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**Working Paper**

## Measuring household uncertainty in EU countries

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# Measuring household uncertainty in EU countries<sup>†</sup>

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## Abstract

I provide a measure of household uncertainty available for European Union (EU) countries. The measure draws from the same consumer survey data used to construct widely-used consumer sentiment indices. I find that increases in household uncertainty are followed by declines in consumer sentiment and household financial conditions. Using Euro Area-wide indices, I also find that the effects of increases in household uncertainty differ from increases in uncertainty from other sources such as financial markets and economic policy. Notably, household uncertainty shocks are inflationary. These results challenge the notion that (household) uncertainty shocks act like negative demand shocks.

*JEL Codes:* C32, D84, E37

*Keywords:* uncertainty, household expectations, survey data

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## 1. Introduction

There is a large, and still growing, literature studying (macro) uncertainty and its effects on the economy. Many measures are now available and use data from various sources.<sup>1</sup> These were initially obtained from financial markets data and subsequent alternative measures have been sourced from media and news as well as professional forecast survey data. Evidence based on these measures generally

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<sup>†</sup>The views expressed in this paper are those of the author and do not necessarily represent the views of the Bank of Finland. I thank Giovanni Caggiano for helpful comments and discussion.

<sup>1</sup>See e.g. [Bloom \(2009\)](#); [Jurado et al. \(2015\)](#); [Baker et al. \(2016\)](#); [Rossi et al. \(2016\)](#), and [Bloom \(2014\)](#) for an excellent review.

confirm the theoretical predictions from the literature which suggest that heightened uncertainty (or uncertainty shocks) could dampen economic activity and resemble negative demand shocks.

The predicted macroeconomic effects of uncertainty may arise through many channels. One important channel is through household spending and households' propensity to save and work.<sup>2</sup> Notably, pronounced periods of heightened uncertainty occur during large crises in which households' choices play an important role.<sup>3</sup> The dynamics of household debt and housing prices were at the core of many large booms and busts.<sup>4</sup> Households are also most susceptible to irrational exuberance and deviations from rational expectations. In a model where *wedges* in expectations may be present across a variety of agents, [Chahrour and Ulbricht \(2017\)](#) show that such wedges are most likely to be present among households (relative to firms). Consequently, measuring household uncertainty, and their beliefs in general, is crucial to forming a cohesive understanding of the macroeconomic effects of uncertainty.<sup>5</sup>

However, direct measures of household uncertainty are quite scarce. A cursory review of the literature reveals a US-centric bias. Notably, [Leduc and Liu \(2016\)](#) and [Bhandari et al. \(2017\)](#) use the *Michigan Consumer Survey* to measure household uncertainty. To date, no similar measure has been similarly adopted for other countries. This paper seeks to fill this gap in the literature and provide a measure of household uncertainty for European countries.

The aims of the paper are (i) to construct a measure of household uncertainty for

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<sup>2</sup>See [Sandmo \(1970\)](#); [Barro and King \(1984\)](#); [Pijoan-Mas \(2006\)](#); [Fernandez-Villaverde et al. \(2015\)](#); [Ravn and Sterk \(2017\)](#).

<sup>3</sup>See early works based on the *Great Depression*, e.g. [Bernanke \(1983\)](#) and [Romer \(1990\)](#); [Mody et al. \(2012\)](#); [Basu and Bundick \(2017\)](#); [Ravn and Sterk \(2017\)](#) on the *Great Recession*. Uncertainty shocks may also have state-dependent or non-linear effects, e.g. [Caggiano et al. \(2014\)](#).

<sup>4</sup>See e.g. [Jorda et al. \(2011\)](#); [Mian and Sufi \(2011\)](#); [Jorda et al. \(2015\)](#); [Piazzesi and Schneider \(2016\)](#); [Jorda et al. \(2016\)](#); [Mian et al. \(2017\)](#).

<sup>5</sup>There is a related stream of the literature which emphasizes the role of (consumer) sentiment in driving the business cycle, see e.g. [Angeletos and La'O \(2013\)](#); [Lagerborg et al. \(2019\)](#).

European countries, (ii) document its business cycle properties, and (iii) compare the measure of household uncertainty against other measures of uncertainty sourced from financial markets and news media.

The measure is constructed by using the fraction of respondents who choose the option *Don't know* when answering several questions in the monthly European harmonized consumer survey. These are the very same questions used to construct the well-known consumer sentiment indices. Given the way it is constructed, the proposed measure of household uncertainty may be interpreted as a measure of Knightian uncertainty or ambiguity. To better interpret and understand what the proposed measure of household uncertainty captures, the analyses include the consumer sentiment index and a measure of household dispersion of beliefs.

The main findings are as follows. Household uncertainty tends to increase following declines in consumer sentiment and dispersion of beliefs and is negatively correlated with policy uncertainty but positively correlated with financial uncertainty. It tends to increase following periods when households have higher planned durable expenditures and savings. Further, periods of high household uncertainty tend to be followed by periods of worsening of household financial conditions, negative responses on whether now is the right time to buy durables, increases in unemployment, interest rates, and inflation, and declines in industrial production.

Using impulse responses from recursively-identified vector auto-regressions I find that, unlike results based on aggregate US data, it is not clear that household uncertainty shocks act like demand shocks for European countries. It seems that household uncertainty shocks are inflationary in Europe and may have limited or delayed impact on unemployment.<sup>6</sup> The results are comparable to the state-level effects of

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<sup>6</sup>See also micro-evidence in [Giavazzi and McMahon \(2012\)](#) which shows that households increase savings partly by increasing labor supply following an increase in political uncertainty around German elections.

US uncertainty shocks documented by [Mumtaz et al. \(2018\)](#) and support the notion of a *pricing bias* channel to uncertainty.<sup>7</sup> Further, there is substantial heterogeneity in impulse responses across countries echoing micro-evidence of heterogeneous responses to uncertainty among US households documented by [Ben-David et al. \(2018\)](#).

These results raise many questions on the aggregate impact of household uncertainty, and household expectations more broadly, especially when considering economies other than the US. These findings challenge the notion that household uncertainty shocks act like demand shocks.

The next section describes the data used and basic properties of the household uncertainty measure while Section 3 reports results on the macroeconomic impact of household uncertainty shocks relative to financial and policy uncertainty. Finally, Section 4 concludes with some remarks regarding potential future work.

## 2. Data

The European harmonized monthly consumer surveys allow for measurement of different dimensions to household expectations. Using the cross-section of responses in each survey date, one can construct measures of the average response to each question, the dispersion of responses, and the fraction of respondents who answer *Don't know*. For instance, the well-known index of consumer sentiment, (CSI), is calculated based on the average response to four questions in the survey.

- **B2.** How do you expect the financial position of your household to change over the next 12 months?

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<sup>7</sup>[Fernandez-Villaverde et al. \(2015\)](#) show that in the presence of nominal rigidities and given asymmetries in firm profit functions, an increase in uncertainty may lead price-setters to preemptively raise prices and increase mark-ups. Such a channel leads to inflationary uncertainty shocks unless (a Taylor-type) monetary policy responds to uncertainty.

- **B4.** How do you expect the general economic situation in this country to develop over the next 12 months?
- **B7.** How do you expect the number of people unemployed in this country will change over the next 12 months?
- **D2.** Over the next 12 months, how likely will you be to save any money?

To answer these four questions, households choose among five or six options.<sup>8</sup>

- Much better/more (+ +)
- Somewhat better/more (+)
- The same (0)
- Somewhat worse/less (-)
- Much worse/less (-)
- Don't know (?)

Given the last possible response to these four questions we can construct an index capturing household uncertainty (*HUN*). Let  $p_{i,j,t}$  denote the fraction of respondents choosing option  $i$  for question  $j$  at survey date  $t$ . For quantification purposes we can code these responses into numerical values of  $x_{i,j,t} \in \{1, 0.5, 0, -0.5, -1\}$  and unknown for the last option ( $i = 6$ ). Averaging the mean and fraction of respondents indicating their uncertainty yields the measure of household sentiment and uncertainty respectively. Finally, a measure of household dispersion in beliefs is constructed by calculating the cross-sectional variance of responses to these questions. Formally, the measure of household sentiment (*CSI*), dispersion of beliefs (*DIS*), and uncertainty (*HUN*) are derived in the following way,

$$\begin{aligned}
 CSI_t &= \frac{1}{4} \sum_j \sum_{i=1}^5 x_{i,j,t} \tilde{p}_{i,j,t} \\
 DIS_t &= \frac{1}{4} \sum_j \sum_{i=1}^5 (x_{i,j,t} - \bar{x}_{j,t})^2 \tilde{p}_{i,j,t} \\
 HUN_t &= \frac{1}{4} \sum_j p_{6,j,t}
 \end{aligned}$$

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<sup>8</sup>The middle option (0) is not available for the question on the likelihood of saving.



where  $\tilde{p}_{i,j,t} = 100 * p_{i,j,t} / \sum_{i=1}^5 p_{i,j,t}$  re-scales the probabilities to sum to 100 excluding the probabilities assigned to the sixth option denoting uncertainty.

The analysis is done on a balanced panel of 20 countries (plus the Euro Area average) and for the period May 2002 to April 2018.<sup>9</sup> In addition to these expectations indices, I also calculate averaged responses reflecting household planned durable expenditures (EDE), planned savings (SAV), views on whether it is the right time to make major purchases (RTB), and an index of changes in current household financial situations (CFS).<sup>10</sup>

The survey data is complemented with several monthly macroeconomic variables. I take monthly data on the log of industrial production (IPG), CPI inflation (INF), the daily market rate (DMR), and the unemployment rate (UNE). The industrial production and inflation variables are transformed into year-on-year growth rates while the daily market rate and unemployment rate are year-on-year simple differences.<sup>11</sup>

A rudimentary check of what these various indices capture can be discerned by how they correlate with and respond to other survey responses and macroeconomic indicators. Table 1 provides peak (in absolute terms) lead-lag correlations of variables for the Euro area. Each column header reports the variable that is in leads or lags. The first row reports peak correlations with consumer sentiment while the second row reports at which lead or lag the peak correlation is observed. Rows two to six report the same statistics for the dispersion of household beliefs and household uncertainty respectively.

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<sup>9</sup>A broader, unbalanced panel is available for survey responses between 1995 to 2018 and spans 28 geographic areas (26 countries and averages for the European Union and the Euro area).

<sup>10</sup>These average measures are calculated in the same way as the CSI.

<sup>11</sup>Data available [here](#).

Table 1: Peak lead-lag correlation: Euro area measures

	$CSI_{t+k}$	$DIS_{t+k}$	$HUN_{t+k}$	$EDE_{t+k}$	$SAV_{t+k}$	$CFS_{t+k}$	$RTB_{t+k}$	$UNE_{t+k}$	$IPG_{t+k}$	$INF_{t+k}$	$DMR_{t+k}$
$CSI_t$	1.00	-0.46	-0.48	0.64	0.64	0.86	0.78	-0.88	0.66	-0.60	-0.51
Lead/Lag (k)	0.00	0.00	-18.00	1.00	0.00	0.00	-5.00	3.00	2.00	-13.00	-18.00
$DIS_t$	-0.46	1.00	-0.57	-0.79	-0.49	-0.58	0.29	0.47	-0.22	-0.45	-0.72
Lead/Lag (k)	0.00	0.00	20.00	0.00	0.00	0.00	20.00	-17.00	10.00	20.00	20.00
$HUN_t$	-0.48	-0.57	1.00	0.57	0.28	-0.44	-0.64	0.48	-0.47	0.58	0.69
Lead/Lag (k)	18.00	-20.00	0.00	-14.00	-15.00	18.00	17.00	20.00	17.00	5.00	2.00

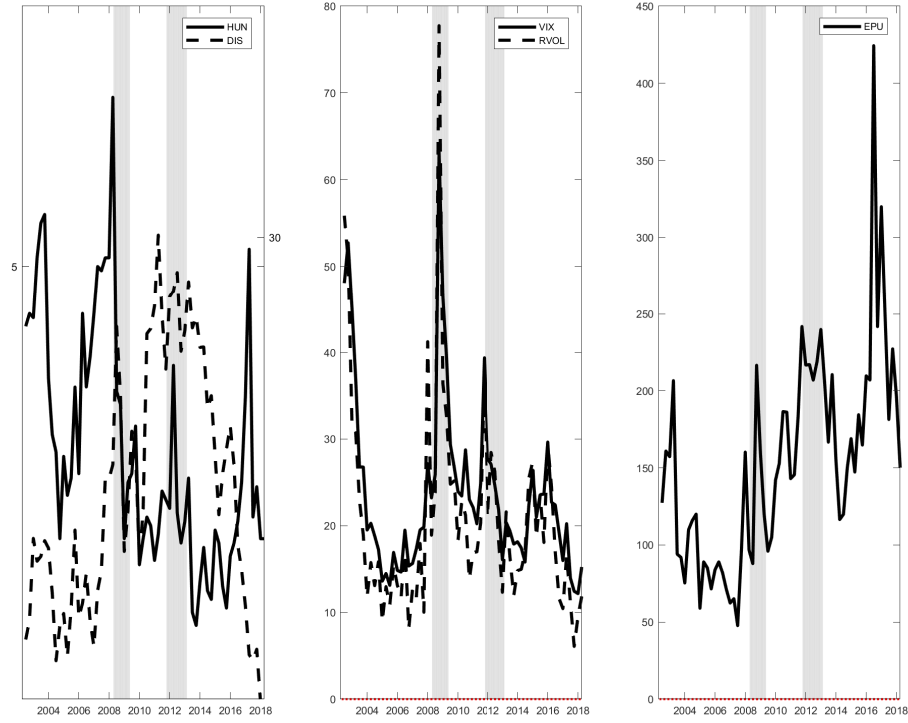
*HUN is the measure of household uncertainty, CSI is the index of consumer sentiment, DIS is an index of consumer disagreement, EDE is an index of planned durable expenditures, SAV is an index of planned household savings, RTB is an index measuring views on right time to make major purchases, and CFS is an index of change in households' financial situation. UNE, IPG, INF, and DMR are the unemployment rate, industrial production growth, inflation, and daily market rate respectively. All variables are Euro area averages.*

The first row of Table 1 shows that consumer sentiment is contemporaneously negatively correlated with dispersion, positively correlated with improvements in financial situation and likelihood to save, and is higher when views on the right time to buy has been previously high and when market rates and inflation were previously low. Increases in consumer sentiment are typically followed by lower unemployment and higher industrial production growth. On the other hand household uncertainty tends to increase when belief dispersion was previously low and when planned durable expenditures and likelihood to save were high. Increases in household uncertainty lead to declines in sentiment, household financial situations, views on the right time to buy, higher unemployment, inflation, and interest rates, as well as lower industrial production growth.<sup>12</sup>

I also collect Euro area data on alternative measures of uncertainty from the literature to compare with household uncertainty. In particular, I use the implied (from option prices) volatility of the Eurostoxx 50 index (VIX) and the Baker et al. (2016) measure of economic policy uncertainty for Europe (EPU). Figure 1 plots the time evolution of these two measures of uncertainty along with household disagreement and uncertainty for the Euro area.

<sup>12</sup>See Figures A.2, A.3, and A.4 in the Appendix for the full set of correlation coefficients across various leads and lags. The evolution of these variables over time and for the Euro area are also

Figure 1: Measures of uncertainty for Europe



*DIS and HUN are Euro area indices of household dispersion of beliefs and uncertainty respectively. VIX is the option-implied volatility of the Eurostoxx 50 index. RVOL is the realized volatility of the Eurostoxx 50 index. EPU is the [Baker et al. \(2016\)](#) measure of economic policy uncertainty for Europe. Shaded areas are Euro area peak-to-trough periods.*

Table 2 reports the correlations of these measures of uncertainty for the Euro area. Household dispersion of beliefs is negatively correlated with household uncertainty and positively correlated with measures of financial and policy uncertainty. On the other hand, household uncertainty is positively correlated with the VIX financial measure of uncertainty and negatively correlated with the EPU measure of policy uncertainty.

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plotted in Figure A.1.

Table 2: Correlations of Euro area uncertainty measures

	DIS	HUN	RVOL	VIX	EPU
DIS	1				
HUN	-0.3388	1			
RVOL	0.1863	0.0847	1		
VIX	0.1897	0.1488	0.9092	1	
EPU	0.2581	-0.2616	0.2415	0.2197	1

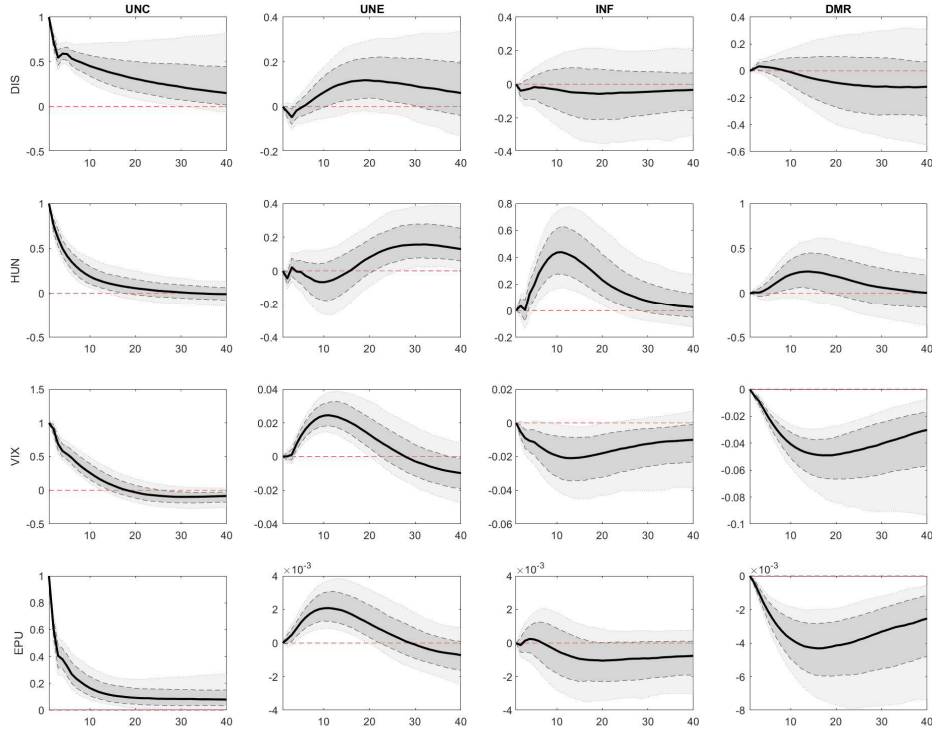
*DIS and HUN are Euro area indices of household disagreement and uncertainty respectively. VIX is the option-implied volatility of the Eurostoxx 50 index. RVOL is the realized volatility of the Eurostoxx 50 index. EPU is the [Baker et al. \(2016\)](#) measure of economic policy uncertainty for Europe.*

### 3. Macroeconomic impact of household uncertainty

I replicate the vector auto-regression (VAR) analysis in [Leduc and Liu \(2016\)](#) which used the Michigan Consumer Survey to measure household uncertainty for the US. The VAR is comprised of a measure for uncertainty, unemployment, inflation, and interest rates and is estimated with three lags.<sup>13</sup> Shocks are identified recursively with uncertainty ordered first. In Figure 2, we can compare impulse responses from household uncertainty and belief dispersion shocks relative to financial and news media-based measures of Euro area uncertainty. We find that, as documented for the US case by [Leduc and Liu \(2016\)](#), financial uncertainty shocks look like demand shocks as they raise unemployment and lower inflation. To some extent, these properties are shared by the economic policy uncertainty measure and the household measure of dispersion of beliefs. On the other hand, we find that increases in household uncertainty has a negligible initial effect on unemployment, only raising unemployment after about 20 quarters. Further, in contrast to [Leduc and Liu \(2016\)](#)

<sup>13</sup>The VAR is estimated using Bayesian methods with Minnesota priors (full VAR) using the ECB’s BEAR toolbox ([Dieppe et al., 2016](#)). Impulse responses from the *RVOL* measure are similar to the *VIX* measure.

Figure 2: Uncertainty impulse responses



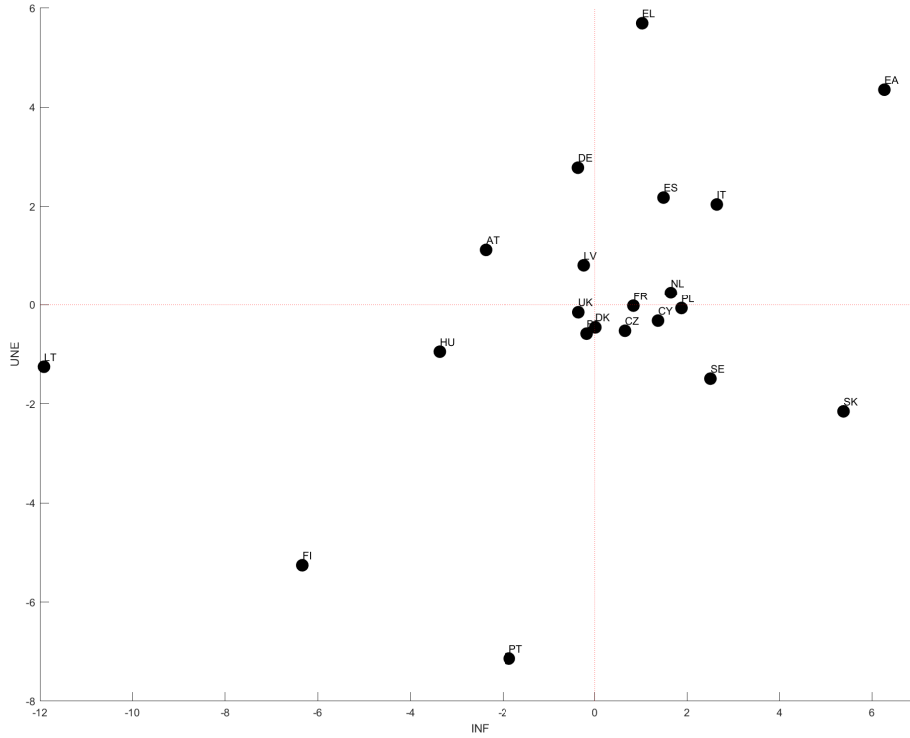
*The panels report impulse responses from shocks to uncertainty. Each column reports responses for a given variable and the uncertainty measure used is given by the row labels. The light and dark shaded areas reflect 90 and 68% confidence sets respectively.*

but consistent with [Mumtaz et al. \(2018\)](#), household uncertainty shocks lead to higher inflation.

These results mask significant heterogeneity when the analysis is done for individual countries. Figure 3 plots cumulated median impulse responses of unemployment (vertical axis) and inflation (horizontal axis) to household uncertainty shocks for each of the 20 countries in our sample.<sup>14</sup> For Austria, and to some extent Germany and Latvia, we get the result that household uncertainty shocks raise unemployment and lower inflation. Household uncertainty shocks raise unemployment and inflation for Italy, Spain, and Greece while it lowers both for Finland, Portugal and

<sup>14</sup>To help control for country differences in trends, the VAR is augmented with month-specific constant terms as well linear time trends.

Figure 3: Household uncertainty impulse responses



*The dots represent cumulated median impulse responses from shocks to household uncertainty for 20 European countries. The response of unemployment is on the vertical axis and the response of inflation is on the horizontal axis. The impulse responses are taken from a recursively-identified VAR estimated with three lags, linear time trends, and month-specific constant terms.*

Hungary. Finally, for countries like Slovakia and Sweden, household uncertainty shocks raise inflation and lowers unemployment. We also observe substantial heterogeneity when the same analysis is done for shocks to dispersion in household beliefs for each country.<sup>15</sup>

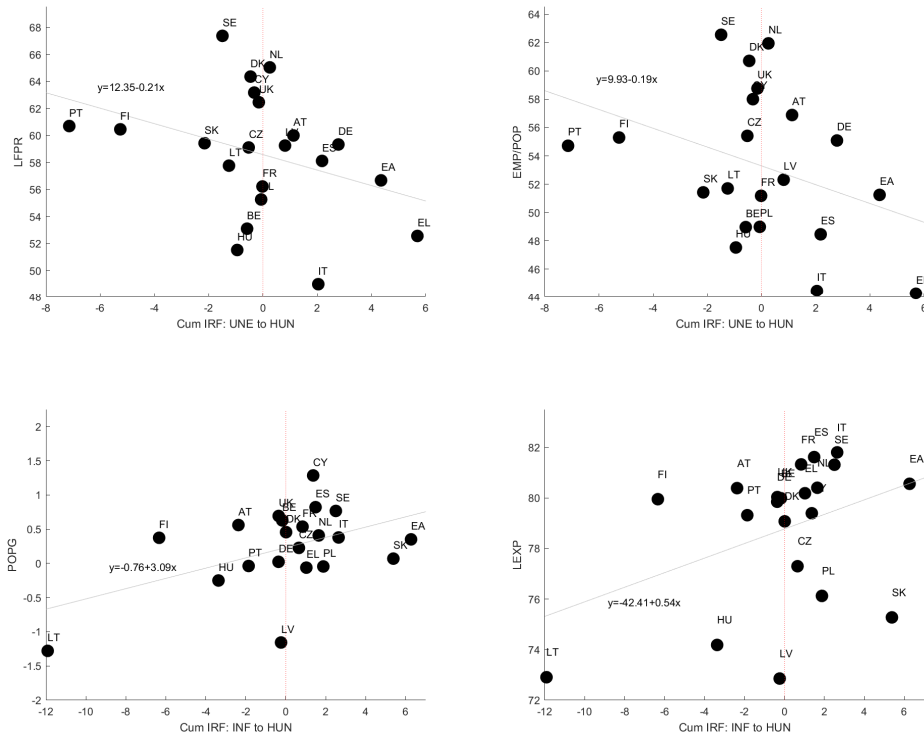
A comparison of the cumulated (median) impulse responses across country characteristics reveal that the impact of household uncertainty on unemployment is decreasing in average labor force participation while the impact of household uncertainty on inflation is increasing in population growth and life expectancy.<sup>16</sup> Figure

<sup>15</sup>See Figure A.5 in the Appendix.

<sup>16</sup>Country average characteristics obtained from the World Bank World Development Indicators database.

4 plots cumulated impulse responses of unemployment and inflation to household uncertainty shocks on the horizontal axes against average (2002-2017) labor force participation rates (LFPR), employment to population (EMP/POP), population growth (POPG) and life expectancy at birth (LEXP). These results indicate that labor market conditions and demographic factors may play important roles in the transmission of household uncertainty to macroeconomic conditions.

Figure 4: Country characteristics and impulse responses



*The dots represent cumulated median impulse responses from shocks to household uncertainty on the horizontal axes against country average characteristics on the vertical axes for 20 European countries. The top two panels plot the response of unemployment against labor force participation rates (LFPR) and employment to population ratios (EMP/POP). The bottom two panels plot the response of inflation against population growth (POPG) and life expectancy at birth (LEXP).*

## 4. Conclusion

For most European countries, it is not clear that shocks to household uncertainty act like negative demand shocks. It seems that household uncertainty shocks are inflationary in Europe and may have limited, or delayed, impact on unemployment. Further, there is substantial heterogeneity across countries. A core-periphery paradigm may not be sufficient to characterize these differences in results. Country differences in labor market structures and demographics may be important factors in the transmission of household uncertainty. These are considerations that bear further investigation and are areas for future work.

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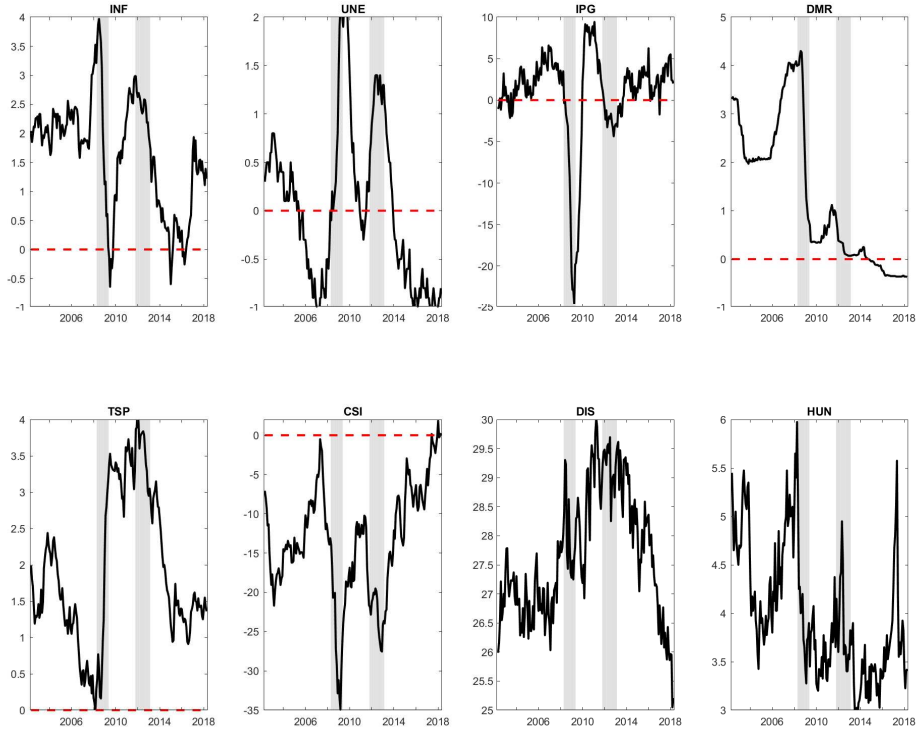
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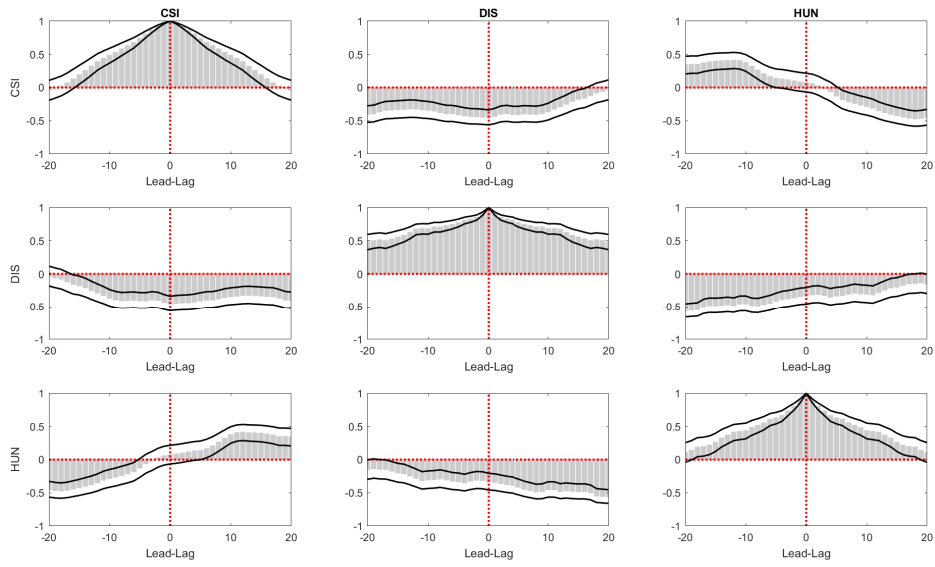
# Appendix

Figure A.1: Euro area household expectations and macro variables



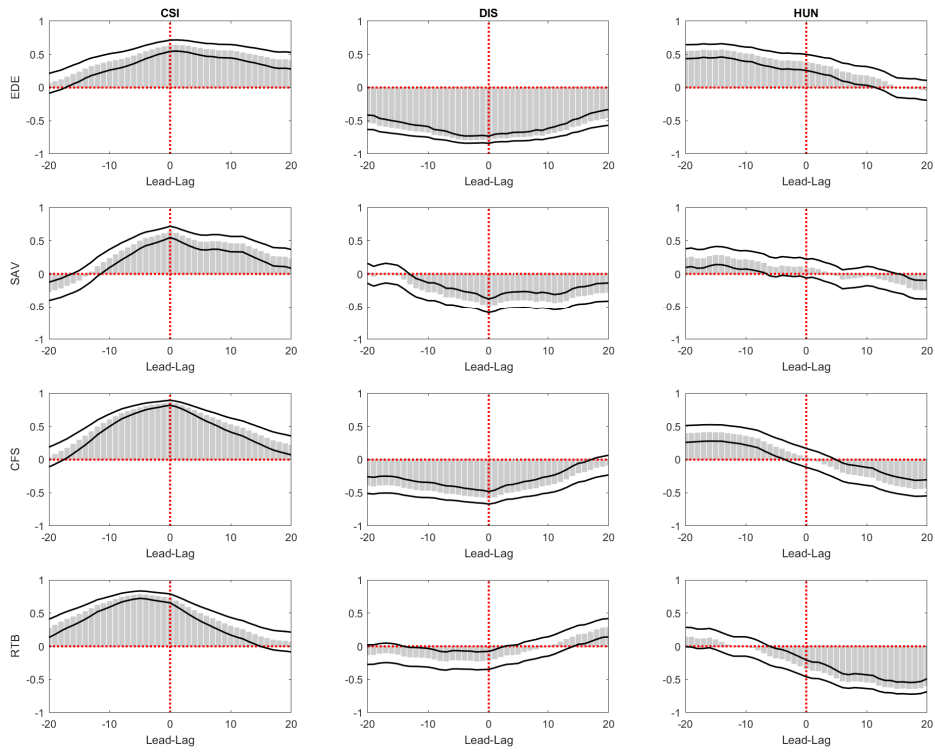
*INF and IPG are year-on-year growth rates of the consumer price index and industrial production respectively. UNE is the year-on-year difference in unemployment rates. DMR and TSP are daily money market rates and the term spread (10-year rates less daily market rates). CSI, DIS, and HUN are indices of consumer sentiment, dispersion of beliefs, and household uncertainty respectively. All series are Euro area averages. Shaded areas are Euro area peak-to-trough periods.*

Figure A.2: Cross-correlations of survey indices I



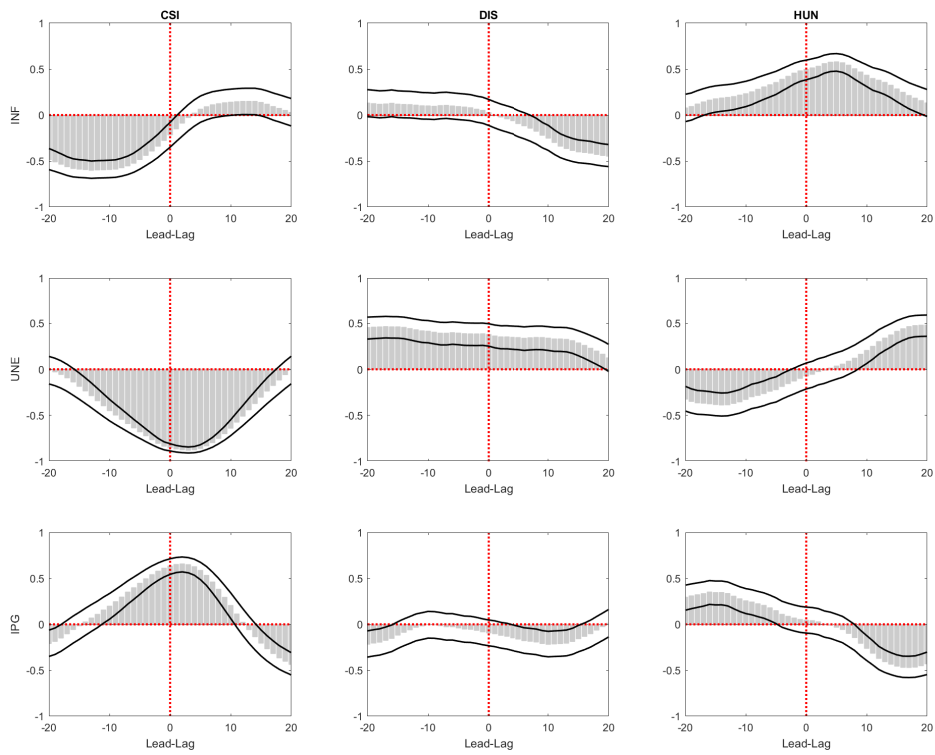
The panels report lead-lag cross-correlations between *CSI*, *DIS*, and *HUN* for Euro area averages. The first column reports correlations of *CSI* with leads and lags of the other variables. The second and third columns do the same for *DIS* and *HUN* respectively. Row labels report the lead-lag variable. Solid lines reflect 95% confidence intervals.

Figure A.3: Cross-correlations of survey indices II



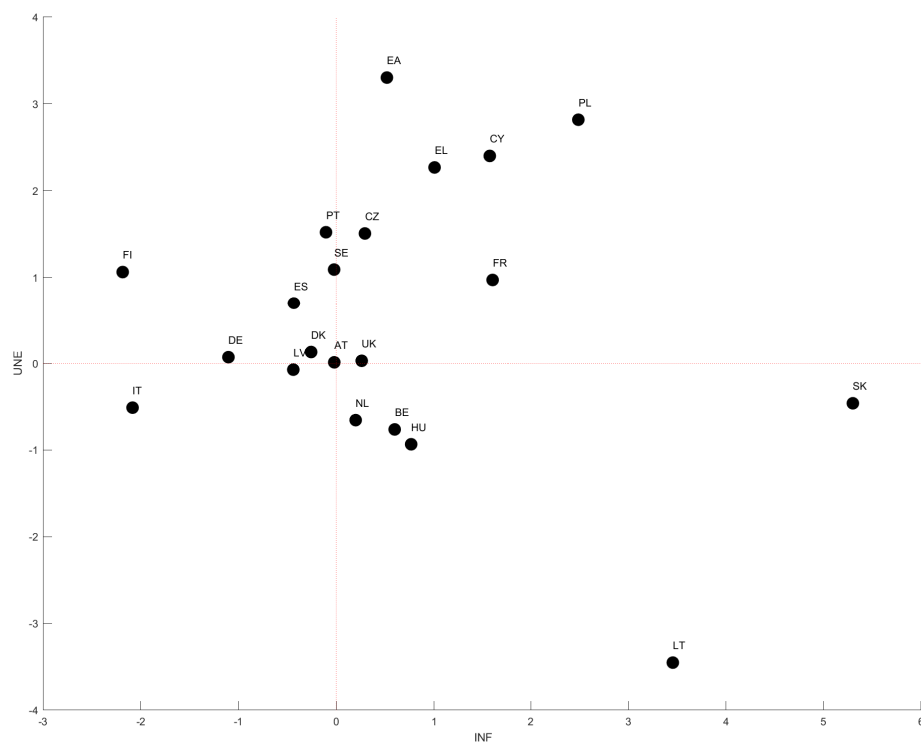
*The panels report lead-lag cross-correlations between CSI, DIS, and HUN for Euro area averages. The first column reports correlations of CSI with leads and lags of the other variables. The second and third columns do the same for DIS and HUN respectively. Row labels report the lead-lag variable. Solid lines reflect 95% confidence intervals.*

Figure A.4: Cross-correlations of survey indices III



The panels report lead-lag cross-correlations between *CSI*, *DIS*, and *HUN* for Euro area averages. The first column reports correlations of *CSI* with leads and lags of the other variables. The second and third columns do the same for *DIS* and *HUN* respectively. Row labels report the lead-lag variable. Solid lines reflect 95% confidence intervals.

Figure A.5: Household dispersion impulse responses



*The dots represent cumulated median impulse responses from shocks to household dispersion in beliefs for 20 European countries. The response of unemployment is on the vertical axis and the response of inflation is on the horizontal axis. The impulse responses are taken from a recursively-identified VAR estimated with three lags, linear time trends, and month-specific constant terms.*

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