CISS, and CLIFS), while EPU is more general and covers policy-sensitive news, such as wars, but also the failure of Lehman Brothers, and major news on (common) policies.

As expected, the measure having the biggest spike during the GFC is the EAVSTOXX, while systemic measures like CISS and CLIFS react more during the sovereign debt crisis. In general, the EPU for the euro area is more volatile and seems to capture different events in the time window, including Brexit.

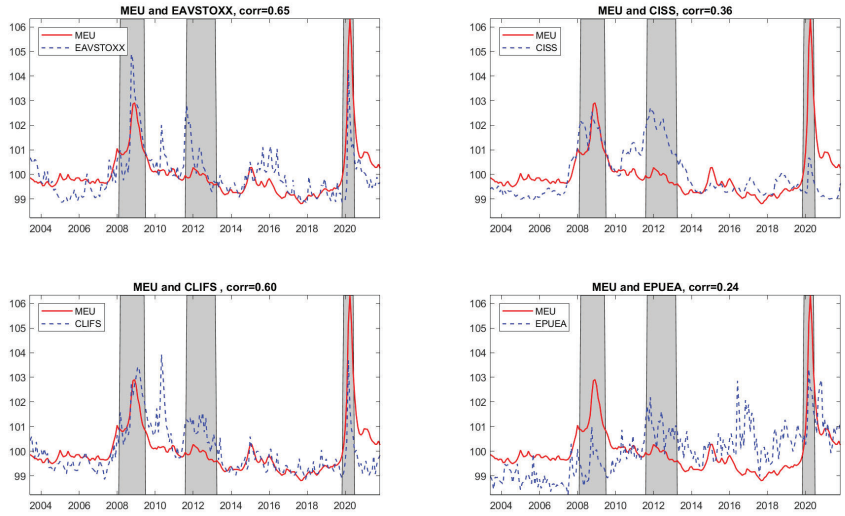
All these measures seem to spike over the first wave of COVID-19, as shown also in Cascaldi-Garcia et al. (2023), however the magnitude is much larger for the MEU. This observation supports for the interpretation of the COVID-19 shock, which was in 2020-21, mostly as a macroeconomic phenomenon rather than purely financial, or related to the overall financial markets. There have been selected cases of stress in assets, especially for transportation sector like airline companies, which are apparently the consequences of rising macro uncertainty.

5 Impact of MEU in BVAR applications

5.1 Impact of MEU shocks on the macroeconomy

We now quantify the macro impacts of an unexpected increase in macroeconomic policy uncertainty. We do so by using a BVAR model as described in section 3.3 with

Figure 2 – Comparison between MEU and other uncertainty indicators



Source: CISS and CLIFS are from ECB SDW, EAVSTOXX from *https* : *//www.stoxx.com*, and EPUEA from the *https* : *//policyuncertainty.com/*

our measure of macroeconomic uncertainty.[18] The main objective of this exercise is to understand the reaction of industrial production (IP) to an uncertainty shock and how much this contributed to a decline in the former during the first waves of COVID-19 compared to other events in the recent past.

Figure 3 shows the baseline impulse response functions (IRFs) in response oto a shock to the MEU. Here we draw a comparison between a sample up to 2019 and including all data until the end of 2021. For the full sample to end of 2021, we find that an increase in the MEU by one standard deviation has a large and significant negative impact on IP in the short-run, up to 1 year after the shock, and it is relatively short-lived. The shock subtracts around 0.82 percentage points from euro area IP at its maximum impact, i.e., after 3-4 months from the shock.[19] If we look at the IRF pre-COVID-19 instead, the

[18]The full set of IRFs and complete historical decompositions are available upon request. We do not assign the structural interpretation on other shocks, which is not the focus of our study.

[19]The cumulative response is -2.3 percentage points in the first quarter.

magnitude is halved and goes back to zero smoother over time. Such difference mainly reflecting changes in the magnitude of the shock to MEU (the top-center figure), which almost doubles in the full sample to 2021, influenced by increasing uncertainty associated with the COVID-19. The 1-year Euribor rate does not seem to react to the shock in the full sample, but decreases if pre-COVID data are used, reflecting the constraints of monetary policy given the magnitude of the COVID-19 shock. If we look at IRFs in the case of stock prices, HICP, or unemployment, instead, they are almost not significantly different from zero and between 2019 and 2021. If anything, we do find a slight increase in unemployment rate in the full sample partly thanks to policy responses. Meanwhile, the results for HICP are possibly driven by a long period of low inflation in the euro area.[20]

As robustness checks, we use shadow rates as in Krippner (up to 2021m9 given the availability of data) instead of Euribor 1y for interest rates, and the results are robust (see Appendix Figure 14). We investigate also core HICP, instead of headline HICP, and our main outcomes hold (see Appendix Figure 15). Lastly, we employ a BVARX with the inclusion of the Kilian index (Kilian, 2009; 2019; Kilian and Zhou, 2018) as an exogenous variable to count for possible impacts of global factors into the euro area economy. Our main results are confirmed also in this case (see Appendix Figure 16).[21]

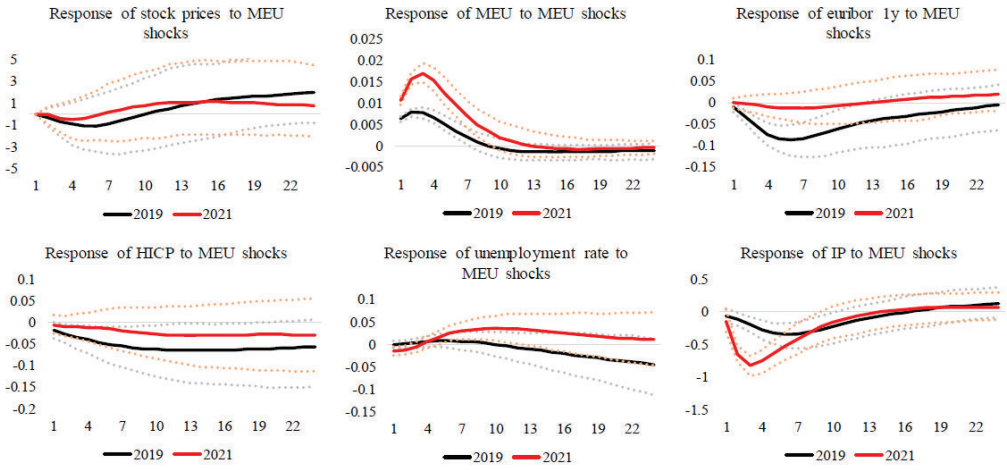
5.1.1 Different specification and alternative uncertainty measures

In Figure 4, we zoom specifically on the IRFs of IP but by using the alternative measures of uncertainty sketched before, compared to the MEU, or the different identification as in Christiano, Eichenbaum, and Evans (2005). We do this exercise by using the data up to 2019 versus 2021. It is clear that the IRFs to a MEU shock are very robust to the alternative identification. Secondly, IP reacts less to a shock in more financially-driven

[20] The comparison across alternatives for the IRFs point estimates for HICP is provided in the Appendix at Figure 17.

[21] The maximum impact of a MEU shock on IP is 0.78 with the inclusion of the Kilian index, compared to 0.82 as per the baseline without it.

Figure 3 – Impulse responses for the baseline: 2019 v 2021



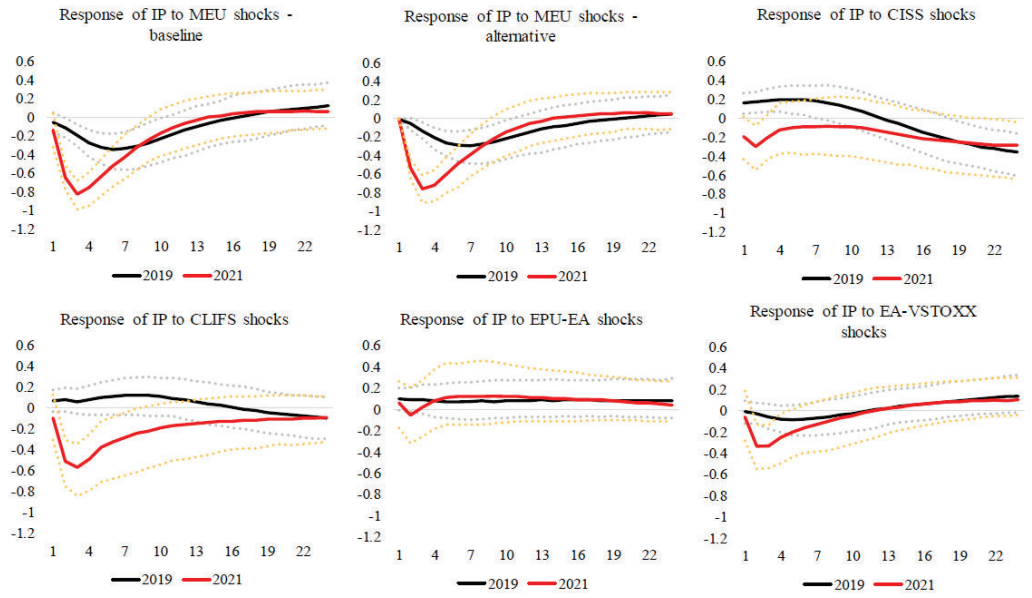
Note: The confidence intervals (dotted) are at 95 percent.

measures, such as CISS, EAVSTOXX, but also in the EPU. As for CLIFS, the IRF is the most similar to the case of MEU, but only when 2020 and 2021 are included. Next, we will evaluate the historical decomposition to quantify the relevance of these measures to the dynamics of industrial production in recent episodes.

5.2 Contribution of uncertainty shocks on recent industrial production dynamics

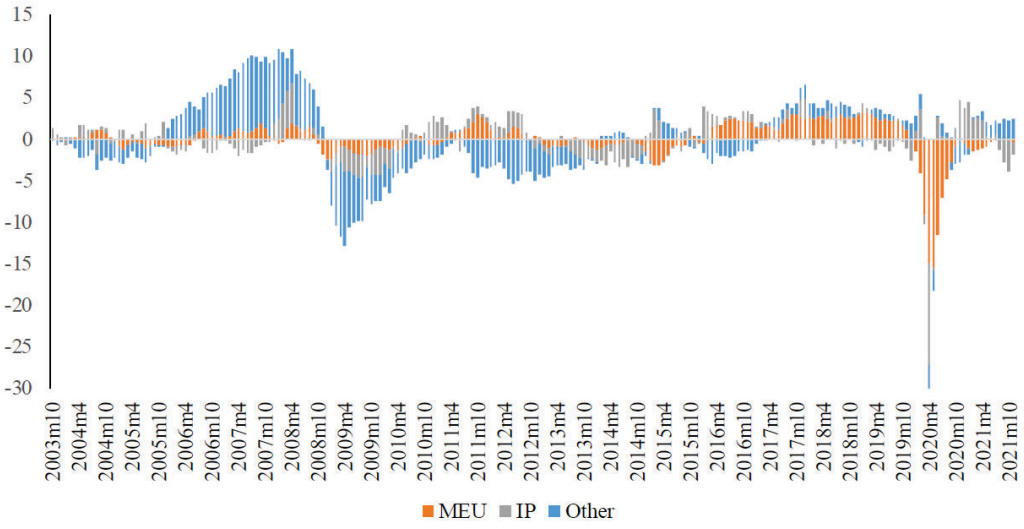
Investigating historical decomposition allows to distill the role played by MEU shocks, and the alternative uncertainty measures, in IP fluctuations over time and especially during the recent COVID-19 shock. Figure 5 shows the complete historical decomposition in the case of the MEU using the baseline identification. For the GFC, MEU shocks play a certain role in the fall of IP, but its share is relative small compared to other factors, while during the period before COVID-19 a lower MEU (as lower uncertainty in macroeconomic variables) had a positive effect on IP. During 2020, the MEU is the

Figure 4 – Impulse responses: impact on Industrial Production (IP): Different specification and alternative uncertainty measures



Note: Figure shows the repose of IP in various exercises. *Top panel*: top-left panel is the baseline response to MEU. Top-center panel is from the alternative specification of Christiano, Eichenbaum, and Evans (2005). Top-right is the response to an expected increase in CISS. *Bottom panel*: bottom-left panel is the response to an expected increase in CLIFS. Bottom-center panel is the response to an expected increase in EPU-EA. Bottom-right is the response to an expected increase EA-VSTOXX shock.

Figure 5 – Historical decomposition: Industrial Production (IP)



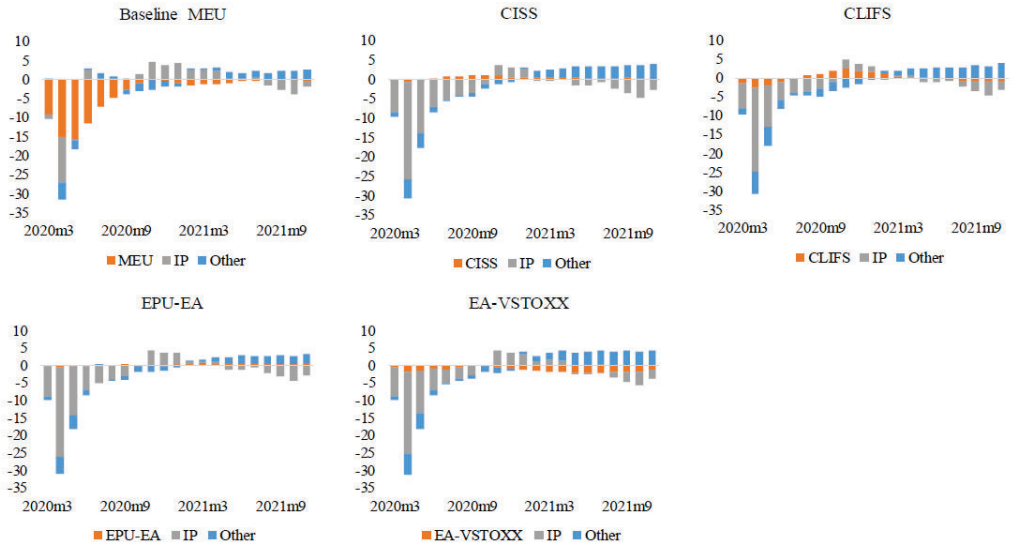
Note: Figure presents the historical decomposition of industrial production over the sample. the orange bar shows the contribution of MEU shocks; the grey bar the contribution of own shocks to industrial production based on the Cholesky-ordering identification; the blue bar the contribution of other shocks.

major contributor to the dip in IP.

Figure 5 presents the decomposition of industrial productions in the COVID-19-related months, with an aim to quantify the contribution of uncertainty shocks. The MEU shocks appears to explain a major part of the decline in IP, while all the other candidates of uncertainty do not seem to make any substantial contribution during this episode. The results are confirmed in Figure 7, where we show the cumulative contributions during the first COVID-19 wave (2020m3 to 2020m8). During the recovery taking part in 2021, both shocks to MEU and EAVSTOXX continue impacting negatively industrial productions, while CLIFS indicates favorable impacts supporting IP's growth.

The second part of 2020 and then 2021 were also the periods in which policy measures have been put in place to counteract the COVID-19 shock, lowering uncertainty overall.

Figure 6 – Historical decomposition: Industrial Production (IP)



Note: Figure presents the historical decomposition of industrial production over the sample. the orange bar shows the contribution of MEU shocks; the grey bar the contribution of own shocks to industrial production based on the Cholesky-ordering identification; the blue bar the contribution of other shocks.

As a result, the "other" component began contributing positively to the change in IP.[22]

5.3 Impact on public debt

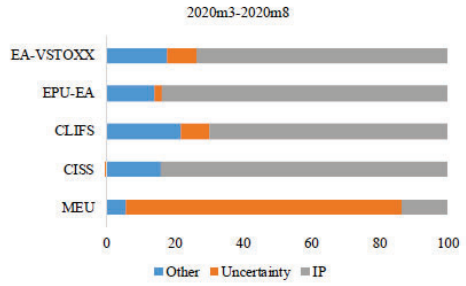
It is interesting to study the impact of macroeconomic uncertainty on debt over GDP.[23] We find that a shock to MEU increases debt over GDP with the peak reaching after approximately 1 year, and this response is very persistent over time. Also, the MEU seems to be a major component to debt dynamics both in good times (when debt over GDP decreased) and bad times. This is especially relevant after 2016.[24] This is in line with the observation that discretionary measures, together with automatic stabilizers,

[22] If we include the Kilian index in a BVARX, the historical decomposition of IP is very much comparable to the baseline results (see Appendix Figure 19).

[23] We also conduct a robustness check with total debt, and the results are in line.

[24] See historical decomposition over the full sample in the Online Appendix at Figure 21

Figure 7 – Historical decomposition: Industrial Production (IP) 1st wave COVID-19



Note: Figure shows the share of different factors on explaining industrial production fluctuations during the 2020m3-2020m8.

were put in place during COVID-19 times. Public deficit and debt soared as governments massively supported their economies to mitigate the impacts of the pandemic, reaching 98 percent for the euro area at the end of 2020 from 84 percent in 2019 (see Eurostat, 2021).[25]

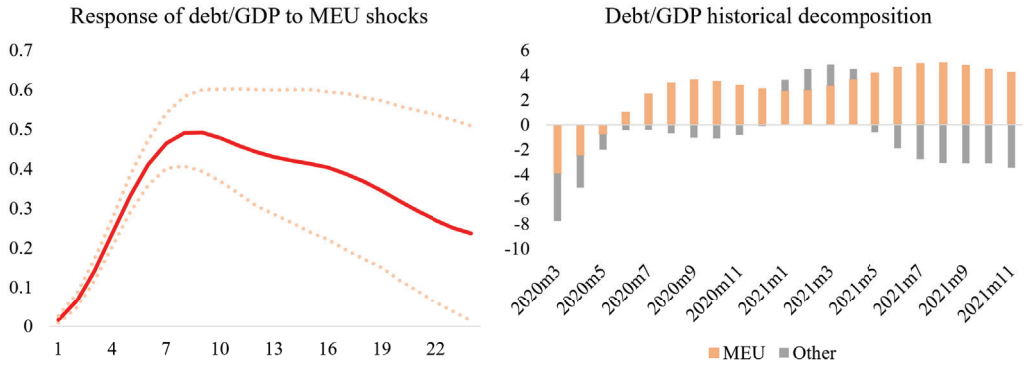
5.4 Impact on Emerging European economies

Given economic linkages between EA countries and Emerging European economies (EMEU), it is interesting to analyze the impact of macroeconomic uncertainty shock to these countries. We do so by using a BVAR model with block exogeneity, i.e., the variables of EMEU do not influence euro area variables.[26] We find similar impacts to these countries, albeit slightly larger response of industrial production. The results for HICP almost mimic the one for the euro area (Figure 9). Figure 10 indicates that the MEU contributed considerably to the drop in EMEU's industrial production, but the role of other shocks, including the shocks to EA's IP, is also important.

[25] https://ec.europa.eu/eurostat/documents/2995521/11563047/2-22042021-AP-EN.pdf/19f07f1a-49dd-29be-fbf0-857dc423519f?t=1619026271193

[26] Nevertheless, the results are robust when removing block exogeneity restriction, the full set of outcomes for this check is available upon request.

Figure 8 – Response of debt-to-GDP to uncertainty shocks and its historical decomposition



Note: Figure shows the share of different factors on industrial production fluctuations during the 2020m3-2020m8.

Figure 9 – Impact to EMEU using with block exogeneity

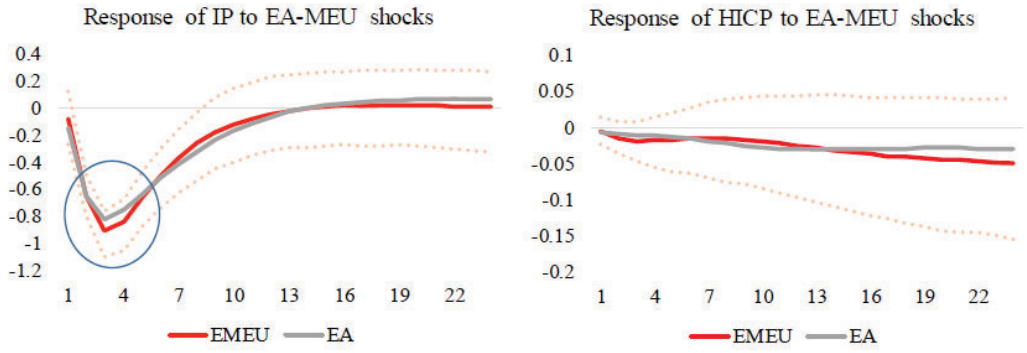
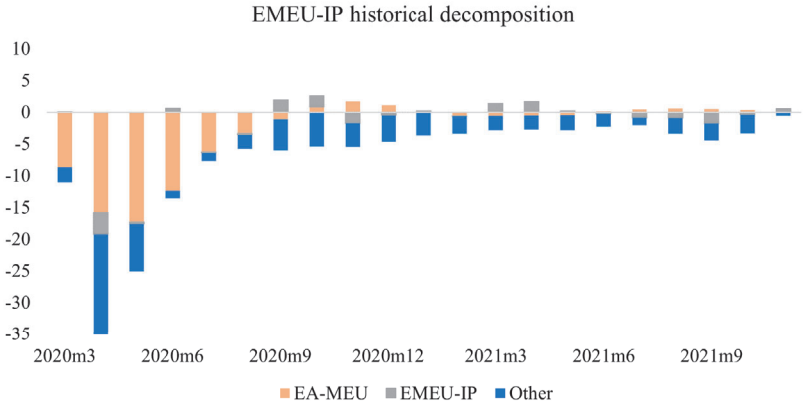


Figure 10 – Impact to EMEU: historical decomposition



Note: Figure presents the historical decomposition of industrial production over the sample. the orange bar shows the contribution of EA-MEU shocks; the grey bar the contribution of own shocks to industrial production based on the Cholesky-ordering identification; the blue bar the contribution of other shocks.

5.5 COVID-19 in VARs

There have been different attempts to count for the COVID-19 shocks in (B)VARs. For instance, while Lenza and Primiceri (2021) do not include a factor that explains COVID-19 macroeconomic behaviour (as for instance, an uncertainty index like the MEU) but they increase the variance of the shocks from 2020 onwards that decays over time. This works like an "implicit" increased volatility, indicating higher uncertainty. We have made this path explicitly and, as shown in the sections above, does explain much of the IP variation. If we do not include any uncertainty measure, then the contribution in COVID-19-times lies all on IP shocks (and partially on stock prices).[27] Interestingly, our results including the MEU in COVID-19 times are in line with the recent work by Ng (2021) and Davis and Ng (2022), where measures of uncertainties are included to take into consideration big "disaster-type" shocks, as COVID-19.

[27]The result is available upon request.

5.6 Post-COVID-19 macro uncertainty

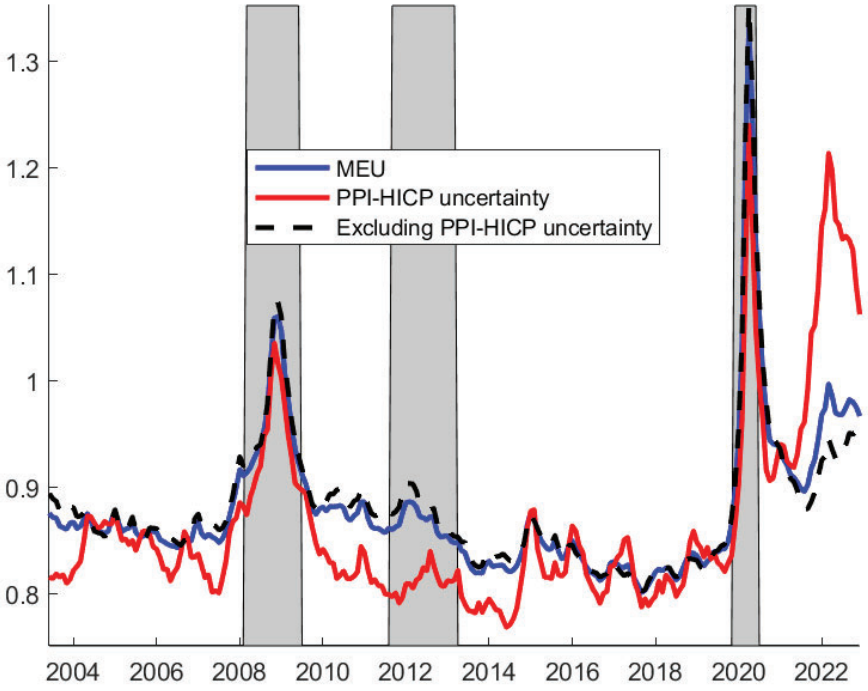
This section extends the sample to 2022m12 to cover the "post-COVID-19" period, which also includes the episode of inflation surge. As shown in Figure 11, there are two important remarks. First, the estimate of MEU in the pre-COVID-19 and during the COVID-19 remains similar with those in Figure 1, indicating the robustness as well as the stability of our measure. Second, importantly, we find that after falling quickly from the 2020m4 peak, the MEU bounces back at the end of 2021 and lingers at a level much higher than the pre-pandemic the historical average. To understand this behavior and the role of price/inflation uncertainty, we categorize the individual series into two groups: one includes the uncertainty series of producer price indices and HICP indices versus the rest. As shown in Figure 11, the increase of MEU in 2021 appears to be mainly driven by the increasing inflation volatility observed in the euro area.[28] Our results therefore complement the recent findings of Yotzov et al. (2023) that document the increases in inflation uncertainty by using firm-level data from a large and representative survey of UK businesses.

The resulting IRFs to industrial production, and all the other variables, are robust to the one shown in the previous sections (i.e., with data up to 2021) both for the baseline and for the alternative identification (see Online Appendix Figure 24). As for the historical decomposition, after 2021 the MEU contributes to changes in industrial production negatively, indicating the negative impact of inflation uncertainty on business cycles, as in line with Yotzov et al. (2023) who argue that inflation uncertainty may be important for understanding firm performance. However, as somewhat expected, the magnitude of the contribution, it is much smaller than during the first wave of COVID-19 (peaked at -2.7, compared to -15 during COVID-19, as shown in Online Appendix Figure 25).[29]

[28] Euro area's HICP inflation reached above 4 percent in 2021m10, continuing rising to more than 10 percent in 2022m10 before slowly decreasing.

[29] As per IRFs and historical decomposition of IP, including a "global factor" proxied by the Kilian

Figure 11 – The MacroEconomic Uncertainty for the euro area (MEU)



Note: The figure shows the 3-period ahead macroeconomic uncertainty between 2003m6 and 2022m12. The shaded areas represent periods of recession in the euro area, based on the euro area Business Cycle Network (euro areaBCN) - Chronology of euro area Business Cycles. "PPI-HICP uncertainty" is the uncertainty index only considering these components across countries.

Finally, we compare our constructed MEU for the euro area with the macroeconomic uncertainty index from Jurado et al. (2015) for the USA with data up to 2022. It is evident how the two indices basically coincide from the COVID-19 outbreak onwards. This is an additional sign that this specific event was a *global* shock and this has resulted in a very comparable uncertainty measurements in both regions. Interestingly, also the post-COVID-19 dynamics are very similar (see Appendix Figure 26).

index does not affect our main findings neither with data up to 2021 nor with the extension to 2022. The full sets of results with the Kilian index is available upon request.

6 Conclusion and policy considerations

We propose a new data-rich measure of macroeconomic uncertainty for the euro area, called MEU. Our measure complements other indicators of risk and uncertainty, with our index coming to be more persistent and spiking mainly in important events and especially during the first phase of COVID-19. Meanwhile, other measures are more volatile, spiking also in periods of relatively macroeconomic tranquility. We show that shocks to MEU explains a large share of reduction in economic activities during the COVID-19 crisis, possibly due to the special nature of this event. In response to this shock, public debt goes up and only fades away gradually. In addition, it affects negatively EMEU countries. Therefore, the MEU index can be instrumental for policy assessment and can be can be added to a rich toolkit of composite indicators for the euro area.

Regarding the future extension, first, it would be interesting to study the potential heterogeneous impacts of uncertainty shocks on euro area member countries. Second, investigating the non-linear/asymmetric effect of uncertainty shocks, as motivated by Paccagnini and Colombo (2020), is also another potential research question. Last but not least, it would be interesting to disentangle and evaluate the impact of euro area regional, country-specific, and global uncertainty as well as between euro area real versus nominal uncertainty.

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Online Appendix

A Appendix: Dataset

We use a large set of almost **1,500** monthly macroeconomic and financial indicators, encompassing 19 euro area countries. The sample is collected from several sources, including Eurostat, OECD, ECB SDW, and BIS.

The *maximum* list of country-specific variables, including 122 variables, is presented in Table 1, which can be categorized into 7 groups as below.

- Industrial productions components
- Labor market indicators: Index of employment, Unemployment rates, hours, and wages
- Prices: Producer Price Index, HICP, and Import price index
- Car registration, Total Turnover Index, and Building Permits
- Trade with world: Import and Export for different types of goods
- Sentiment, confidence, business tendency, and leading indicators.
- Financial data: Nominal effective exchange rate, long-term rate, loans, deposits, debt securities (at different maturities), share prices, spreads.

In addition, the dataset includes 30 financial variables at the euro area level, which is described in detail in Table 2 and summarized as below.

- euro area bond yields and money market rates at different maturity
- Dow-Jones euro area Stoxx components
- Monetary aggregates M1, M3, and currency in circulation
- Several bilateral exchange rates with Euro

There are several remarks about the dataset:

- First, given that the short-term interest rate of each country is highly correlated with the Euribor 3-month from the euro area-level variables, the former is not included in the country-specific variables.
- Second, the availability of the variables is different across countries over the sample period. As shown in Figure 12, most countries have about or more than 60 variables in the list of Table 1, except Cyprus (CY, 29/122 variables), Greece (GR, 30/122 variables), and Malta (MT, 36/122 variables). In total, the dataset has 1470 variables, with 1445 country-specific variables and 25 euro area-level variables.
- Third, we further clean the dataset: for each country, if two variables are highly correlated variables (with a correlation larger than 0.95 in absolute term), only one of them will be kept. As a result, the final dataset has a total of **1330** variables.

Figure 12 – Number of available country-specific variables over the sample period

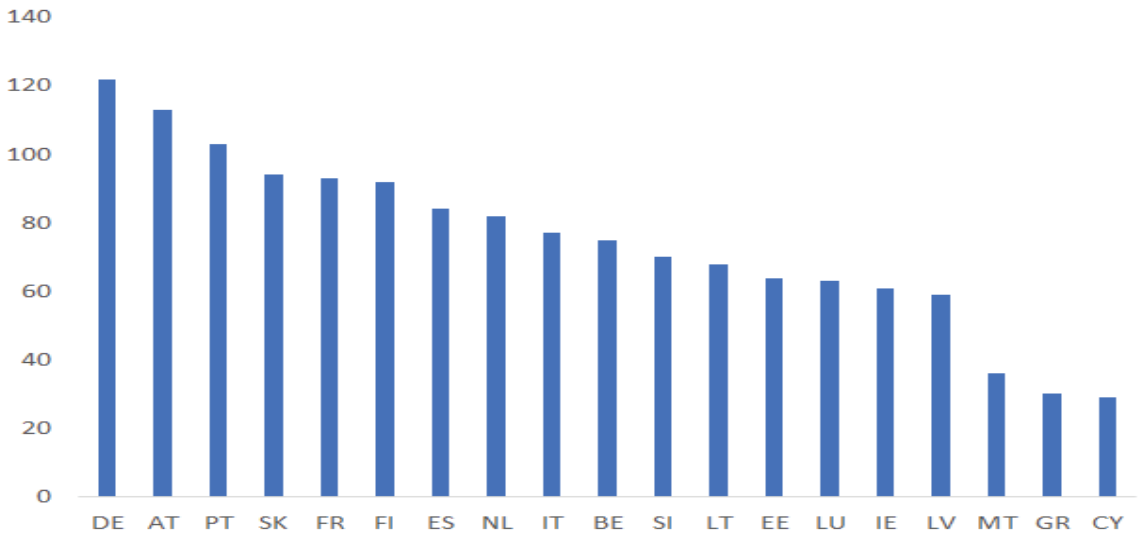


Table 1 – Country-specific variables

No.	Category	Series	Sources
1	Industrial production	Industrial Production Index, Total Industry - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
1	Industrial production	Industrial Production Index, CONSTRUCTION - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
1	Industrial production	Industrial Production Index, MINING AND QUARRYING - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
1	Industrial production	Industrial Production Index, MANUFACTURING - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
1	Industrial production	Industrial Production Index, ELECTRICITY, GAS, STeuro areaM AND AIR CONDITIONING SUPPLY - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
1	Industrial production	Industrial Production Index, All buildings; Eurostat; Working day and seasonally adjusted	Eurostat
1	Industrial production	Industrial Production Index, MIG Intermediate Goods Industry - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
1	Industrial production	Industrial Production Index, MIG Capital Goods Industry - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
1	Industrial production	Industrial Production Index, MIG Durable Consumer Goods Industry - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat

1	Industrial production	Industrial Production Index, MIG Non-durable Consumer Goods Industry - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
1	Industrial production	Industrial Production Index, Consumer goods industry - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
1	Industrial production	Industrial Production Index, MIG Energy - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
1	Industrial production	Industrial Production Index, Total Industry no construction- NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
2	Labor market indicators	Gross wages and salaries, MIG Intermediate Goods Industry - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
2	Labor market indicators	Gross wages and salaries, MIG Capital Goods Industry - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
2	Labor market indicators	Gross wages and salaries, MIG Durable Consumer Goods Industry - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
2	Labor market indicators	Gross wages and salaries, MIG Non-durable Consumer Goods Industry - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
2	Labor market indicators	Gross wages and salaries, MIG Energy - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
2	Labor market indicators	Index of Employment, MINING AND QUARRYING - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat

2	Labor market indicators	Index of Employment, MANUFACTURING - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
2	Labor market indicators	Index of Employment, ELECTRICITY, GAS, STeuro areaM AND AIR CONDITIONING SUPPLY - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
2	Labor market indicators	Index of Employment, ACCOMMODATION AND FOOD SERVICE ACTIVITIES - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
2	Labor market indicators	Index of Employment, Total Industry (excluding construction) - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
2	Labor market indicators	Index of Employment, MIG Intermediate Goods Industry - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
2	Labor market indicators	Index of Employment, MIG Capital Goods Industry - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
2	Labor market indicators	Index of Employment, MIG Durable Consumer Goods Industry - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
2	Labor market indicators	Index of Employment, MIG Non-durable Consumer Goods Industry - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
2	Labor market indicators	Index of Employment, MIG Energy - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
2	Labor market indicators	Hours worked, MINING AND QUARRYING - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat

2	Labor market indicators	Hours worked, MANUFACTURING - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
2	Labor market indicators	Hours worked, ELECTRICITY, GAS, STeuro areaM AND AIR CONDITIONING SUPPLY - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
2	Labor market indicators	Hours worked, Total Industry (excluding construction) - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
2	Labor market indicators	Hours worked, MIG Intermediate Goods Industry - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
2	Labor market indicators	Hours worked, MIG Capital Goods Industry - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
2	Labor market indicators	Hours worked, MIG Durable Consumer Goods Industry - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
2	Labor market indicators	Hours worked, MIG Non-durable Consumer Goods Industry - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
2	Labor market indicators	Hours worked, MIG Energy - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
2	Labor market indicators	Standardised unemployment, Rate, Total (all ages), Total (male and female); unspecified; Eurostat; Seasonally adjusted, not working day adjusted, percentage of civilian workforce	Eurostat

3	Prices	Producer Price Index, total, MANUFACTURING - NACE Rev2; Eurostat; Neither seasonally nor working day adjusted	Eurostat
3	Prices	Producer Price Index, total, Total Industry (excluding construction) - NACE Rev2; Eurostat; Neither seasonally nor working day adjusted	Eurostat
3	Prices	Producer Price Index, total, MIG Intermediate Goods Industry - NACE Rev2; Eurostat; Neither seasonally nor working day adjusted	Eurostat
3	Prices	Producer Price Index, total, MIG Capital Goods Industry - NACE Rev2; Eurostat; Neither seasonally nor working day adjusted	Eurostat
3	Prices	Producer Price Index, total, MIG Durable Consumer Goods Industry - NACE Rev2; Eurostat; Neither seasonally nor working day adjusted	Eurostat
3	Prices	Producer Price Index, total, MIG Non-durable Consumer Goods Industry - NACE Rev2; Eurostat; Neither seasonally nor working day adjusted	Eurostat
3	Prices	Producer Price Index, total, Consumer goods industry - NACE Rev2; Eurostat; Neither seasonally nor working day adjusted	Eurostat
3	Prices	Producer Price Index, total, MIG Energy - NACE Rev2; Eurostat; Neither seasonally nor working day adjusted	Eurostat
3	Prices	Import Price Index, MANUFACTURED PRODUCTS; Eurostat; Neither seasonally nor working day adjusted	Eurostat
3	Prices	Import Price Index, MIG Intermediate Goods Industry - NACE Rev2; European Central Bank; Neither seasonally nor working day adjusted	Eurostat

3	Prices	Import Price Index, MIG Capital Goods Industry - NACE Rev2; Eurostat; Neither seasonally nor working day adjusted	Eurostat
3	Prices	Import Price Index, MIG Durable Consumer Goods Industry - NACE Rev2; Eurostat; Neither seasonally nor working day adjusted	Eurostat
3	Prices	Import Price Index, MIG Non-durable Consumer Goods Industry - NACE Rev2; Eurostat; Neither seasonally nor working day adjusted	Eurostat
3	Prices	Import Price Index, Consumer goods industry - NACE Rev2; Eurostat; Neither seasonally nor working day adjusted	Eurostat
3	Prices	Import Price Index, MIG Energy - NACE Rev2; Eurostat; Neither seasonally nor working day adjusted	Eurostat
3	Prices	HICP - Overall index, Monthly Index, Eurostat, Neither seasonally nor working day adjusted	Eurostat
3	Prices	HICP - Energy, Monthly Index, Eurostat, Neither seasonally nor working day adjusted	Eurostat
3	Prices	HICP - Industrial goods, Monthly Index, Eurostat, Neither seasonally nor working day adjusted	Eurostat
3	Prices	HICP - Goods, Monthly Index, Eurostat, Neither seasonally nor working day adjusted	Eurostat
3	Prices	HICP - Food incl. alcohol and tobacco, Monthly Index, Eurostat, Neither seasonally nor working day adjusted	Eurostat
3	Prices	HICP - Services, Monthly Index, Eurostat, Neither seasonally nor working day adjusted	Eurostat

3	Prices	HICP - Transport services, Monthly Index, Eurostat, Neither seasonally nor working day adjusted	Eurostat
3	Prices	HICP - All-items excluding housing, water, elect., gas and other fuels, Monthly Index, Eurostat, Neither seasonally nor working day adjusted	Eurostat
3	Prices	HICP - All-items excluding energy and food, Monthly Index, Eurostat, Neither seasonally nor working day adjusted	Eurostat
3	Prices	HCIP - All-items excl. education, health and social protection, Monthly Index, Eurostat, Neither seasonally nor working day adjusted	Eurostat
4	Car registration, Total Turnover Index, and Building Permits	Car registration, New passenger car; Absolute value; European Central Bank; Working day and seasonally adjusted	ECB
4	Car registration, Total Turnover Index, and Building Permits	Car registration, New commercial vehicles; Absolute value; European Central Bank; Working day and seasonally adjusted	ECB
4	Car registration, Total Turnover Index, and Building Permits	Car registration, New heavy commercial vehicles; Absolute value; European Central Bank; Working day and seasonally adjusted	ECB

4	Car registration, Total Turnover Index, and Building Permits	Car registration, New light commercial vehicles; Absolute value; European Central Bank; Working day and seasonally adjusted	ECB
4	Car registration, Total Turnover Index, and Building Permits	Building Permits/ Sq. meters of useful floor area or alt. size measure, All buildings; Eurostat; Seasonally adjusted, not working day adjusted	Eurostat
4	Car registration, Total Turnover Index, and Building Permits	Building Permits/ Sq. meters of useful floor area or alt. size measure, All residential buildings; Eurostat; Seasonally adjusted, not working day adjusted	Eurostat
4	Car registration, Total Turnover Index, and Building Permits	Building Permits/ Sq. meters of useful floor area or alt. size measure, All non-Residential Buildings; Eurostat; Seasonally adjusted, not working day adjusted	Eurostat
4	Car registration, Total Turnover Index, and Building Permits	Total Turnover Index, deflated, Retail trade including fuel, except of motor vehicles and motorcycles - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat

4	Car registration, Total Turnover Index, and Building Permits	Total Turnover Index, deflated, Retail sale of food, beverages and tobacco - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
4	Car registration, Total Turnover Index, and Building Permits	Total Turnover Index, deflated, Retail sale of non-food products (except fuel) - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
4	Car registration, Total Turnover Index, and Building Permits	Total Turnover Index, deflated, Retail sale of automotive fuel in specialised stores - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
4	Car registration, Total Turnover Index, and Building Permits	Total Turnover Index, MINING AND QUARRYING - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
4	Car registration, Total Turnover Index, and Building Permits	Total Turnover Index, MANUFACTURING - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat

4	Car registration, Total Turnover Index, and Building Permits	Total Turnover Index, ACCOMMODATION AND FOOD SERVICE ACTIVITIES - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
4	Car registration, Total Turnover Index, and Building Permits	Total Turnover Index, Total Industry (excluding construction) - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
4	Car registration, Total Turnover Index, and Building Permits	Total Turnover Index, MIG Intermediate Goods Industry - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
4	Car registration, Total Turnover Index, and Building Permits	Total Turnover Index, MIG Capital Goods Industry - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
4	Car registration, Total Turnover Index, and Building Permits	Total Turnover Index, MIG Durable Consumer Goods Industry - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat

4	Car registration, Total Turnover Index, and Building Permits	Total Turnover Index, MIG Non-durable Consumer Goods Industry - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
4	Car registration, Total Turnover Index, and Building Permits	Total Turnover Index, Consumer goods industry - NACE Rev2; Eurostat; Working day and seasonally adjusted	Eurostat
4	Car registration, Total Turnover Index, and Building Permits	Total Turnover Index, MIG Energy excluding NACE Rev.2 Sections D and E; Eurostat; Working day and seasonally adjusted	Eurostat
5	Trade with world	Total trade - Trade with World (all entities), Import, Value (Community concept), Import, ECU/Euro, Eurostat, Working day and seasonally adjusted	Eurostat
5	Trade with world	Total trade - y trade with World (all entities), Export, Value (Community concept), Export, ECU/Euro, Eurostat, Working day and seasonally adjusted	Eurostat
6	Sentiment, confidence, business tendency and leading indicators	Economic sentiment indicator – Seasonally adjusted data, not calendar adjusted data	Eurostat

6	Sentiment, confidence, business tendency and leading indicators	Retail confidence indicator – Seasonally adjusted data, not calendar adjusted data	Eurostat
6	Sentiment, confidence, business tendency and leading indicators	Construction confidence indicator – Seasonally adjusted data, not calendar adjusted data	Eurostat
6	Sentiment, confidence, business tendency and leading indicators	Consumer confidence indicator – Seasonally adjusted data, not calendar adjusted data	Eurostat
6	Sentiment, confidence, business tendency and leading indicators	Industrial confidence indicator – Seasonally adjusted data, not calendar adjusted data	Eurostat
6	Sentiment, confidence, business tendency and leading indicators	Services Confidence Indicator – Seasonally adjusted data, not calendar adjusted data	Eurostat

6	Sentiment, confidence, business tendency and leading indicators	Business tendency surveys (construction) ¿ Confidence indicators ¿ Composite indicators ¿ National indicator – Level, rate or national currency, s.a. – Monthly	OECD
6	Sentiment, confidence, business tendency and leading indicators	Business tendency surveys (retail trade) ¿ Confidence indicators ¿ Composite indicators ¿ National indicator – Level, rate or national currency, s.a. – Monthly	OECD
6	Sentiment, confidence, business tendency and leading indicators	Business tendency surveys (manufacturing) ¿ Confidence indicators ¿ Composite indicators ¿ National indicator – Level, rate or national currency, s.a. – Monthly	OECD
6	Sentiment, confidence, business tendency and leading indicators	Business tendency surveys (services) ¿ Confidence Indicators ¿ Composite Indicators ¿ National indicator – Level, rate or national currency, s.a. – Monthly	OECD
6	Sentiment, confidence, business tendency and leading indicators	Consumer opinion surveys ¿ Confidence indicators ¿ Composite indicators ¿ National indicator – Level, rate or national currency, s.a. – Monthly	OECD

6	Sentiment, confidence, business tendency and leading indicators	Leading Indicators OECD ¿ Component series ¿ CS - Confidence indicator ¿ Normalised – Level, rate or national currency, s.a. – Monthly	OECD
7	Financial indicators	Long term rate	OECD
7	Financial indicators	Nominal Effective exchange rate indices	BIS
7	Financial indicators	MFIs excluding ESCB – Loans – Total – Outstanding amounts at the end of the period (stocks) – Domestic (home or reference area) – Monetary financial institutions (MFIs) – All currencies combined – Euro	ECB
7	Financial indicators	MFIs excluding ESCB – Loans – Total – Outstanding amounts at the end of the period (stocks) – Domestic (home or reference area) – Non-Financial corporations (S.11) – All currencies combined – Euro	ECB
7	Financial indicators	MFIs excluding ESCB – Loans – Total – Outstanding amounts at the end of the period (stocks) – Domestic (home or reference area) – Households and non-profit institutions serving households (S.14 and S.15) – All currencies combined – Euro	ECB
7	Financial indicators	MFIs excluding ESCB – Deposit liabilities – Total – Outstanding amounts at the end of the period (stocks) – Domestic (home or reference area) – Monetary financial institutions (MFIs) – All currencies combined – Euro	ECB

7	Financial indicators	MFIs excluding ESCB – Deposit liabilities – Total – Outstanding amounts at the end of the period (stocks) – Domestic (home or reference area) – Non-Financial corporations (S.11) – All currencies combined – Euro	ECB
7	Financial indicators	MFIs excluding ESCB – Deposit liabilities – Total – Outstanding amounts at the end of the period (stocks) – Domestic (home or reference area) – Households and non-profit institutions serving households (S.14 and S.15) – All currencies combined – Euro	ECB
7	Financial indicators	MFIs excluding ESCB – Debt securities held – Total – Outstanding amounts at the end of the period (stocks) – Domestic (home or reference area) – Monetary financial institutions (MFIs) – All currencies combined – Euro	ECB
7	Financial indicators	MFIs excluding ESCB – Debt securities held – Total – Outstanding amounts at the end of the period (stocks) – Domestic (home or reference area) – General Government – All currencies combined – Euro	ECB
7	Financial indicators	MFIs excluding ESCB – Debt securities held – Total – Outstanding amounts at the end of the period (stocks) – Domestic (home or reference area) – Non-MFIs excluding general government – All currencies combined – Euro	ECB
7	Financial indicators	Share Prices ¿ All shares/broad ¿ Total ¿ Total – Index 2015=100 – Monthly	OECD
7	Financial indicators	Monthly – Euro – ECB – Spread – Lending spreads; weighted spread between the MIR rate for new NFC loans and the swap rate with a maturity corresponding to the loan category initial period of rate fixation – Spread	ECB

7	Financial indicators	Monthly – Euro – ECB – Spread – Lending spreads; weighted spread between the MIR rate for new loans to Households and the swap rate with a maturity corresponding to the loan category initial period of rate fixation – Spread	ECB
7	Financial indicators	Credit and other institutions (MFI except MMFs and central banks) – Lending for house purchase excluding revolving loans and overdrafts, convenience and extended credit card debt – Total – Annualised agreed rate (AAR) / Narrowly defined effective rate (NDER) – Total – Households and non-profit institutions serving households (S.14 and S.15) – Euro – New business	ECB
7	Financial indicators	Credit and other institutions (MFI except MMFs and central banks) – Other lending excluding revolving loans and overdrafts, convenience and extended credit card debt – Total – Annualised agreed rate (AAR) / Narrowly defined effective rate (NDER) – Total – Households and non-profit institutions serving households (S.14 and S.15) – Euro – New business	ECB
7	Financial indicators	Credit and other institutions (MFI except MMFs and central banks) – Loans including lending for house purchase (defined for cost of borrowing purposes, sum of A2C (Households), A2A and A2Z (both related to non-financial corporations)) – Up to 1 year calculated by weighting the volumes with a moving average (defined for cost of borrowing purposes) – Annualised agreed rate (AAR) / Narrowly defined effective rate (NDER) – Total – Non-Financial corporations and Households (S.11 and S.14 and S.15) – Euro – New business	ECB

7	Financial indicators	Credit and other institutions (MFI except MMFs and central banks) – Loans including lending for house purchase (defined for cost of borrowing purposes, sum of A2C (Households), A2A and A2Z (both related to non-financial corporations)) – Over 1 year calculated by weighting the volumes with a moving average (defined for cost of borrowing purposes) – Annualised agreed rate (AAR) / Narrowly defined effective rate (NDER) – Total – Non-Financial corporations and Households (S.11 and S.14 and S.15) – Euro – New business	ECB
7	Financial indicators	Credit and other institutions (MFI except MMFs and central banks) – Deposits with agreed maturity – Total – Annualised agreed rate (AAR) / Narrowly defined effective rate (NDER) – Total – Non-Financial corporations and Households (S.11 and S.14 and S.15) – Euro – New business	ECB
7	Financial indicators	Credit and other institutions (MFI except MMFs and central banks) – Deposits with agreed maturity – Up to 1 year – Annualised agreed rate (AAR) / Narrowly defined effective rate (NDER) – Total – Non-Financial corporations and Households (S.11 and S.14 and S.15) – Euro – New business	ECB
7	Financial indicators	Credit and other institutions (MFI except MMFs and central banks) – Deposits with agreed maturity – Over 1 and up to 2 years – Annualised agreed rate (AAR) / Narrowly defined effective rate (NDER) – Total – Non-Financial corporations and Households (S.11 and S.14 and S.15) – Euro – New business	ECB

7	Financial indicators	Credit and other institutions (MFI except MMFs and central banks) – Deposits with agreed maturity – Over 2 years – Annualised agreed rate (AAR) / Narrowly defined effective rate (NDER) – Total – Non-Financial corporations and Households (S.11 and S.14 and S.15) – Euro – New business	ECB
7	Financial indicators	Credit and other institutions (MFI except MMFs and central banks) – Deposits with agreed maturity – Over 1 year – Annualised agreed rate (AAR) / Narrowly defined effective rate (NDER) – Total – Non-Financial corporations and Households (S.11 and S.14 and S.15) – Euro – New business	ECB
7	Financial indicators	Credit and other institutions (MFI except MMFs and central banks) – Deposits with agreed maturity – Up to two years – Annualised agreed rate (AAR) / Narrowly defined effective rate (NDER) – Total – Non-Financial corporations and Households (S.11 and S.14 and S.15) – Euro – New business	ECB

Table 2 – Euro area level variables

No.	Category	Series	Sources
	euro area level data	Monthly – Euro area (changing composition) – Euro – ECB – Benchmark bond – Euro area 2-year Government Benchmark bond yield – Yield	ECB
	euro area level data	Monthly – Euro area (changing composition) – Euro – ECB – Benchmark bond – Euro area 3-year Government Benchmark bond yield – Yield	ECB
	euro area level data	Monthly – Euro area (changing composition) – Euro – ECB – Benchmark bond – Euro area 5-year Government Benchmark bond yield – Yield	ECB
	euro area level data	Monthly – Euro area (changing composition) – Euro – ECB – Benchmark bond – Euro area 7-year Government Benchmark bond yield – Yield	ECB
	euro area level data	Monthly – Euro area (changing composition) – Euro – ECB – Benchmark bond – Euro area 10-year Government Benchmark bond yield – Yield	ECB
	euro area level data	Monthly – Euro area (changing composition) – Euro – ECB – Benchmark bond – Real Euro area 10-year Government Benchmark bond yield – Yield, average of observations through period	ECB
	euro area level data	Monthly – Euro area (changing composition) – Euro – Reuters – Money Market – Euribor 6-month (EURIBOR6MD_) – Historical close, average of observations through period	ECB

	euro area level data	Monthly – Euro area (changing composition) – Euro – Reuters – Money Market – Euribor 1-month (EURIBOR1MD_) – Historical close, average of observations through period	ECB
	euro area level data	Monthly – Euro area (changing composition) – Euro – Reuters – Money Market – Euribor 3-month (EURIBOR3MD_) – Historical close, average of observations through period	ECB
	euro area level data	Monthly – Euro area (changing composition) – Euro – Reuters – Money Market – Euribor 1-year – Historical close, average of observations through period	ECB
	euro area level data	Monthly – Euro area (changing composition) – Euro – ECB – Money Market – Real 3-month Euribor (Euro Interbank Offered Rate) – Historical close, average of observations through period	ECB
	euro area level data	Monthly – Euro area (changing composition) – Euro – ECB – Money Market – Eonia rate – Historical close, average of observations through period	ECB
	euro area level data	Monthly – Euro area (changing composition) – Euro – DataStream – Equity/index – Dow Jones Euro Stoxx 50 Price Index – Historical close, average of observations through period	ECB
	euro area level data	Monthly – Euro area (changing composition) – Euro – DataStream – Equity/index – Dow Jones Euro Stoxx Price Index – Historical close, average of observations through period	ECB

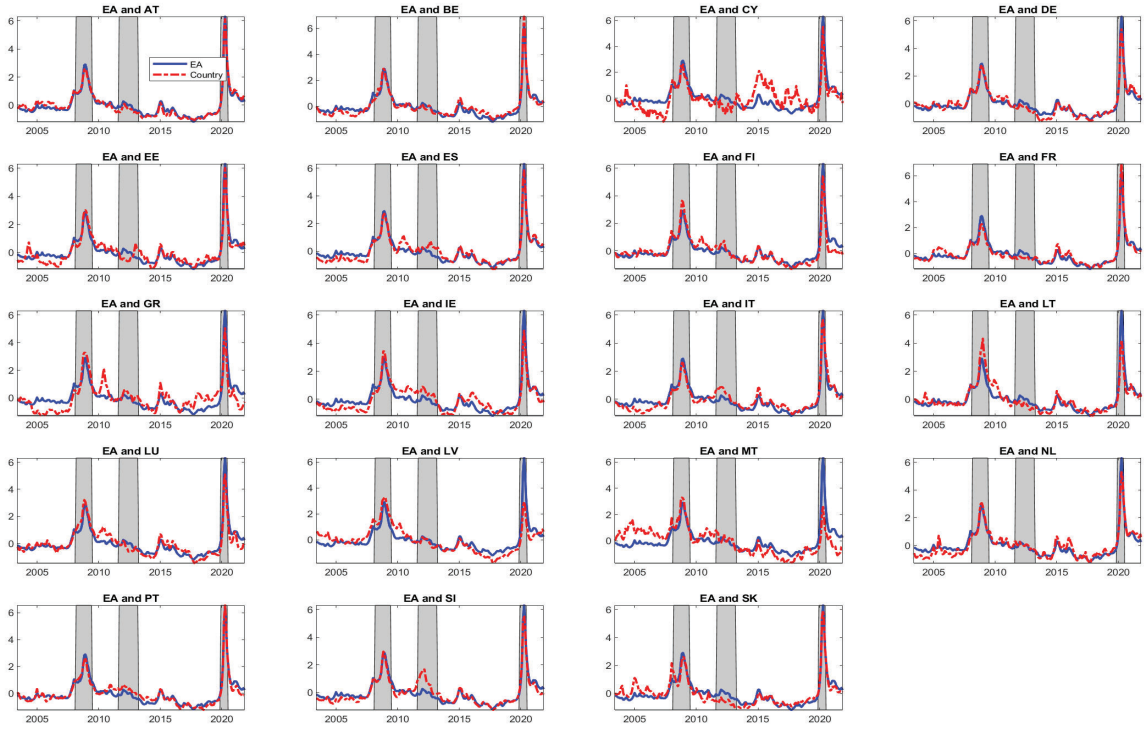
	euro area level data	Monthly – Euro area (changing composition) – Euro – DataStream – Equity/index – Dow Jones Euro Stoxx Basic Materials E Index – Historical close, average of observations through period	ECB
	euro area level data	Monthly – Euro area (changing composition) – Euro – DataStream – Equity/index – Dow Jones Euro Stoxx Consumer Services Index – Historical close, average of observations through period	ECB
	euro area level data	Monthly – Euro area (changing composition) – Euro – DataStream – Equity/index – Dow Jones Euro Stoxx Financials Index – Historical close, average of observations through period	ECB
	euro area level data	Monthly – Euro area (changing composition) – Euro – DataStream – Equity/index – Dow Jones Euro Stoxx Technology E Index – Historical close, average of observations through period	ECB
	euro area level data	Monthly – Euro area (changing composition) – Euro – DataStream – Equity/index – Dow Jones Euro Stoxx Healthcare Index (S1ESH1E) – Historical close, average of observations through period	ECB
	euro area level data	Monthly – Euro area (changing composition) – Euro – DataStream – Equity/index – Dow Jones Euro Stoxx Industrials Index – Historical close, average of observations through period	ECB

	euro area level data	Monthly – Euro area (changing composition) – Euro – DataStream – Equity/index – Dow Jones Euro Stoxx Telecommunications Index – Historical close, average of observations through period	ECB
	euro area level data	Monthly – Euro area (changing composition) – Euro – DataStream – Equity/index – Dow Jones Euro Stoxx Utilities E Index – Historical close, average of observations through period	ECB
	euro area level data	Monthly – Euro area (changing composition) – Working day and seasonally adjusted – MFIs, central government and post office giro institutions – Monetary aggregate M1 – Not applicable – Index of Notional Stocks – Euro area (changing composition) – Non-MFIs excluding central government – All currencies combined – Euro	ECB
	euro area level data	Monthly – Euro area (changing composition) – Working day and seasonally adjusted – MFIs, central government and post office giro institutions – Monetary aggregate M3 – Not applicable – Index of Notional Stocks – Euro area (changing composition) – Non-MFIs excluding central government – All currencies combined – Euro	ECB
	euro area level data	Monthly – Euro area (changing composition) – Working day and seasonally adjusted – MFIs, central government and post office giro institutions – Currency in circulation – Not applicable – Index of Notional Stocks – Euro area (changing composition) – Non-MFIs excluding central government – All currencies combined – Euro	ECB
	euro area level data	UK pound sterling/Euro	ECB
	euro area level data	US dollar/Euro	ECB

	euro area level data	Japanese yen/Euro	ECB
	euro area level data	Chinese yuan renminbi/Euro	ECB
	euro area level data	Swiss franc/Euro	ECB

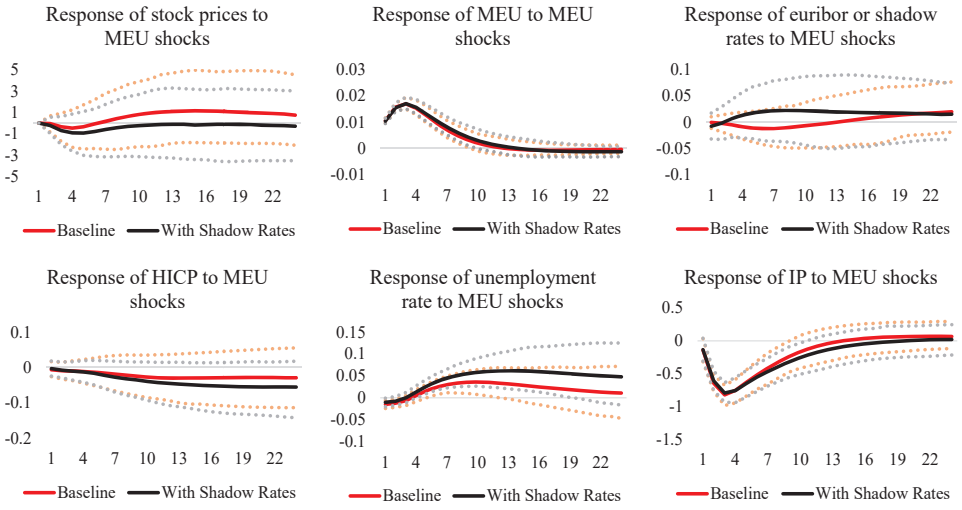
B Appendix: euro area versus country-specific indices

Figure 13 – Euro area (blue) versus country-specific (red) MacroEconomic Uncertainty



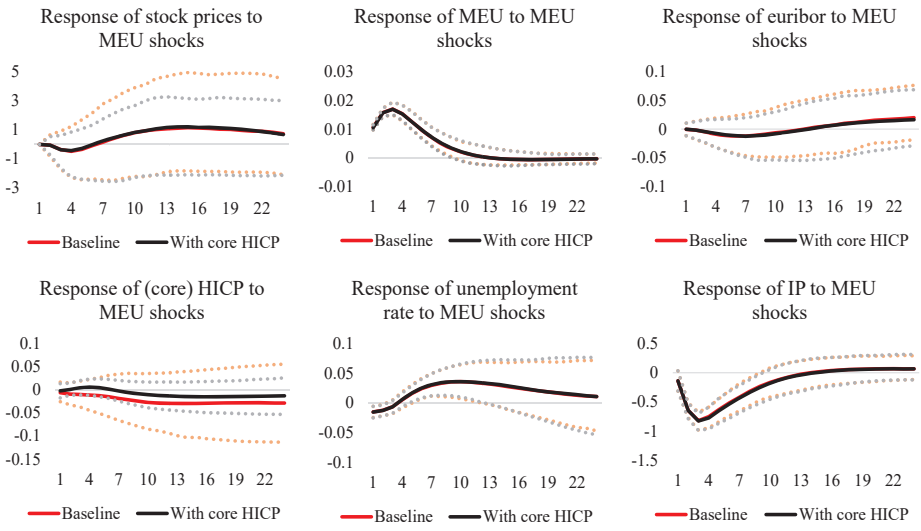
C Appendix: IRFs and historical decompositions

Figure 14 – IRFs baseline with shadow rates 2021



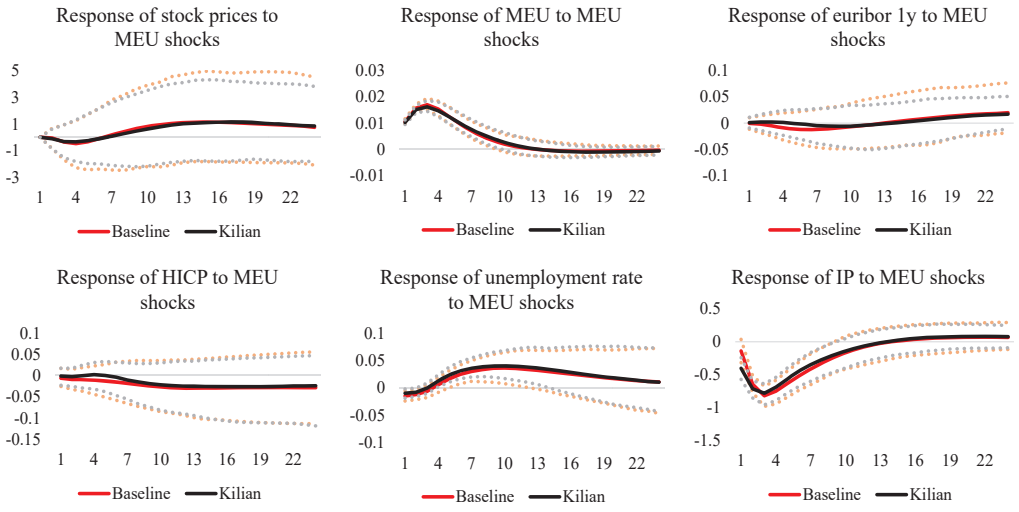
Note: Baseline refers to the identification as is Bloom (2005) with 1-year Euribor. The identification for the results "With Shadow Rates" is the same but with this new variable replacing 1-year Euribor. The time period for the estimations is 2003m6-2021m11 for Baseline and 2003m6-2021m9 for the setup with shadow rates.

Figure 15 – IRFs baseline core HICP 2021



Note: Baseline refers to the identification as is Bloom (2005) with 1-year Euribor. The identification for the results "With core HICP" is the same but with this new variable replacing HICP. The time period for the estimations is 2003m6-2021m11.

Figure 16 – IRFs baseline BVARX with Kilian index 2021



Note: Baseline refers to the identification as is Bloom (2005). The Kilian index is included as an exogenous variable (BVARX). The index is from Federal Reserve Bank of Dallas, Index of Global Real Economic Activity [IGREA], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/IGREA. The time period for the estimations is 2003m6-2021m11.

Figure 17 – Impulse responses: point estimates for Industrial Production (IP) and HICP inflation

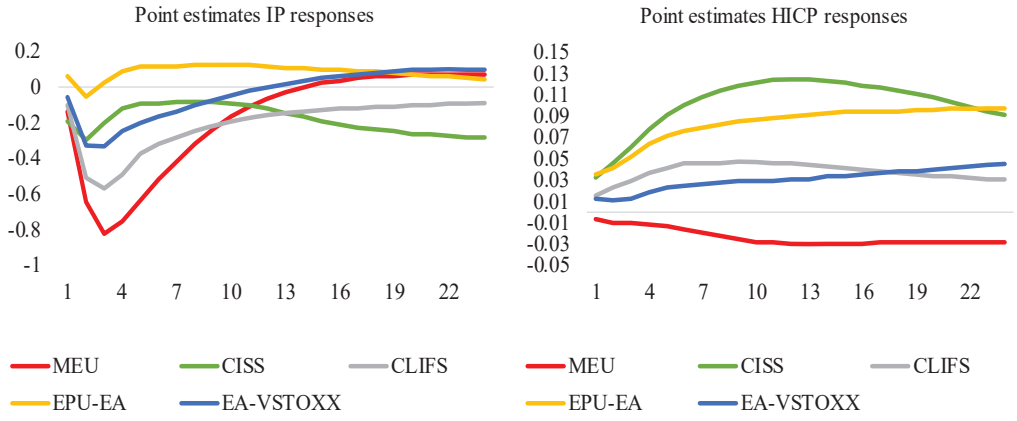


Figure 18 – Historical decomposition: Industrial Production (IP)

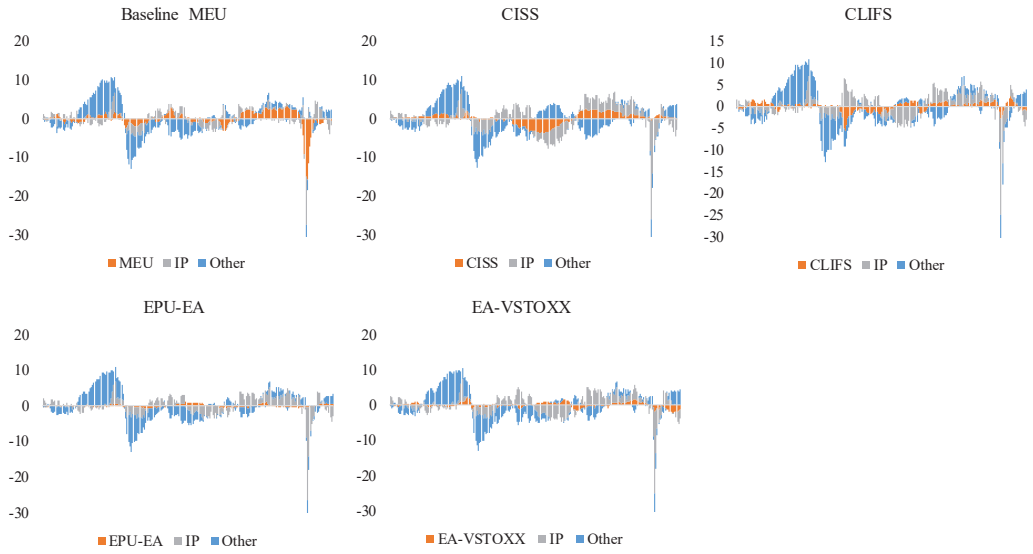


Figure 19 – Historical decomposition: Industrial Production (IP) with Kilian index

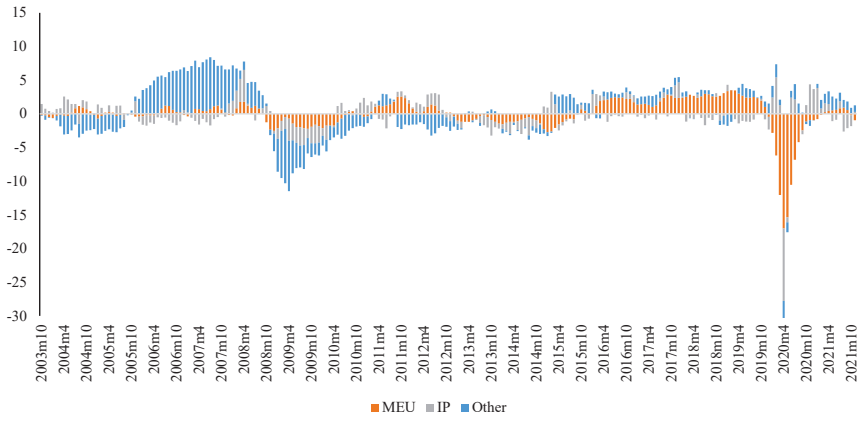
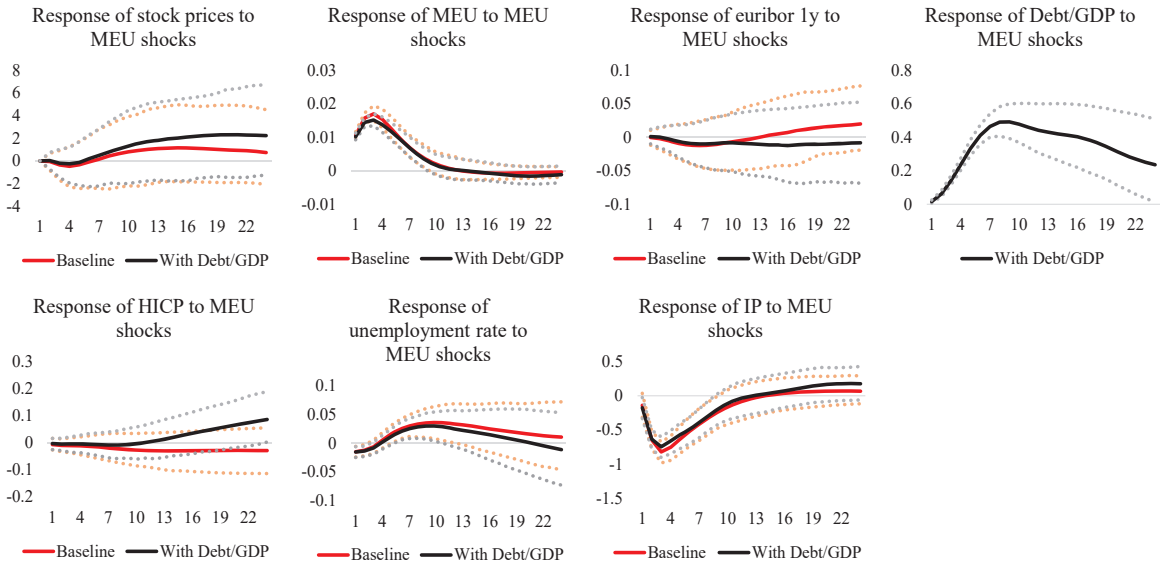


Figure 20 – IRFs baseline with Debt/GDP 2021



Note: Baseline refers to the identification as is Bloom (2005) without inclusion of Debt/GDP. The identification for the results "With Debt/GDP" is the same but with this new variable ordered last. The time period for the estimations is 2003m6-2021m11.

Figure 21 – Including debt: IRFs to uncertainty shocks and historical decomposition

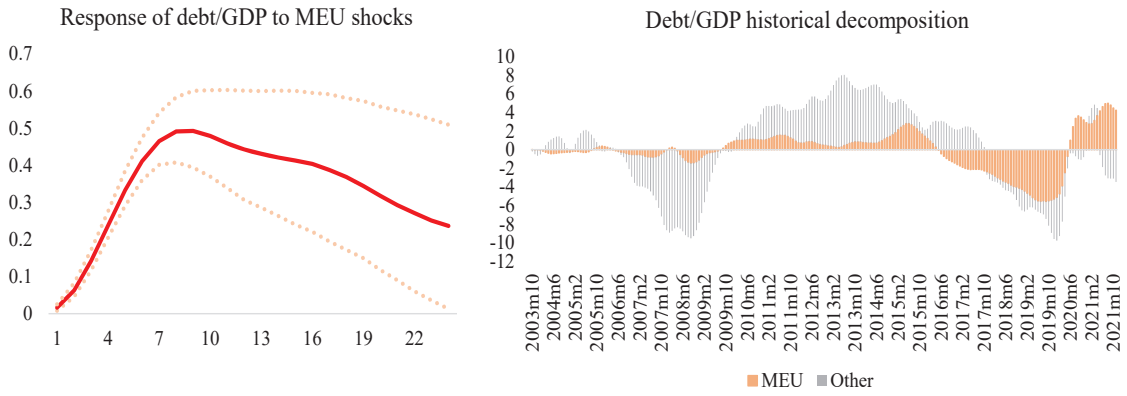
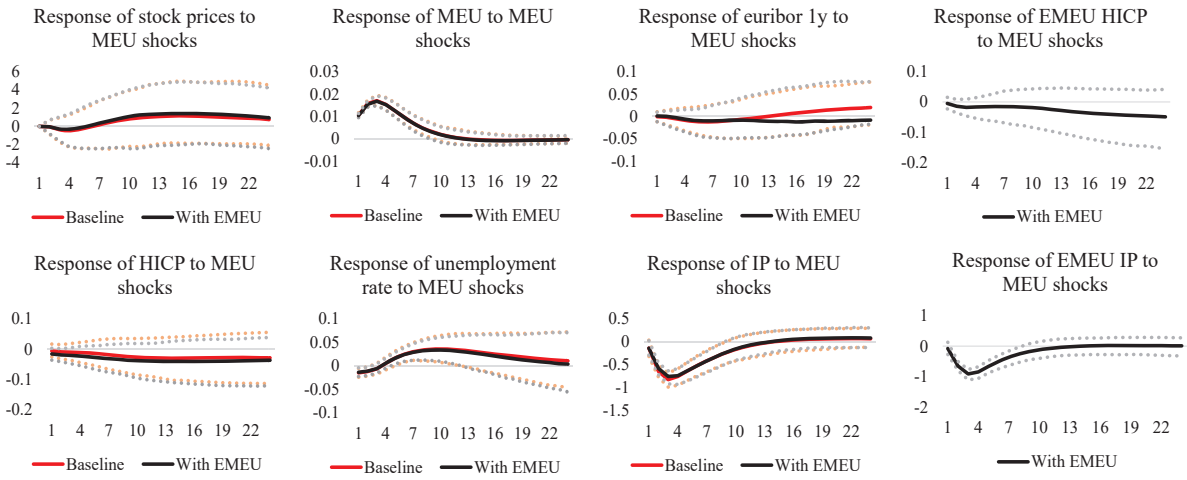


Figure 22 – IRFs for Impact to EMEU (block exo) 2021



Note: The identification is as om Bloom (2005) with EMEU variables ordered last. Block exogeneity is imposed, i.e., the EMEU variables ("EMEU") cannot influence euro area variables. The time period for the estimations is 2003m6-2021m11.

Figure 23 – Impact to EMEU: historical decomposition

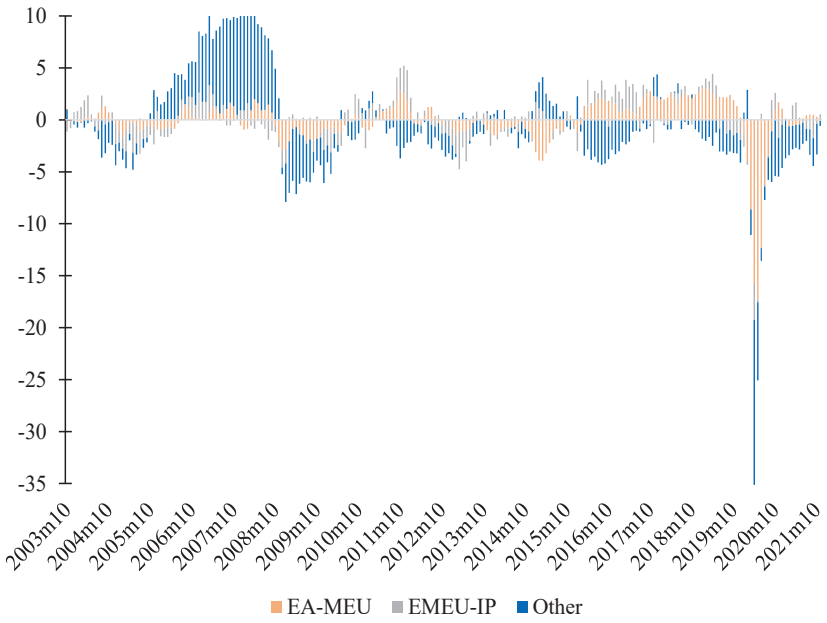


Figure 24 – Impulse responses for the baseline: post-COVID-19

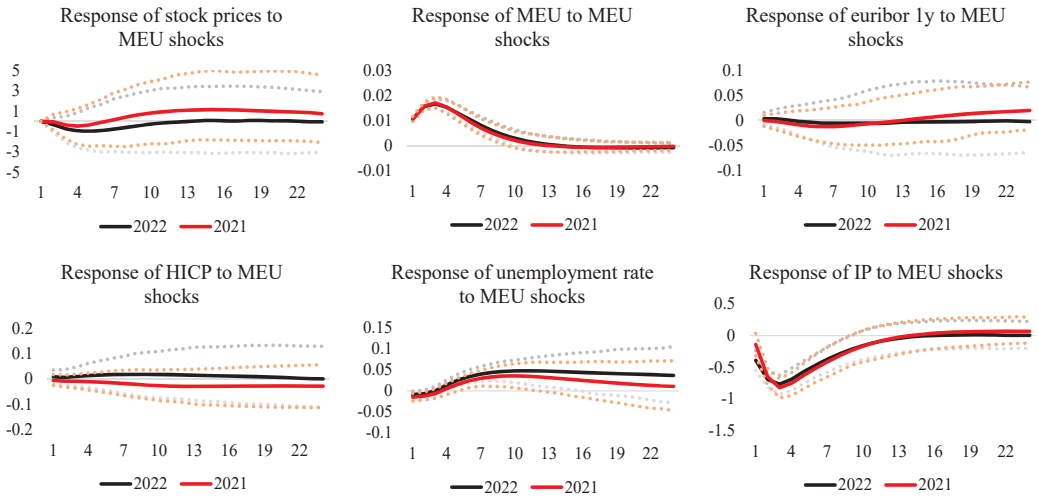


Figure 25 – Historical decomposition: Industrial Production (IP) post-COVID-19

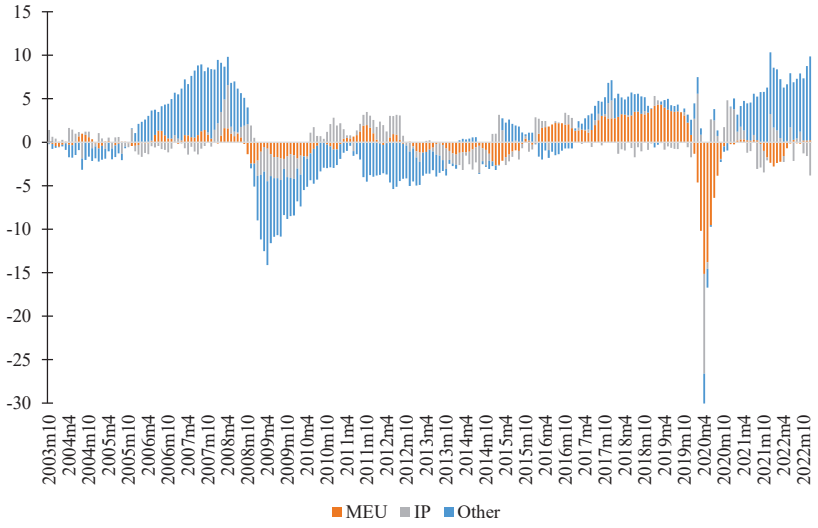
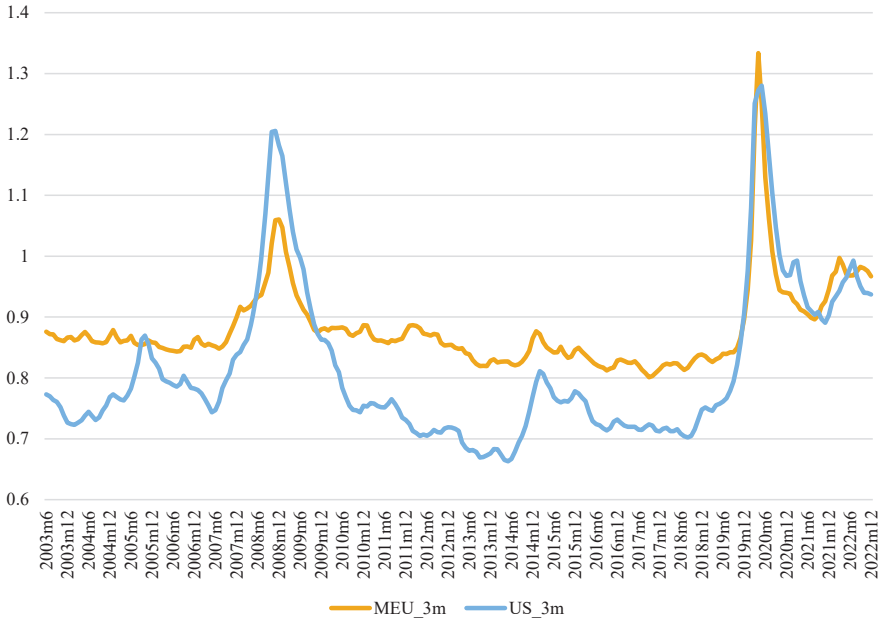


Figure 26 – MacroEconomic Uncertainty: Euro Area versus US



Note: MEU_3m is our MEU index 3-month ahead and the US_3m is the 3-Month Ahead Macroeconomic Uncertainty for the USA. Source: Jurado et al. (2015), JLN 3-Month Ahead Macroeconomic Uncertainty [JLNUM3M], retrieved from FRED, Federal Reserve Bank of St. Louis.

PUBLICATIONS

A Comprehensive MacroEconomic Uncertainty Measure for the Euro Area and its Implications to COVID-19

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