II. Impact of uncertainty shocks in the euro area

This section discusses the impact of uncertainty on the real economy in the euro area. The empirical analysis uses new country-level indicators of uncertainty for individual euro area Member States derived from the Business and Consumer Surveys. It provides evidence on: i) the differential impact of uncertainty shocks across Member States depending on their structural characteristics; ii) the difference between idiosyncratic and common uncertainty shocks; and iii) the interactions between uncertainty and other adverse shocks (namely, confidence and financial shocks).

The results confirm that the real economy (notably investment) in euro area members is negatively affected by an unexpected spike in uncertainty and responses tend to differ across Member States. Individual structural characteristics of the economy appear to determine responses to uncertainty shocks as much as the origin of the shocks themselves (idiosyncratic vs. common shocks). The Member States with more efficient labour markets, product markets and financial systems seem to be able to better weather uncertainty shocks. Likewise, a higher degree of economic openness and a greater manufacturing share in the economy contribute to dampening the impact of uncertainty. The analysis therefore points to the fact that well-functioning labour, product and financial markets are important to strengthen economic resilience in euro area economies. Resilience in turn may have a positive feedback effect on the perception of risks and uncertainties and is crucial for the functioning of the monetary union. ([50])

II.1. Introduction

Economists tend to agree that sentiments and beliefs represent an important driver of economic agents' decisions. Consequently, abrupt changes (shocks) in agents' beliefs might affect real economic developments, which as an idea goes back to Pigou and Keynes ('animal spirits').([51]) During the last decade, there have been numerous events causing major spikes in uncertainty on the global scale. Since the global financial crisis, the concept of uncertainty has also become an integral part of policy discussions and a booming economic literature has analysed the impact of uncertainty shocks on the real economy.

Whereas there is no single theory describing the impact of uncertainty shocks on economic activity, it can be expected that uncertainty, by affecting the capability of economic agents to assess future prospects, influences their behaviour at present. When uncertainty is high, consumers, for instance, might postpone consumption of durable goods and increase their precautionary savings. ([52]) Firms may adopt a similar 'wait-and-see' approach in terms of investments. ([53]) The financial sector may find difficult to evaluate the riskiness of projects, which results in credit rationing, especially for firms with weaker balance sheets. Banks as financial intermediaries might suffer problems themselves with external financing. ([54]) *Risk aversion* of economic agents, perceived *irreversibility* of some decisions (investment for instance) and *financial frictions* facilitate the transmission between uncertainty and the real economy.

Whereas uncertainty has been tracked by means of different indicators, most studies agree that spikes in uncertainty induce negative effects on economy activity, especially investment. The vast empirical evidence for the US has been gradually complemented by studies for other countries. In the euro area, there have been numerous events inducing high uncertainty during the recent years. Yet, the empirical evidence documenting the economic impact of such uncertainty shocks is still rather scarce, especially when it comes to cross-country evidence for euro area Member States. ([55])

([50]) The section was prepared by Bořek Vašíček. The author wishes to thank Christian Gayer for useful comments.

([51]) Pigou, A. (1927), *'Industrial Fluctuations'*, MacMillan, London; Keynes, J.M. (1936), '*The General Theory of Employment, Interest and Money*', Macmillan, London.

([52]) Caballero, R.J. (1990), 'Consumption puzzles and precautionary savings', *Journal of Monetary Economics*, No. 25(1), pp. 113-136.

([53]) Bernanke, B.S. (1983), 'Irreversibility, uncertainty, and cyclical investment', *The Quarterly Journal of Economics*, No. 98(1), pp. 85-106.

([54]) For stylized DSGE model for the euro area see: Bonciani, D. and B. van Roye (2016), 'Uncertainty shocks, banking frictions and economic activity', *Journal of Economic Dynamics and Control*, No. 73, pp. 200-219

([55]) For evidence for the whole area see: Balta, N., I. Valdes Fernandez and E. Ruscher (2013), 'Assessing the impact of uncertainty on consumption and investment', *Quarterly Report on the Euro Area,* Vol. 12, No 2, pp. 7-16; EC (2017), '*European*

This section assesses the impact of uncertainty on real economic developments in the euro area using data for individual Member States, including new country-level indicators of uncertainty. The Business and Consumer Surveys (BCS) administered by the European Commission ([56]) represent a unique source of information that has not been explored for the construction of country-specific uncertainty indicators yet. ([57]) The focus of the analysis is on the structural characteristics that may explain differences in country-specific responses to uncertainty shocks. The analysis also touches upon the difference between idiosyncratic and common uncertainty shocks and the relation between uncertainty and other macroeconomic variables (besides economic activity).

II.2. Measures of uncertainty

The level of uncertainty perceived by economic agents cannot be measured in an objective way. There has been a lively discussion in recent years in the literature on how to proxy uncertainty at an aggregate level, i.e. typically for a country as a whole. The economic literature has employed five classes of *observable* indicators that aim to proxy the *unobservable* level of uncertainty:

- Financial market indicators, most commonly given by the implied or historical volatility of stock market or volatility of bond market or the exchange rate. Examples of such indicators are the indices of implied volatility of stock market VIX or VSTOXX. ([58])

- News-based indicators that rely on the frequency of key words in selected newspapers. The most popular version is the Economic Policy Uncertainty Index relying on the frequency of the terms 'uncertainty', 'economic policy' (and their variations) and policy-relevant terms.([59])

- **Micro-based indicators** such as the cross-sectional (firm-level or industry-level) dispersion of profits or productivity.([60])

- **Survey-based indicators** that are also micro-based but have a subjective nature, like the dispersion of answers regarding expectations for the future in surveys such as the Business and Consumer Survey (BCS) of the European Commission. ([61])

- Macroeconomic data sets and forecasts, used to infer uncertainty by looking at the forecast dispersion (for example of Consensus Forecast), forecast errors, or the unforecastable component of large sets of macroeconomic (and financial) variables.([62])

Graph II.1 plots examples of each of these indicators for the euro area (except for firms' profit / productivity dispersion, which is not available for the euro area), namely the implied volatility of the stock market (VSTOXX), the Economic Policy Uncertainty index (EPU), the BCS-based dispersion indicator (IQ_DISP) and macroeconomic uncertainty inferred from forecast

Economic Forecast', Winter 2017; ECB (2016), 'The impact of uncertainty on activity in the euro area', *ECB Economics Bulletin*, Issue 8; Gieseck, A. and Y. Largent (2016), 'The Impact of Macroeconomic Uncertainty on Activity in the Euro Area', *Review of Economics*, No 67(1), pp. 25-52; Girardi, A. and A. Reuter (2016), 'New uncertainty measures for the euro area using survey data', *Oxford Economic Papers*, No. 69(1), pp. 278-300.

For individual Member States see: Meinen, P. and O. Röhe (2017), 'On measuring uncertainty and its impact on investment: Cross-country evidence from the euro area', *European Economic Review*, Vol. 92, pp. 161-179; Popescu, A. and F.R. Smets (2010), 'Uncertainty, risk-taking, and the business cycle in Germany', *CESifo Economic Studies*, Vol. 56, No 4, pp. 596-626; Basselier, R. and G. Langenus (2014), 'Recent changes in saving behaviour by Belgian households: the impact of uncertainty', *NBB Economic Review*, December 2014, pp. 53-62; Busetti, F., C. Giordano and G. Zevi (2015), 'Main drivers of the recent decline in Italy's non-construction investment', *Questioni di Economia e Finanza*, No. 276, June 2015.

([56]) https://ec.europa.eu/info/business-economy-euro/indicators-statistics/economic-databases/business-and-consumer-surveys_en

([57]) The commonly used uncertainty indicators such as implied stock market volatility are not available for most euro area countries.

([58]) Bloom, N. (2009), 'The impact of uncertainty shocks', *Econometrica*, Vol. 77, No. 3, pp. 623–685 popularized the use of financial market volatility indices as uncertainty proxies.

([59]) Baker, S.R., N. Bloom and S.J. Davis (2016), 'Measuring economic policy uncertainty', *The Quarterly Journal of Economics*, No. 131(4), pp. 1593-1636.

([60]) Bloom, N., M. Floetotto, N. Jaimovich, I. Saporta-Eksten, and S.J. Terry (2012), 'Really Uncertain Business Cycles', *National Bureau of Economic Research Working Paper,* No. 18245.

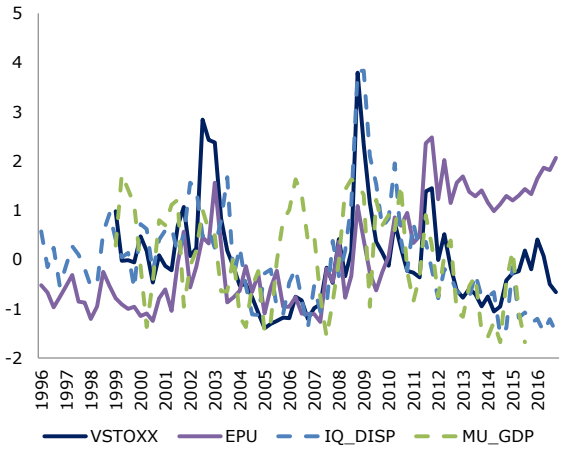
([61]) R. Bachmann, S. Elstner and E. Sims (2013), 'Uncertainty and economic activity: evidence from business survey data', *American Econonomic Journal: Macroeconomics*, No. 5(2), pp. 217-249

([62]) Jurado, K., S.C. Ludvigson and S. Ng (2015), 'Measuring uncertainty', *The American Economic Review*, No. 105 (3), pp. 1177-1216; Rossi, B. and T. Sekhposyan (2015), 'Macroeconomic uncertainty indices based on nowcast and forecast error distributions', *The American Economic Review*, No. 105(5), pp. 650-655

errors of GDP from the Survey of Professional Forecasters (MU_GDP). ([63])

Indications based on the different measures tend to coincide at the most pronounced peaks such as the years 2001-03 (dot-com bubble burst, World Trade Centre attacks, and Iraq war), the beginning of the global financial crisis in 2008-09 and the euro area debt crisis in 2012. For 2016 substantial dispersion between economic policy uncertainty and other indicators is observed, which has gradually faded away during 2017.

Graph II.1: **Uncertainty indicators for the euro area**



(1) VSTOXX - implied volatility of the EURO STOXX 50 index, EPU - Economic Policy Uncertainty, IQ_DISP - intraquestion dispersion from the BCS, MU_GDP - macroeconomic uncertainty derived from forecast error from the SPF.
Source: Bloomberg (VSTOXX), www.policyuncertainty (EPU), author's calculation (IQ_DISP), Rossi and Sekhposyan (2016) (MU_GDP).

Pros and cons of different uncertainty indicators

Each of these indicators has advantages and pitfalls. First, some indicators can be relatively easily obtained or calculated, while derivation of some others is more complex. Besides, *the time availability* of the indicators differs. Namely, most data sources, except for the financial ones, are subject to publication lags, and macroeconomic data tend to be subject to revisions. Second, none of the indicators is fully *representative* for the whole economy and each of them may *reflect other concepts* on top of uncertainty. For example, the stock market volatility can change due to changes in risk aversion or economic confidence, which differ from uncertainty. Forecast or survey dispersion might reflect uncertainty but also heterogeneity of the agents, which imply that they evaluate the prospects differently either because they possess different information or because the same information might have different implications for them. Third, *the availability* of these indicators *at country level* is an important constraint, also for the euro area. The first two classes of indicators (financial market indicators and news-based indicators) are available for the euro area as a whole and the largest Member States and the third (micro-based indicators) is available only for a few Member States. On the contrary, survey-based indicators and macroeconomic-forecast based indicators can be constructed for most EU Member States, and thus will be used for the empirical analysis in this section.

The BCS are run each month in all EU countries, albeit the time span and coverage may differ somewhat. Advantages of **the survey-based uncertainty indicators** are their timeliness as they can be calculated right after the new BCS is published, and above all their representativeness as they cover a wide range of businesses (industry, services, retail trade and construction) as well as opinions of consumers. Decisions by businesses and consumers are also directly affected by the uncertainty they perceive and they in turn determine overall macroeconomic activity. However, as noted above, dispersion of answers to the surveys may also be driven by other forces than perceived uncertainty, namely heterogeneity of agents that affect their opinions. Therefore, macroeconomic forecast, namely the Survey of professional forecasts (SPF) administered by the ECB, can be used as an additional data source to derive **uncertainty indicators based on forecast errors**. ([64]) Given their aggregated and ex-post nature, they do not suffer from the problem of heterogeneity. On the other hand, the SPF relies on opinions of very specific group of agents (professional forecasters) and may therefore not be representative of the whole economy.

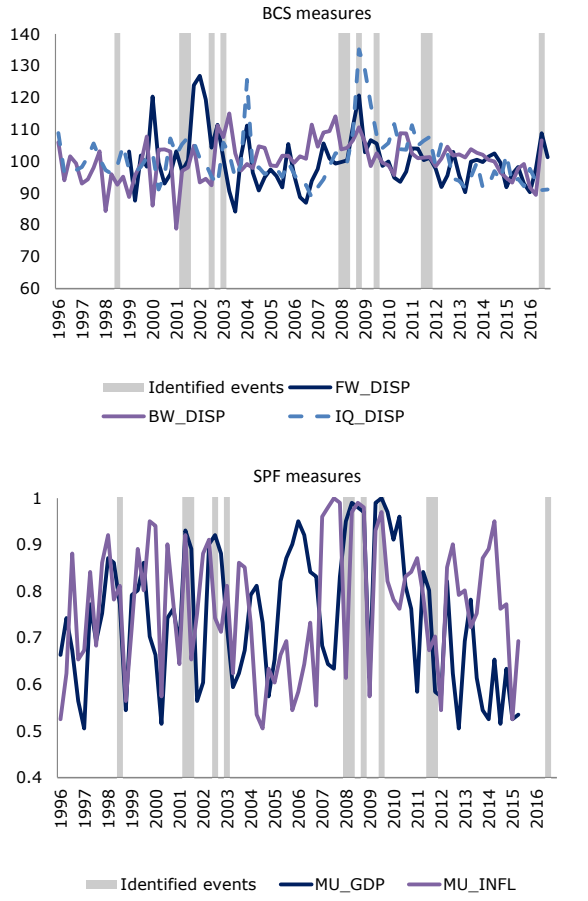
([63]) More details of the latter two indicators that will be used for the empirical analysis will be provided below.

([64]) The forecast-error based uncertainty measure used in this section comes from Rossi, B. and T. Sekhposyan (2016). 'Macroeconomic uncertainty indices for the euro area and its individual member countries', *Empirical Economics*, Volume 53, Issue 1, pp. 1-22. Unlike uncertainty measures based on forecast dispersion (e.g. Jurado et al., 2015, op. cit.) the forecast-error based uncertainty measure does not require large cross section of forecast (not available for most Member States) but only point forecast and actual realization of macroeconomic variables.

New uncertainty measures for individual euro area countries

BCS inquire on a monthly basis around 120,000 businesses with questions about production, orders and employment and around 40,000 consumers on their financial situation and their evaluation of macroeconomic developments. The questions are related to the present situation, the recent past (3 months for business and 12 months for consumers) and the expectation for the near future (again in 3 and 12 months respectively). Importantly, some questions are asked both related to the past (backward-looking) and the future (forward-looking). This dataset allows constructing three different uncertainty indicators. ([65]) The first indicator (FW_DISP) is based on the dispersion of responses to 22 forward-looking questions (monthly and quarterly). The second indicator (BW_DISP) takes into account also the backward-looking versions of the questions, which allows comparison between the ex-ante and ex-post dispersion. In this way the impact of heterogeneity as driven by different backgrounds of agents or information sets available to them shall be muted. ([66]) Finally, the third indicator (IQ_DISP) is based on the dispersion of scores across different questions rather than the dispersion of answers to a single question. The underlying assumption is that uncertainty is related with change. If the economic situation changes, the responses to different questions (related to past, present and future) can evolve in different directions and the dispersion of scores across questions increases. ([67]) Graph II.2 (upper panel) plots these three indicators at country level, using France as an example, and suggests that most peaks of the indicators follow some well-identified events but also some important differences exist between the three indicators. ([68])

Graph II.2: **Different uncertainty indicators constructed from BCS and SPF - example for France**



Source: Author's calculations (BCS measures), Rossi and Sekhposyan (2016) (SPF measures).

The lower panel in turn plots two macroeconomic uncertainty indicators, derived from the point forecast from the Survey of Professional Forecasters (SPF) administered by the ECB, which can be calculated for each euro area Member State, namely forecast errors in quarterly forecast of

([65]) Girardi and Reuter (2015), op. cit.

([66]) The indicator relies on the differences in dispersion of answers to backward- and forward-looking questions. The responses to questions related to the past shall not be affected by uncertainty but only by the heterogeneity of respondents. Therefore, by scaling of forward-looking questions (reflecting both heterogeneity and uncertainty) to backward-looking questions (reflecting only heterogeneity) the effect of heterogeneity shall be neutralized.

([67]) The replies to each question in BCS are summarized in terms of share of respondent giving positive answers minus those giving negative answers. The previous two indicators (FW_DISP and BW_DISP) use question-specific dispersions, i.e. the standard deviation of positive and negative answers to a specific question in the survey. IQ_DISP, in turn, proxies uncertainty by the dispersion of changes of the shares across several survey questions.

([68]) In the case of France the FW_DISP indicator captures well the 2001-2003 uncertainty period (dot-com bubble burst, World Trade Centre attacks, and Iraq war). It increases (albeit only moderately) during the Great Recession and temporarily spikes after the Brexit vote (2016, Q3).The BW_DISP is very flat and does not increase much during the Great Recession (2008-2009) and even decreases during the euro area debt crisis (2011).Finally, the IQ_DISP indicator identifies a number of significant events: the Gulf war (1991), the important strikes in 1995 in France, the dot-com bubble burst and WTC attacks (2001), the Iraq war and the strikes in France in 2003, the Lehman brothers collapse (2008, Q4) but again it does not increase significantly during the euro area debt crisis (2011).

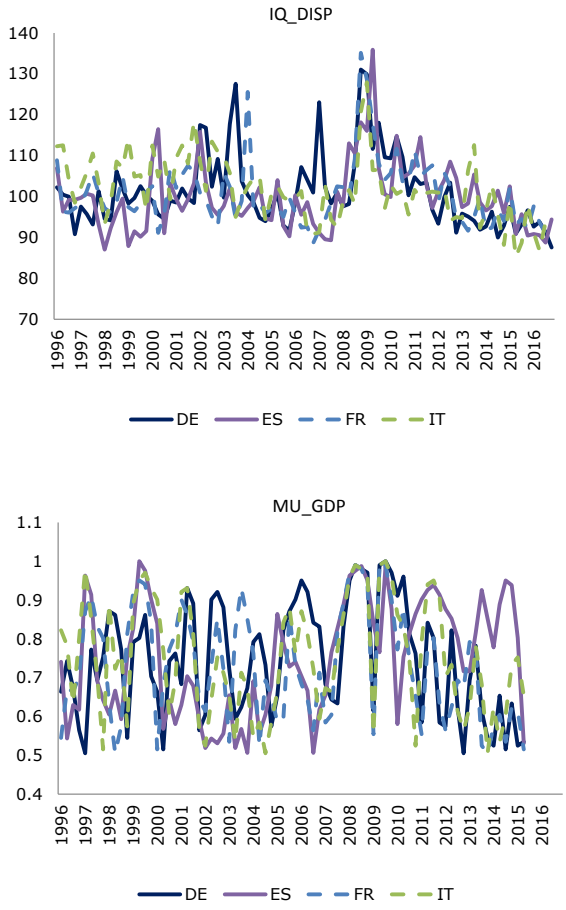
GDP (MU_GDP) and inflation (MU_INFL). ([69]) The indicators are based on the comparison of the realized forecast error with the unconditional distribution of forecast errors for each variable. If the forecast error is in the tail of the distribution, it means that the realization was very difficult to predict, and therefore the macroeconomic environment was very uncertain. Confronting the three BCS indicators with events that can be deemed to trigger spikes in uncertainty in individual euro area countries, the IQ_DISP indicator appears as the most reliable in that for most countries it peaks at the time of such events (such as the global financial crisis). Therefore, this indicator will be used in further analysis as the BCS-based indicator of uncertainty. Similar inspection for the forecast uncertainty indicators suggest that the GDP-based forecast error (MU_GDP) seems to be more related to identified events and will be used in the analysis that follows.

The overall impression is that where there was a major political, economic and financial distress event both types of uncertainty indicators peaked. However, there are also numerous spikes, especially for the forecast-error based indicator, which cannot be reasonably related to any known uncertainty-generating event. In any case, these indicators shall be rather understood as *proxies* of uncertainty rather than *direct measures*. Consequently, it seems appropriate to jointly use various available uncertainty indicators to ensure robustness of the empirical analysis.

Uncertainty in the euro area has a strong common component

While there are apparent differences in dynamics between the BCS-based and forecast-based uncertainty indicators, there is also substantial co-movement of indicators across Member States. This is apparent in Graph II.3 that plots both selected indicators (IQ_DISP and MU_GDP) for the four largest euro area countries. Formal statistical factor analysis confirms that over 80% of the dynamics of each indicator across the Member States can be explained by a single common factor. ([70]) This suggests that uncertainty in the euro area is a common rather than idiosyncratic phenomenon. Cyprus, Greece, Ireland and Portugal in turn feature the strongest idiosyncratic components, which is consistent with the economic priors about the specific uncertainty-generating events in these countries. ([71])

Graph II.3: **Uncertainty indicators constructed from BCS (IQ_DISP) and SPF (MU_GDP) for four largest EA countries**



Source: Author's calculations (IQ_DISP), Rossi and Sekhposyan (2016) (MU_GDP).

II.3. Impact of uncertainty in the euro area

The existing empirical studies for the euro area as a whole ([72]) confirm the detrimental impact of uncertainty on the real economy, especially

([69]) The indicators come from Rossi and Sekhposyan (2016), op. cit. They are by construction bounded on the interval [0.5, 1].

([70]) Recently, very similar findings were provided for a larger group of developed countries in Nowzohour, L. and L. Stracca (2017), 'More than a feeling: confidence, uncertainty and macroeconomic fluctuations.' *ECB Working paper*, No. 2100.

([71]) The decoupling of these countries has been most apparent in terms of sovereign bond yields, which were often deemed to be related to redenomination risk. See for example: Klose, J. and B. Weigert (2014), 'Sovereign yield spreads during the euro crisis: Fundamental factors versus redenomination risk', *International Finance*, No. 17(1), pp. 25-50.

([72]) Balta, et al. (2013), op. cit., EC (2017), ECB (2016), op. cit., Gieseck and Largent (2016), op. cit, Girardi and Reuter (2016), op. cit.

investment. The empirical evidence for the euro area also puts in doubt the common finding for the US that after some time economic activity rebounded strongly offsetting its original decline (overshooting). However, little is known abound the differential impact of uncertainty shocks across euro area Member States. ([73]) This will be the focus in the rest of this section.

The heterogeneous impact of uncertainty shocks across the euro area

This section provides new empirical evidence on the impact of uncertainty shocks in the euro area. It uses a suite of Bayesian Vector Autoregression (BVAR) models that allows testing the impact of unexpected uncertainty shocks on GDP, consumption and investments. The BVAR includes (besides the measures of uncertainty and real economic activity) other variables to distinguish the causal impact of uncertainty from that of other factors affecting economic activity. ([74]) It is important, for instance, to distinguish *uncertainty shocks* from *confidence shocks*, as well as from *financial shocks*. ([75]) Confidence (measured by Economic sentiment indicator, ESI) can affect consumer and investment decisions. Whereas confidence shocks shall be understood as changes in *the level* of confidence in future outcomes (first moment shocks), uncertainty shocks are rather proxied by changes *in the dispersions* of opinions about the future (second moment shocks).([76]) Adverse developments on financial markets often coincide with periods of increasing uncertainty, and financial and uncertainty shock can reinforce each other, but remain separate shocks in nature. Financial shocks can be measured as unexpected changes in asset prices, housing prices, price or volume of banking credit. ([77])

Graph II.4 provides a first glimpse at the heterogeneity of responses across the euro area. It documents the impact of domestic uncertainty (proxied by IQ_DISP, MU_GDP and EPU) on GDP, consumption and investment using the impulse-response function from the BVAR model estimated for two sample countries, namely Germany and Spain. The impact of the uncertainty shock is much stronger for Spain than for Germany, irrespective of the uncertainty measure used. While the responses of German GDP, consumption and investment are not statistically significant, ([78]) the Spanish output suffers a decline, which is even more pronounced and statistically significant for investment across all three uncertainty indicators, and in case of EPU also for consumption. The impact of uncertainty shocks in Spain is also rather persistent and the real economy fully recovers only after five years since the uncertainty shock hit.

The differential impact of domestic uncertainty shocks on the economy, as from the results presented above, can be driven by the different *severity* of the uncertainty shocks hitting each country and by differences in economic *resilience* across Member States. Given the importance of the euro area common uncertainty component, it is interesting to additionally assess how economies of Member States respond to uncertainty shocks that are common rather than idiosyncratic. Graph II.5 compares the impact of such a euro-area wide uncertainty shock (the common factor of country-level measures) on the Spanish and German GDP. The results suggest that GDP declines (at statistically significant levels) as a consequence of

([73]) Meinen and Röhe (2017), op cit. provide evidence of uncertainty impact on investments for four largest euro area countries. Evidence for single Member States is provided e.g. Popescu and Smets (2010), op. cit., Basselier and Langenus (2014), Busetti et al. (2015), op. cit.

([74]) A Bayesian Vector Autoregression (BVAR) model is estimated on quarterly data for 1996-2016. The Bayesian shrinkage allows estimating a model with several endogenous variables. The baseline model includes 6 variables (alongside with constant term and linear trend to control for non-stationarity of some variables) in the following ordering: stock prices, the economic sentiment indicators (ESI), the respective uncertainty measure (IQ_DISP, MU_GDP and - in country-specific VAR - also EPU), short-term interest rate (EONIA), log HICP and log real GDP, consumption or investment respectively. The model is estimated with four lags. The results of country-specific BVARs show generalized impulse-response functions (that are invariant to the ordering or variables in the BVAR). The macroeconomic data come from Eurostat, ECB and EC.

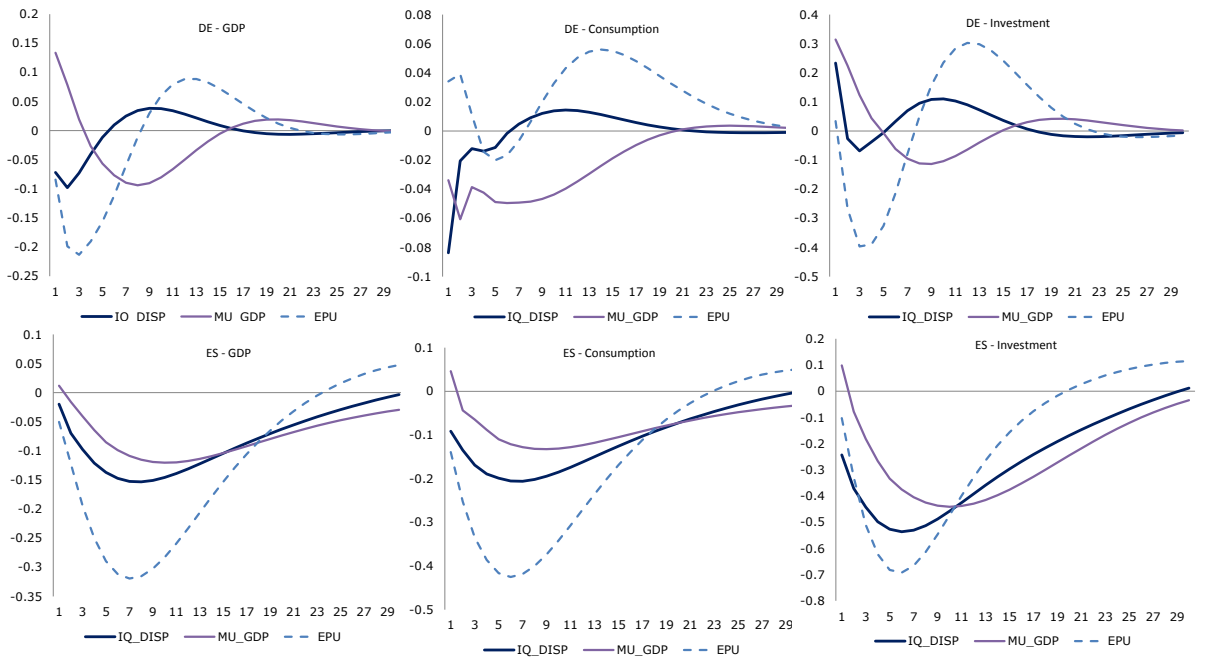
([75]) News shock is another type of shock studied recently. However, unlike the other shocks, these are shocks that shall be understood as news about future total factor productivity, which affect the real economy only in the longer term. See for example: Jaimovich, N. and S. Rebelo (2008), 'News and business cycles in open economies', *Journal of Money, Credit and Banking*, No. 40(8), pp. 1699-1711; and Barsky, R.B. and E.R. Sims (2011), 'News shocks and business cycles', *Journal of Monetary Economics*, No. 58(3), pp. 273-289.

([76]) There is also booming economic literature that studies the role of confidence as an autonomous driver of business cycle fluctuations. See for instance: Bacchetta, P. and E. Van Wincoop (2013), 'Sudden spikes in global risk', *Journal of International Economics*, No. 89(2), pp. 511-521; Angeletos, G.M. and J. La'O (2013), 'Sentiments', *Econometrica*, No. 81(2), pp. 739-779.

([77]) Gilchrist, S., J.W. Sim, and E. Zakrajšek (2014), 'Uncertainty, financial frictions, and investment dynamics', *National Bureau of Economic Research Working Paper*, No. 20038.

([78]) The confidence intervals along the point estimates are not plotted to save the space.

Graph II.4: **Impact of domestic uncertainty shock on GDP, consumption and investment - Germany and Spain**



(1) The graph represents estimated response of GDP, consumption and investment following unexpected uncertainty shock in the BVAR model. Uncertainty is proxied by three alternative indicators: IQ_DISP, MU_GDP, EPU. The x-axis represents quarters. The y-axis represents percentage points.
Source: Author's calculations.

the uncertainty shock in both economies (for IQ_DISP and EPU). However, the impact on German GDP is less persistent than on Spanish GDP, which is very apparent especially in the case of the EPU.

The preliminary evidence presented so far suggests that (i) euro area Member States may suffer both from idiosyncratic and common uncertainty shocks, which reflect the high degree of interconnectedness of their economies, and (ii) the response to uncertainty shocks might differ across Member States, reflecting different degrees of economic resilience.

II.4. Uncertainty shocks and structural characteristics of EA countries

Whereas it is impossible to prevent *the occurrence* of uncertainty shocks, it is important to understand which factors determine *the impact* of uncertainty shocks on the real economy, so as to design policies in a way to shape this.

Structural differences between euro area countries

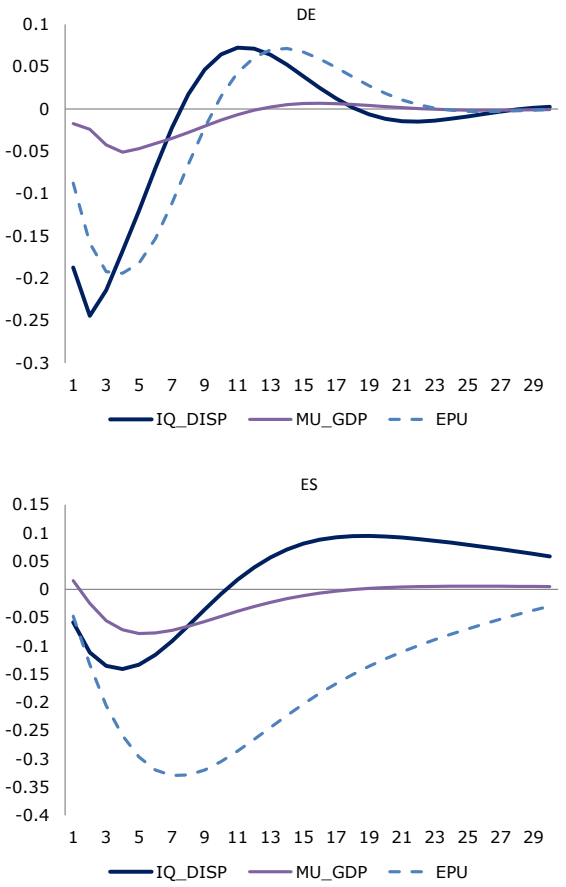
Previous empirical evidence based on large country samples suggests that financial structures, labour market characteristics and even macroeconomic policies determine how economies react to uncertainty shocks. ([79])

Similar analysis can be carried out for euro area countries. This sub-section will explore in particular the role of five structural characteristics, as described below. First, the role of labour markets, including differences in wage bargaining systems, flexibility of wages and labour mobility, is considered. Greater *labour market efficiency* is generally deemed as important for shock absorption capacity and recovery after shocks. Secondly, *product market efficiency* (determined by the

([79]) Carrière-Swallow, Y. and L.F. Céspedes (2013), 'The impact of uncertainty shocks in emerging economies', *Journal of International Economics*, No. 90(2), pp. 316-325; and Claeys, P. (2017), 'Uncertainty spillover and policy reactions', *Ensayos sobre Política Económica*, No. 35(82), pp. 64-77 document that emerging countries suffer larger falls in consumption and investment following global uncertainty shocks. They stress the role of financial development, fiscal policy (if there is sufficient fiscal space) and fixed exchange rate regimes to dampen the transmission of uncertainty on the real economy.

quality of business regulation and the degree of competition) plays an important role too in strengthening economic resilience in that it determines the flexibility of price adjustment.

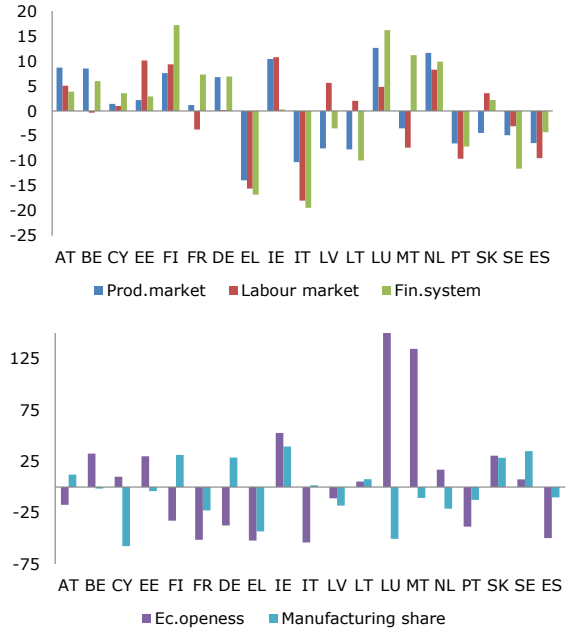
Graph II.5: **Impact of common euro-area uncertainty shocks (three alternative measures of uncertainty) on GDP of Germany and Spain**



(1) The graph represents estimated response of GDP following unexpected uncertainty shock in the BVAR model. Uncertainty is proxied by three alternative indicators: IQ_DISP, MU_GDP, EPU. The x-axis represents quarters. The y-axis represents percentage points.
Source: Author's calculations.

Third, *a well-developed financial system* is crucial to channel credit to companies and households, directing funding to most productive use and supporting innovation. While most euro area countries have bank-based financial systems, the access to loans for small and medium sized enterprises differs. Besides the banking system, there are also notable differences on possibility of financing via local equity markets. Fourth, while trade and financial linkages across the euro area are generally very strong, the degree of *economic openness* is not the same for all the Member States. While economic openness makes an economy more vulnerable to external shocks, it may also improve its shock-absorption capacity through cross-border risk sharing (via cross-border holdings of financial assets). *The economic structures* of Member States differ in terms of contribution of different economic sectors to overall output. Namely, the shares of industry and services determine also the share of tradable output. A higher share of sectors that produce tradables, like sectors more integrated in global value chains, with higher value added and sectors whose output is less volatile may be beneficial to withstand shocks. While previous characteristics may clearly refer to different sectors, manufacturing is certainly a sector where most of the previous characteristics hold.

Graph II.6: **Structural characteristics of the euro area countries**

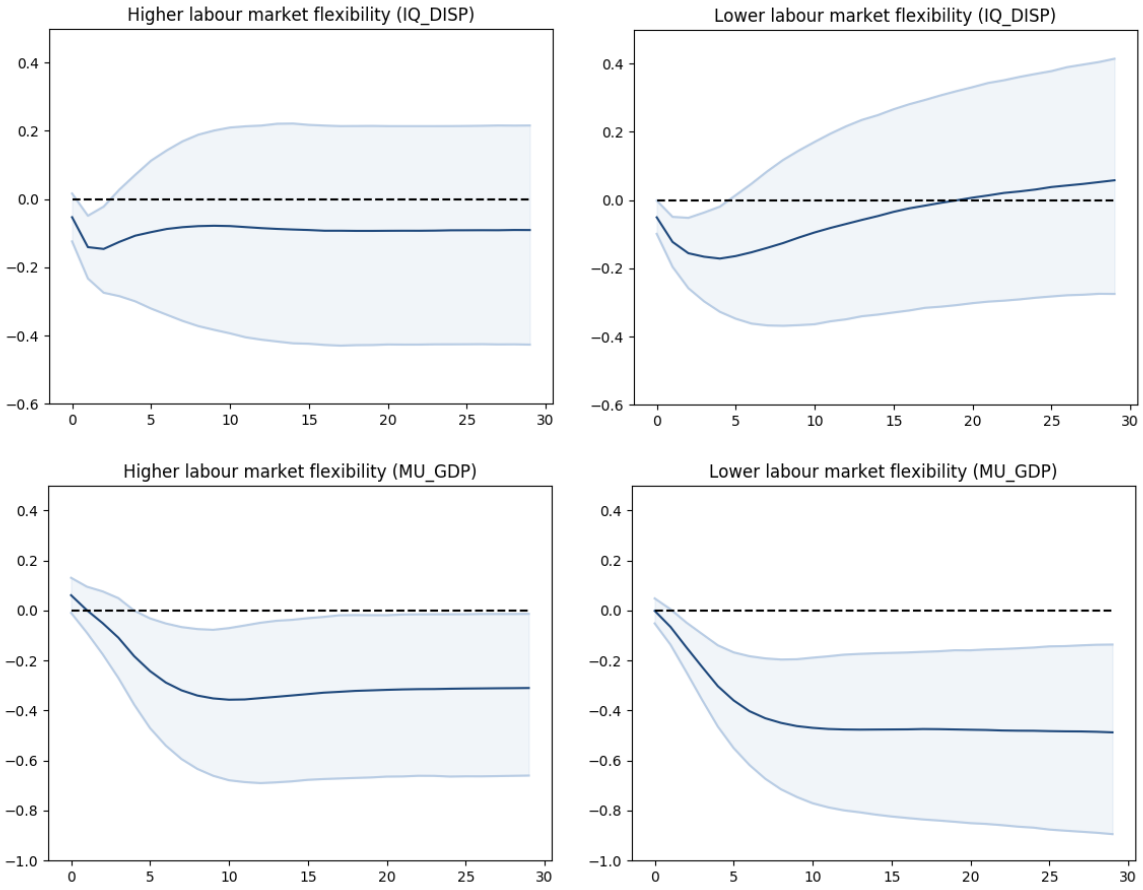


(1) The graph represents deviation of each structural characteristic from the euro area mean (normalized to zero).
Source: Author's calculations based on World Competitiveness Database (WEF) and World Development Indicators (WB).

Graph II.6 plots measures of these five structural characteristics for the euro area countries. Namely, the measures of labour and product markets, and financial system efficiency (upper panel) come from World Economic Forum Competitiveness Database. ([80])

([80]) These indicators form (alongside nine others) the Global Competitiveness Index and are labelled as pillars 7. (Labour

Graph II.7: **Impact of uncertainty shock on GDP in EA countries according to labour market efficiency**



(1) The graph represents estimated response of GDP following unexpected uncertainty shock in the panel BVAR models. The EA countries are split into two subpanels according to labour market efficiency. Relatively higher labour market efficiency: AT, BE, DE, EE, FI, NL, SK, Relatively lower labour market efficiency: EL, ES, FR, IT, PT, SE. Uncertainty is proxied by two alternative indicators: IQ_DISP, MU_GDP. The x-axis represents quarters. The y-axis represents percentage points.
Source: Author's calculations.

The trade on GDP and manufacturing value added on GDP (lower panel) comes from World Development Indicators by the World Bank. Time average is taken for each indicator and country. The indicators are normalized to have zero mean and bars in Graph II.6 represent the (positive or negative) deviation (in p.p.) from the mean euro area value for each of the five indicators.

There appears to be correlation across the first three characteristics (efficiency of labour and product markets and financial system development) within the Member States, i.e. countries that feature more efficient labour markets tend to have also relatively more efficient product markets and financial systems (i.e. the first three bars point to the same, positive or negative, direction). Economic openness (proxied by the sum of exports and imports over GDP) and economic structure (proxied by the share of manufacturing out of total GDP) have lager dispersion across Member States than the former three characteristics. The empirical analysis that follows explores whether these structural characteristics affect the impact of uncertainty

market efficiency), 6. (Product market efficiency) and 8. (Financial development). The dataset covers the period 2006-2016. The overall score for each indicator is determined as an average score of different sub-indicators. Labour market efficiency is a composite index of 10 characteristics including for example cooperation in labour-employer relations, flexibility of wage determination, hiring and firing practices or country capacity to retain and attract talent. Product market efficiency consists of 16 indicators, for example intensity of local competition, extent of market dominance, effectiveness of anti-monopoly policy, number procedures and days to start a business. Financial system development consists of 8 indicators, for example financial services meeting business needs, financing through local equity market, ease of access to loans, venture capital availability or soundness of banks.

shocks on the real economy of euro area Member States.

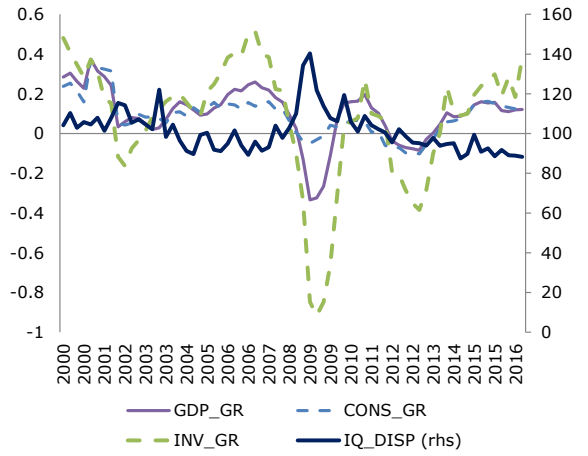
The impact of uncertainty shocks varies with structural characteristics

The empirical analysis uses panel BVAR models. The panel setting allows taking into account the country-level information while addressing the issue of the relatively short data series for individual Member States. ([81]) In particular, the panel approach is employed to provide evidence for different groups of Member States according to the five structural characteristics defined above. Specifically, the 13 euro area countries that are included in this analysis are split broadly (6 versus 7 countries) according to scores attained for each of the five characteristics. ([82]) For example, a sub-panel is constructed with Member States with *relatively* more efficient labour markets (i.e. those with higher scores) versus a sub-panel of Member States with *relatively* less efficient labour markets (i.e. those with lower scores). The panel BVAR model is estimated then for each group separately. ([83])

Graph II.7 reports the impact of country-specific uncertainty shocks (uncertainty is proxied by IQ_DISP and MU_GDP) on GDP using impulse-response functions from the estimated panel BVAR for Member States with relatively more efficient and less efficient labour markets respectively. While the 90% confidence interval around the mean estimate is rather wide (which may reflect further heterogeneity of responses within each sub-group), it is evident that the impact of an uncertainty shock differs across the two groups. While the impact of the uncertainty shock is mostly statistically insignificant for countries with more efficient labour markets, it is significant for the others (this holds for both measures of uncertainty). The difference is driven mainly by the response of investment but consumption seems to be (at least temporarily) affected too in countries with lower labour market efficiency. ([84]) The forecast-error based measure (MU_GDP) induces exceptionally persistent responses of the real economy to uncertainty, which is, in Member States with lower labour market efficiency, statistically significant even after several years from the shock.

For better illustration, Graph II.8 plots the yearly changes in real GDP, consumption and investment alongside the uncertainty indicator (IQ_DISP) for the euro area. There is a visible inverse pattern between real economic developments and uncertainty. This holds for investment as the most volatile part of GDP.

Graph II.8: **Real economic developments and uncertainty in the euro area**



(1) The graph represents yearly changes in real GDP, real consumption and real investment alongside the level of uncertainty as proxied by IQ_DISP indicator.
Source: Eurostat and author's calculation.

The results for product market and financial system efficiency are very similar given ([85]) that the split of Member States is almost identical (only France switches the position with Slovakia). More efficient product markets allow, for example, for faster adjustment in prices that may be needed when the economy is hit by adverse shocks. Likewise, well developed financial systems feature less rigidity in provision of bank credit or better diversification of financing, which turns out very relevant in times of high uncertainty when banking sector tightens lending standards.

([81]) The list of variables included in the panel BVAR is the same as for normal BVAR (see footnote 24). Pooled estimator is used and report impulse-response functions come from the Cholesky factorization. The data availability allows including 13 euro area countries out of 19, namely Austria, Belgium, France, Germany, Greece, Estonia, Finland, Italy, Netherlands, Portugal, Slovenia, Slovakia and Spain.

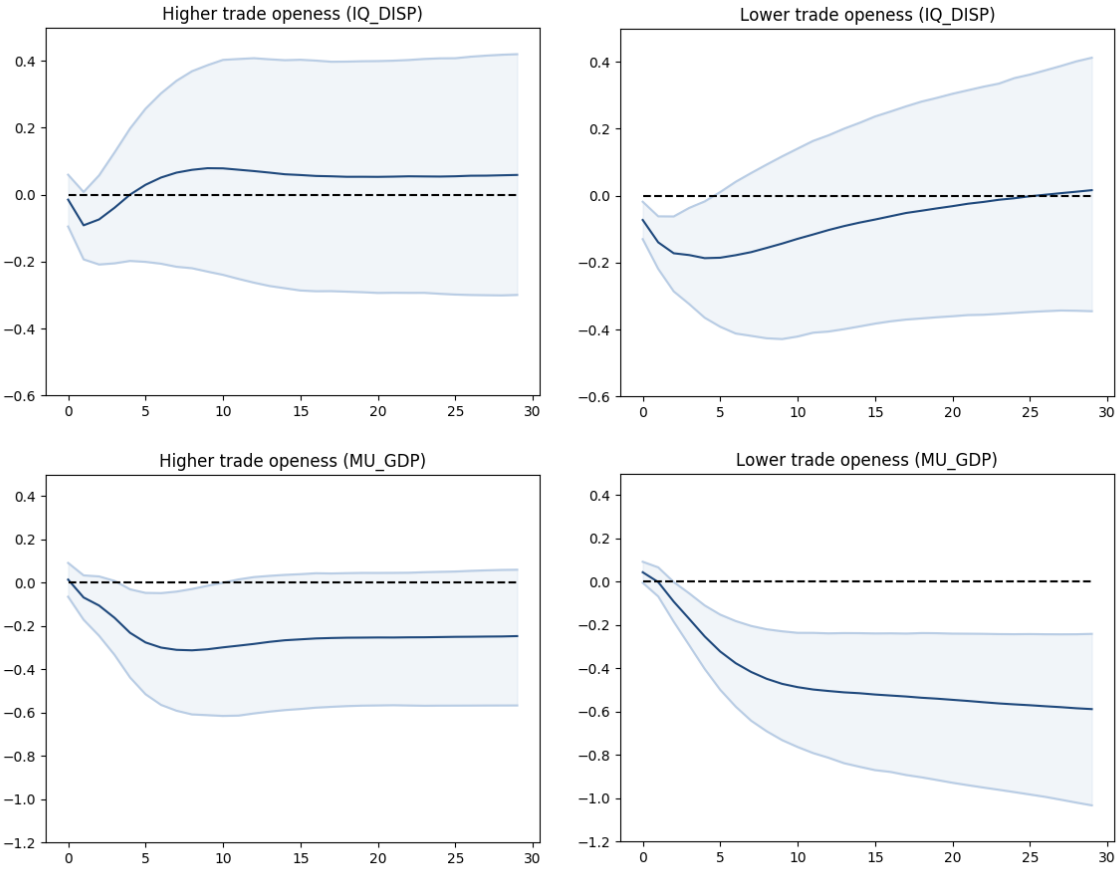
([82]) The median country is assigned to the upper (lower) group if the sample mean is above (below) the median.

([83]) As each cross-section unit (i.e. each Member State) contributes evenly to the overall results, results are driven relatively more by individual country experiences than results for the euro area as whole (where larger Member States obtain higher weights).

([84]) These results are not reported here due to space constrains.

([85]) These results are not reported here due to space constrains.

Graph II.9: **Impact of uncertainty shock on GDP in EA countries according to trade openness**



(1) The graph represents estimated response of GDP following unexpected uncertainty shock in the panel BVAR models. The EA countries are split into two subpanels according to trade openness. Relatively higher trade openness: AT, BE, EE, NL, SE, SK, Relatively lower trade openness: DE, EL, ES, FI, FR, IT, PT. Uncertainty is proxied by two alternative indicators: IQ_DISP, MU_GDP. The x-axis represents quarters. The y-axis represents percentage points.
Source: Author's calculation.

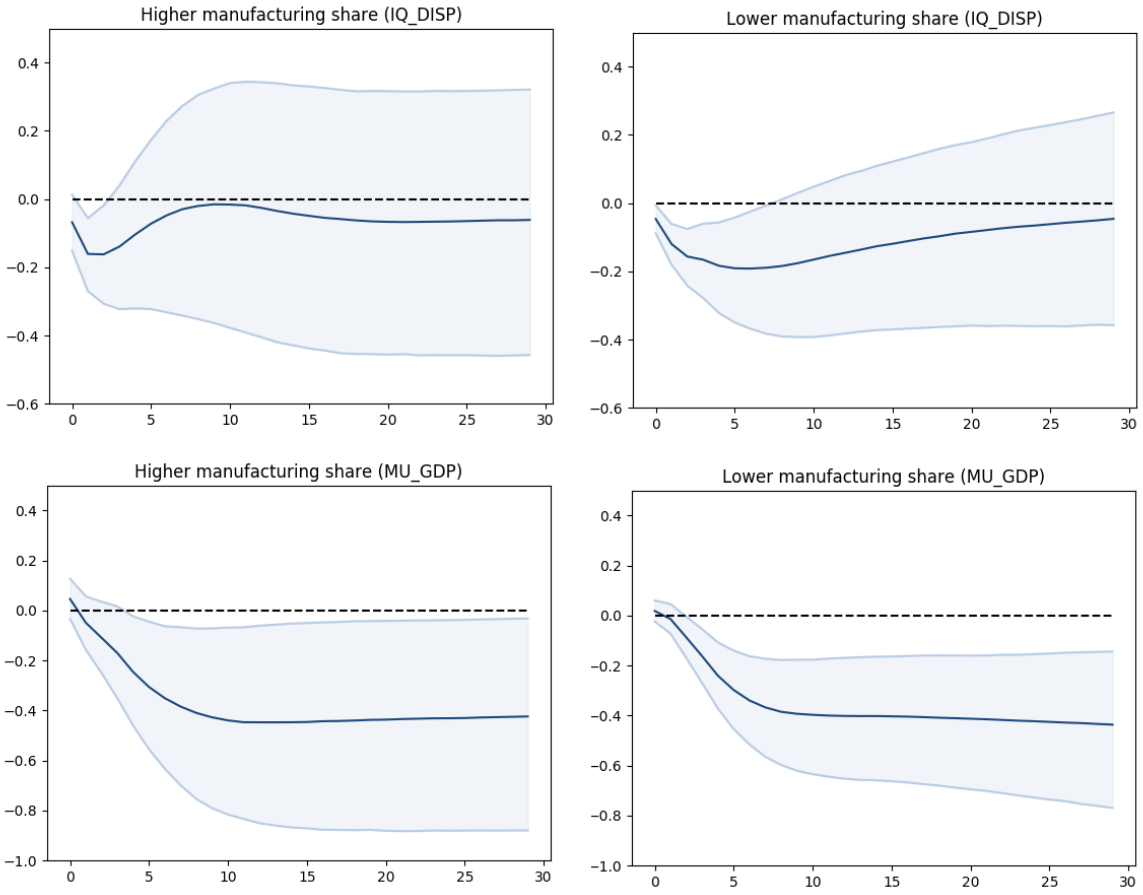
As noted earlier, Member States with more efficient labour markets perform also relatively better in terms of efficiency of product markets and functioning of the financial system. Therefore, it cannot be easily disentangled from this simple analysis which of these structural characteristics is relatively more relevant, but the analysis provides clear evidence that all these structural features of the economy affect its response to uncertainty shocks.

Economic openness provides a split of Member States that is much less akin to core versus periphery division. Unsurprisingly, the Member States with higher degree of openness are smaller economies, whereas the group with lower economic openness includes all large Member States (Germany, France, Italy, and Spain). Graph II.9 confirms that economic openness matters in that more open economies are practically unaffected by uncertainty shocks, under both measures used for the latter. ([86]) It appears that while openness can, on the one hand, make countries more vulnerable to external shocks, international trade (namely in the form of intra-industry trade) ([87]) and financial linkages, on the other hand, smooth the impact of shocks through cross-border risk sharing.

([86]) It is also interesting to note that the countries with higher degrees of openness are indeed very open as the mean value of import and exports on the GDP among the analysed Member States is around 110%.

([87]) Krugman, P.R. (1981), 'Intraindustry Specialization and the Gains from Trade', *Journal of Political Economy*, Vol. 89, No 5, pp. 959-973.

Graph II.10: **Impact of uncertainty shock on GDP in EA countries according to manufacturing share on GDP**



(1) The graph represents estimated response of GDP following unexpected uncertainty shock in the panel BVAR models. The EA countries are split into two subpanels according to manufacturing share on GDP. Relatively higher manufacturing share: AT, DE, EE, FI, SE, SK, Relatively lower manufacturing share: BE, EL, ES, FR, IT, NL, PT. Uncertainty is proxied by two alternative indicators: IQ_DISP, MU_GDP. The x-axis represents quarters. The y-axis represents percentage points.
Source: Author's calculation.

Finally, Graph II.10 reports effects of uncertainty shocks for the Member States according to their share of value added in manufacturing. This characteristic appears relevant too: countries with higher manufacturing shares turn out to be better able to cushion uncertainty shocks. Here the share of value added in manufacturing out of total GDP shall be understood as a proxy of output tradability, and integration into global value chains. In addition, manufacturing is usually characterised by faster productivity growth. All these can be different reasons why a higher share of manufacturing appears to be associated with greater shock absorption capacity.

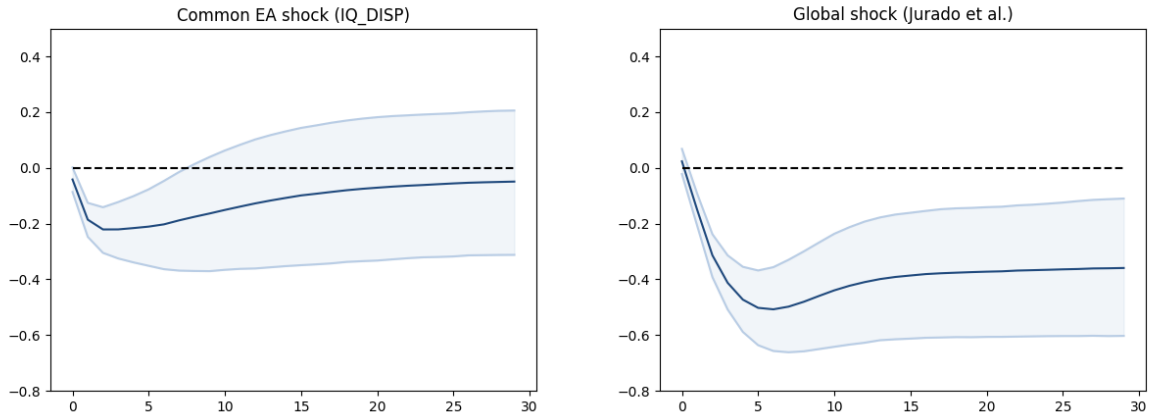
EA-wide and international shocks are relevant as well

The previous results show how different groups of Member States respond differently to uncertainty shocks of idiosyncratic nature (i.e. domestic spike in uncertainty), but largely similar results are also obtained when a common euro area uncertainty shock is considered. ([88])

Therefore, efficiency of labour and product markets and of the financial system, economic openness and higher share of tradables in the economy all appear to contribute to dampening the effect of a common uncertainty shock. When a common shock hits the euro area some Member

([88]) These results are not reported here due to space constrains.

Graph II.11: **Impact of common euro-area uncertainty shock and global uncertainty shock on GDP of the euro area**



(1) The graph represents estimated response of GDP following unexpected uncertainty shock in the panel BVAR models including 13 EA countries. Uncertainty is proxied by two alternative indicators: common EA factor derived from country-level IQ_DISP measures and global uncertainty taken from Jurado et al. (2015). The x-axis represents quarters. The y-axis represents percentage points.
Source: Author's calculation.

States are affected more than others (see also Graph II.5 where Germany is compared to Spain) but, more importantly, the overall euro area output suffers a significant decline (Graph II.11, left panel).

With globalization, spikes in uncertainty may even attain a global dimension. Graph II.11 (right panel) reports the impact of such a global uncertainty shock on the euro area GDP. ([89]) The Graph suggests the euro area output suffers a major decline, which is even of higher magnitude than after the euro-area-wide uncertainty shock.

Fortunately, the spells of global uncertainty occur only infrequently during major events such as the first oil shock (1973–1974), the 1981–1982 recession and recently during the Great recession (2007-2009). ([90])

Interactions between uncertainty and wider macroeconomic developments

Beyond the analysis of the impact of uncertainty shocks on the real economy, it is interesting to evaluate what is the impact of spikes in uncertainty on other macroeconomic and financial variables. Box I explores the relation between uncertainty and other variables included in the empirical model. Namely, it suggests that an increase in perceived uncertainty about the future may decrease economic confidence and provide some hardship to the financial sector today. This can in turn have a feedback effect on perceived uncertainty.

The interaction between uncertainty and macroeconomic policies is another area that has been explored recently in the literature. There are three aspects of this nexus. First, macroeconomic policies may affect perceived uncertainty and EPU was indeed directly proposed to track uncertainty related to broader economic policies. Moreover, some recent studies explicitly construct measures of fiscal and monetary policy uncertainty and test their impact on macroeconomic and financial developments. ([91]) Second, there is evidence that macroeconomic policies respond to uncertainty shocks ([92]) and can alleviate their impact on the economy. ([93]) Third, the presence of uncertainty

([89]) The measure is based on Jurado et al. (2015), op. cit.
([90]) Berger, T., S. Grabert, and B. Kempa (2017), 'Global macroeconomic uncertainty', *Journal of Macroeconomics*, No. 53, pp. 42–56.
([91]) See for instance Johannsen, B. K. (2014), 'When are the effects of fiscal policy uncertainty large?', *Finance and Economics Discussion Series, Federal Reserve Board*, No. 2014-40, Creal, D.D. and J.C. Wu (2017), 'Monetary policy uncertainty and economic fluctuations', *International Economic Review*, No. 58, pp. 1317-1354, Kurov, A., and R. Stan (2018), 'Monetary policy uncertainty and the market reaction to macroeconomic news'. *Journal of Banking & Finance*, No. 86, pp. 127-142.
([92]) Figure 1 in the box suggests that a spike in uncertainty drives EONIA down suggesting that monetary policy may respond to an uncertainty shock by monetary easing. However, EONIA is affected also by other factors besides the monetary policy.
([93]) Carrière-Swallow and Céspedes (2013), op. cit. and Claeys (2017), op. cit..

may (by affecting agents' behaviour) also affect the effectiveness of macroeconomic policies. ([94]) The detailed analysis of these factors is nonetheless beyond the scope of the analysis in this section.

II.5. Conclusions

Spikes in subjective perceptions of uncertainty cannot be entirely avoided as they can originate outside the economic system, and economic theory suggests that psychological factors such as perceived uncertainty represent an inherent driver of behaviour of economic agents.

This section presented new empirical evidence on the impact of uncertainty shocks in the euro area when country-level data, including uncertainty indicators, are used. It turns out that uncertainty indicators of individual Member States share a very strong common component. This suggests that unexpected spikes in uncertainty (uncertainty shocks) are often common rather than idiosyncratic events.

Besides the issue of where the shocks originate from, it is crucial how euro area economies respond to them. This section looked at groups of Member States that share certain structural characteristic rather than at individual countries.

The evidence suggests that relatively less efficient labour markets, product markets and less developed financial systems, as well as a lower degree of trade openness and diversification of the economy, induce a deeper and more persistent impact of uncertainty shocks on output, especially on investment. Moreover, the aforementioned structural features of the economies may have an impact (feedback effect) on the subjective perception of risk and uncertainty by economic agents, thus reinforcing the link structural features – uncertainty effects.

Given the relationship highlighted by the analysis presented in this section between the aforementioned key structural characteristics of the economy and the impact of uncertainty shocks, it appears all the more important to strengthen the resilience of euro area economies through efficient labour and product markets and well-functioning financial markets, which make economies able to withstand shocks and recover from them without protracted effects on output and employment. The analysis presented in this section indeed points at labour, product and financial markets as areas where structural reforms might prove particularly useful to strengthen resilience, therefore dampening the effects of uncertainty shocks.

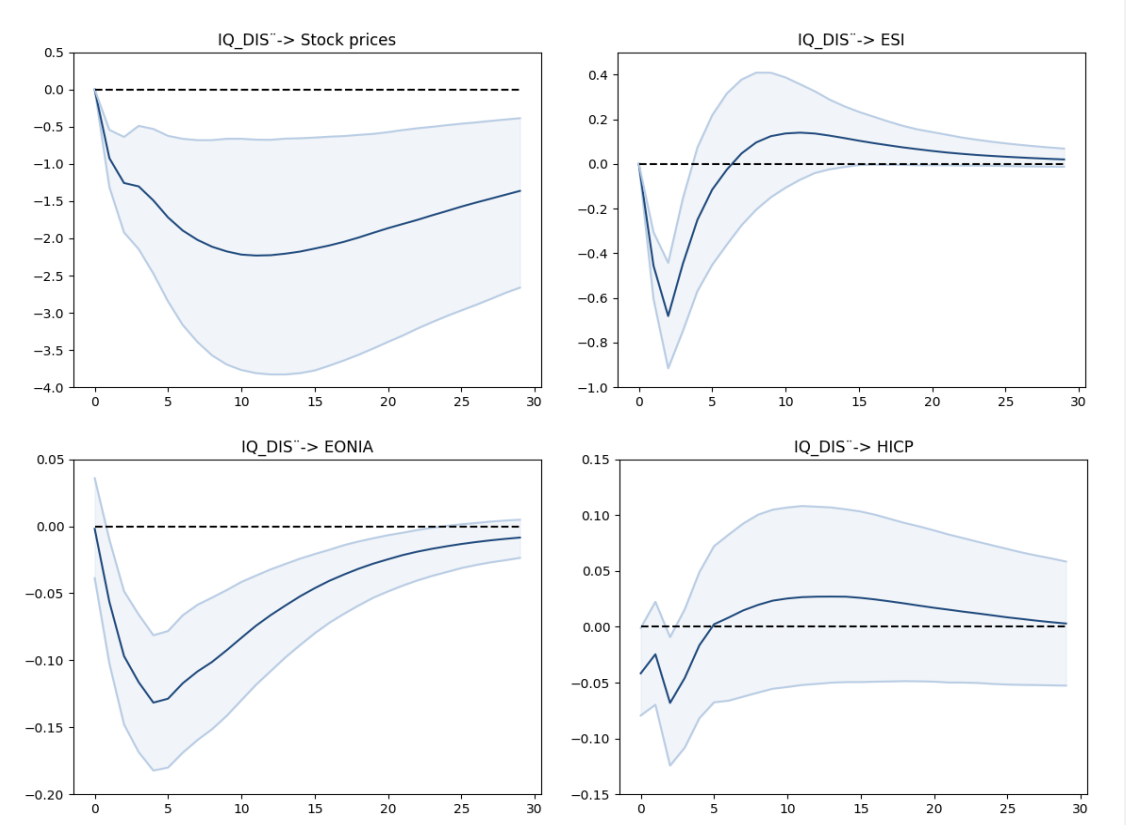
([94]) Aastveit, K.A., G.J. Natvik, and S. Sola (2013), 'Economic uncertainty and the effectiveness of monetary policy', *Norges Bank Working Paper*, No. 17; Pellegrino, G. (2017), 'Uncertainty and the real effects of monetary policy shocks in the euro area', *Melbourne Institute Working Paper*, No. 15/17.

Box II.1: **Interactions between uncertainty and other shocks**

While most empirical literature agree that uncertainty shocks have negative impact on the real economy (which is also confirmed in this section), there is no consensus on how uncertainty affects other macroeconomic variables. This is driven by significant diversity in model settings across empirical studies, in terms of uncertainty indicators employed but also other macroeconomic and financial variables included in the models.

Graph 1 plots responses of the other four variables (besides the uncertainty itself and the measure of real economy), which were included in the panel BVAR model used in this section, to an uncertainty shock. ([1]) The results show that the stock prices experience a protracted decline (upper left chart), the economic sentiment drops quickly but only for a short period (upper right chart), the short-term interest rate declines (lower left chart) and there is also a minor and short-lived decline in prices (lower right chart).

Graph 1: **Impact of common euro-area uncertainty shock on other euro area variables**



(1) The graph represents estimated response of stock prices, ESI, EONIA and HICP following unexpected uncertainty shock in the panel BVAR models including 13 EA countries (AT, BE, DE, EE, EL, ES, FI, FR, IT, NL, PT, SE, SK). Uncertainty is proxied by IQ_DISP. The x-axis represents quarters. The y-axis represents units of each variable.
Source: Author's calculation.

The direction of the economy's responses following an uncertainty shock can be useful to understand the nature of the shock. Specifically, a decline in economic activity coupled with a decline in economic sentiment

([1]) While the common euro area shock from the indicator IQ_DISP is used for this estimation, the use of country-level IQ_DISP indicators or the indicator MU_GDP does not largely change the findings.

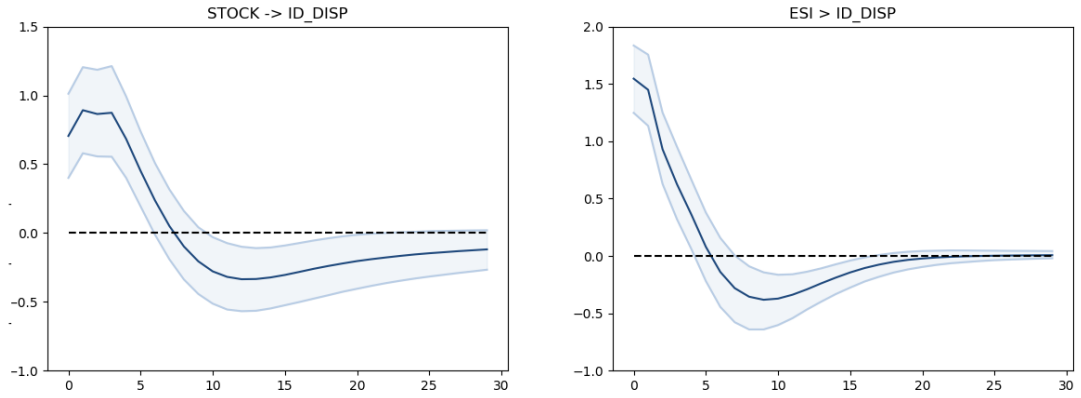
(Continued on the next page)

Box (continued)

and in prices resembles the effects of a recessionary aggregate demand shock. Therefore, through the effect on aggregate demand, uncertainty might affect the real economy. (2)

However, uncertainty can also change as a consequence of other shocks. Graph 2 documents the increase in the uncertainty indicator (IQ_DISP) following a drop in stock market prices (proxy of financial shock, left panel) and Economic sentiment indicator (proxy of confidence shocks, right panel). These results overall suggest the existence of a two-sided relation between uncertainty and other adverse shocks in the euro area.

Graph 2: **Impact of euro area financial shock / economic sentiment shock on uncertainty**



(1) The graph represents estimated response of uncertainty (proxied by IQ_DISP) following unexpected financial and confidence shock in the panel BVAR models including 13 EA countries (AT, BE, DE, EE, EL, ES, FI, FR, IT, NL, PT, SE, SK). Financial shock is proxied by shock in stock prices, confidence shocks is proxied by shock of ESI. The x-axis represents quarters. The y-axis represents units of each variable.

Source: Author's calculation

(2) Leduc, S. and L. Zheng (2016). 'Uncertainty shocks are aggregate demand shocks', *Journal of Monetary Economics*, No 82, pp. 20-35; Basu, S. and B. Bundick (2017). 'Uncertainty shocks in a model of effective demand', *Econometrica*, No. 85 (3), pp. 937-958.