

7507014-when-bad-news-breeds-bias-cross-country-evidence-from-households-inflation-expec

SUMMARY: This research article examines how households form and assess their inflation expectations following major macroeconomic disruptions in twelve euro-area economies from 2004 to 2025. The study uses a large household-level dataset to analyze the accuracy and formation of inflation expectations in response to adverse events. The key finding is that inflation expectations tend to overestimate inflation, with households overestimating inflation following adverse events. The authors attribute this overestimation to households' tendency to overreact to inflationary news and to behavioral biases in response to adverse non-inflationary shocks.

METHOD: The researchers use a large household-level dataset for twelve euro-area economies. They identify major macroeconomic disruptions using stock market volatility, which serves as a mirror reflecting large adverse events. The study focuses on how these disruptions affect inflation expectations, with a particular interest in the accuracy and formation of these expectations. The researchers capture several major adverse events, such as the Global Financial Crisis, the Covid Pandemic, and the Russian Invasion of Ukraine, and analyze their impact on inflation expectations.

KEY FINDINGS:

- Following adverse events, the degree of inaccuracy in inflation expectations typically increases.
- Inflation expectations tend to rise relative to 12-month ahead inflation realizations, suggesting households overestimate inflation.
- The study finds evidence of households overreacting to inflationary news and exhibiting behavioral biases in response to adverse non-inflationary shocks.

IMPLICATION FOR TRADING: The findings have significant implications for monetary policy, particularly in a monetary union. The updating of inflation expectations during disruptive episodes could lead to cross-country heterogeneity, potentially impairing the effectiveness of monetary policy. Practitioners can use these insights to better understand and predict inflation expectations, which can inform their trading strategies. For example, traders might adjust their positions based on the expected impact of adverse events on inflation expectations, potentially leading to more accurate and profitable trading decisions. Additionally, the study's findings can help central banks design more effective communication strategies to manage inflation expectations and maintain monetary policy effectiveness.

When Bad News Breeds Bias: Cross-country Evidence from Households' Inflation Expectations

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Abstract

Utilizing a large household-level dataset of inflation expectations for twelve euro-area economies, we attempt to assess the formation and accuracy of inflation expectations following major disruptions of the macroeconomy which we identify during the period from 2004:1 to 2025:2. We find that the arrival of such adverse events tends to increase the degree of inaccuracy in inflation expectations. We also find that this happens because inflation expectations tend to go up in response to these adverse shocks relative to the 12-month ahead inflation realizations, which offers direct evidence of households overestimating inflation. This is consistent with overreaction of inflation expectations in response to inflationary news and with inflation-as-a-bad behavioral patterns in response to adverse non-inflationary shocks. We infer that such behavioral forces appear to have played an important role in the formation of inflation expectations in the euro-area following adverse shocks during the past two decades.

Keywords: inflation forecast errors; macroeconomic shocks; behavioral; belief heterogeneity; Central Bank communication.

JEL Classification: D84, E31, E70

1 Introduction

Following Coibion and Gorodnichenko (2012), Coibion and Gorodnichenko (2015) and other recent work (see D'Acunto et al. (2024) for a comprehensive survey), there has been an increasing interest in direct measures of consumers' expectations and a resulting flood of evidence pointing away from full information rational expectations models as an appropriate framework for policy analysis, in line with the insights of Curtin (2019).¹ The evidence suggests that agents form expectations consistent with rational inattention models (e.g., Sims (2003), Mackowiak and Wiederholt (2009)) and more recent rational models of limited attention (e.g., Kohlhas and Walther (2021)), as well as with subjective frameworks, including "near-rational" subjective expectations (Woodford (2013)) and behavioral biases (e.g., Bordalo et al. (2018), Bhandari et al. (2025)).

Understanding how the way households form expectations differs from full information rational expectations is important for academia and policy makers alike. Given the key role inflation expectations play in monetary policy, such an understanding would facilitate Central Bank communication strategies and the design of appropriate monetary policy rules in an environment where the formation of consumers' inflation expectations deviates from that of hypothetical fully informed rational agents. Furthermore, our analysis can have implications for the effectiveness of monetary policy across a monetary union, where the updating of inflation expectations during disruptive episodes could potentially be a source of cross-country heterogeneity that could impair monetary policy effectiveness.

We pursue the goal of understanding inflation expectations formation by utilizing a very large household-level dataset across the euro-area for the period from 2004:1 to 2025:2. More specifically, we dissect the effects of major macroeconomic disruptions on household expectations in these economies.² In particular, we are interested in how these adverse shocks affect the formation and accuracy of households' inflation expectations.

¹This pioneer's insights are based on half-a-century's experience with consumers' survey expectations data, having directed the University of Michigan Consumer Sentiment Surveys from 1976 to 2022.

²Thus, our work complements Andre et al. (2022) that use a different approach to assess how individuals form expectations in response to oil supply, monetary policy, government spending, and income tax shocks.

We exploit stock market volatility to identify major disruptions during this period based on the volatility of the main European equity index. In effect, the stockmarket serves as a mirror reflecting large adverse events and helps more accurately assess their arrival time. Unlike Bloom (2009) which treats events as realizations of an uncertainty shock, our selection algorithm treats each event as a potentially separate shock. In doing so, it captures several major adverse events that were plausibly relevant for these euro-area economies.³ Importantly, this ends up selecting events that make intuitive sense and that were arguably largely unanticipated before arrival, such as the Global Financial Crisis, the Covid Pandemic, and the Russian Invasion of Ukraine. This set of diverse events provides a source of exogenous variation to study the updating of individual inflation expectations.⁴ One of our main contributions is that we offer a structured approach for assessing the impact of such macroeconomic events on the formation and accuracy of consumers' inflation expectations across the euro-area.

We find that following the arrival of adverse events, the overall degree of inaccuracy as captured by the absolute forecast error typically rises. This increased inaccuracy following macroeconomic disruptions is driven by an increase in inflation expectations relative to the 12-month ahead inflation realizations.⁵ The latter finding suggests that households associate the arrival of adverse events with higher expected inflation and thus tend to overestimate inflation following such events.

Following the arrival of certain adverse events, such as the Covid episode, which bring about a fall in inflation in some countries and have no inflationary effects in other countries, inflation expectations tend to go up relative to inflation realizations, providing direct evidence that inflation is perceived as a negative phenomenon in the sense of Binetti et al. (2024) and Candia et al. (2020). This inflation-as-a-bad (IAAB) finding plausibly reflects behavioral bias rather than rational models where uncertainty about policy effectiveness faces agents

³As bad news typically elevates uncertainty (see, e.g., Caldara et al., 2016), one interpretation of what we do is that we identify these adverse shocks by using stock market volatility as a proxy of uncertainty.

⁴Furthermore, the fact that we are explaining individual inflation forecast errors using aggregate shocks, makes reverse causality a non-concern as an individual's inflation forecast cannot cause aggregate shocks.

⁵The exception is the euro-crisis, especially for the crisis-struck Greece and Spain, where absolute forecast error fell driven by a fall in inflation expectations relative to the 12-month ahead inflation realizations.

with rational expectations. Consumers' reaction to this shock cannot be plausibly explained by rational agents optimally placing greater weight on worst-case scenarios while forming rational expectations under policy uncertainty, since that would entail that they expect the Central Bank to systematically greatly overreact to disinflationary shocks to such an extent as to create inflation even though low and stable inflation is the ECB's primary mandate.

Instead, the evidence here accords well with the theoretical framework of Bhandari et al. (2025) where subjective beliefs play a role in aggregate fluctuations so that an increase in pessimism generates upward biases in inflation forecasts. In our context, the arrival of adverse shocks is perceived as bad news that may bring about pessimistic waves which increase inflation expectations even when these shocks do not increase inflation or even tend to bring future inflation down. Our evidence is also consistent with households interpreting adverse events as inflationary relying on subjective supply-side models, or rational models where households find it optimal to pay more attention to supply-side shocks.⁶

Our IAAB finding is consistent with the empirical findings in Hou and Wang (2024) which point to the relevance of subjective models of expectation formation, and is in line with Binetti et al. (2024) which find that "inflation is perceived as an unambiguously negative phenomenon" as well as with Tsiaplias (2024) where IAAB perceptions are found to relate to adverse shocks and influence the response of inflation expectations to them.

This IAAB finding has a somewhat surprising monetary policy implication: in response to a disinflationary shock that brings about an increase in inflation expectations, the Central Bank would do well to offer forward guidance reassuring the public that it would fight any inflationary pressures. This would help avoid the recessionary effects of falling consumption due to individuals foreseeing a fall in the present value of their wealth in line with their

⁶That households associate higher expected inflation with lower expected output growth, is explained in Zhang (2024) by a dynamic general equilibrium model with rationally inattentive households that make the optimal choice of paying more attention to supply shocks because these most affect their real income. Similarly, in Kamdar and Ray (2025), that households expecting an expansion also consistently predict disinflation, can be explained in a New Keynesian model with rationally inattentive consumers facing uncertainty regarding aggregate demand and supply shocks, where, as supply-driven recessions are more costly for households relying on labor income, more attention is optimally devoted to supply shocks.

heightened inflation expectations after an adverse disinflationary shock.⁷

Another strand of the literature has documented different forms of overreaction by households, professional forecasters and other agents. Kohlhas and Walther (2021) provide a wide range of survey evidence consistent with overreaction of output and inflation expectations to recent events where individuals extrapolate from recent conditions, coinciding with underreaction to average new information as measured by average forecast revisions (as in Coibion and Gorodnichenko (2015)). Considering professional forecasters' revisions of inflation expectations, Bordalo et al. (2020) present evidence that individual inflation forecasts typically overreact to news while consensus forecasts underreact relative to full information rational expectations.⁸ Given that we do not have a panel, we cannot examine overreaction to individual forecast revisions.

However, our shock identification approach allows us to go beyond previous contributions in providing direct evidence for overreaction to adverse inflationary events. Notably, in response to the Russian Invasion of Ukraine shock, individual households' inflation expectations tend to go up more than the 12-month ahead inflation realizations. This provides direct evidence for overreaction to recent inflationary news as captured by our shock identification exercise. We also find evidence of pervasive overreaction of inflation expectations to recent realizations of the forecasted variable, a more standard measure of recent inflationary news, consistent with individuals extrapolating from recent conditions as in Kohlhas and Walther (2021).

Our overreaction evidence here is consistent with rational models of limited attention such as Kohlhas and Walther (2021) and extensions of noisy rational expectations that allow forecasters to be overconfident as in Broer and Kohlhas (2024), but also with models explicitly based on behavioral biases, along the lines of Bordalo et al. (2018) or Bordalo et al.

⁷That this income effect can exceed the intertemporal substitution effect on consumption implied by a standard Euler equation mechanism when inflation expectations increase, is shown in Coibion et al. (2023), and is consistent with the negative response of consumption intentions and expected financial condition of the household shown in Figures A3 and A4 of the Appendix.

⁸Thus, Bordalo et al. (2020) analyzes a different type of overreactions in survey expectations (overreactions to individual forecast revisions) to that documented in Kohlhas and Walther (2021) who emphasize overreactions to recent realizations of the forecasted variable. Cornand et al. (2020) also provide extensive evidence for overreaction in households' inflation expectations forecast errors to individual forecast revisions.

(2020). Instead, agents with rational expectations under uncertainty that take into account the ECB's primary mandate of low and stable inflation, would arguably be more likely to under-predict future inflation in response to inflationary shocks.

We note that throughout our paper, we take account of the household's current perception of inflation over the past 12 months which captures idiosyncratic aspects of each household such as its tendency to overestimate inflation. Thus, our findings regarding pervasive overestimation of inflation, IAAB in the presence of non-inflationary shocks, and overreaction to inflationary shocks, are net of such idiosyncratic influences.

The next section describes our data and the identification of adverse events during the period under study. Following that, we present our household-level regression estimation and results. The final section briefly concludes.

2 Data and Variables Construction

2.1 Macroeconomic Data

The source of macroeconomic data for inflation, unemployment, and production which we utilize in our regression analysis, is the Eurostat database. We measure realized inflation using the annual rate of change of the harmonized consumer price index (HICP) for all items. For each country, we construct 12-month-ahead realized inflation and combine it with survey data on inflation expectations to calculate forecast errors and absolute forecast errors, where we follow the literature in defining forecast errors as inflation realizations at $t+12$ minus individual inflation expectations at t regarding $t+12$. These measures serve as the dependent variables in our regression analysis shown in Figures 3 to 6 and Tables A1 to A4, as well as in Tables 2, A5 and A6. We also utilize the HICP for fuel to measure fuel inflation and the HICP for food to measure food inflation. These serve as independent variables in our regression analysis in Table 2, while fuel inflation is also included as a control in all Tables of results. Finally, we incorporate the seasonally adjusted unemployment rate and the annual growth rate of industrial production, which are likewise used as independent

variables across our regression analyses. These variables, together with fuel inflation, are employed to capture broader macroeconomic conditions and energy-related cost pressures that may shape both realized and perceived inflation.

Financial market stress is measured by the implied volatility index for the major stock market index (Euro Stoxx 50 Price Index), VSTOXX. The VSTOXX data are daily and their source is the London Stock Exchange Group Data & Analytics, formerly Refinitiv. The VSTOXX index is based on EURO STOXX 50 options prices and designed to reflect the market expectations of near-term up to long-term volatility by measuring the square root of the implied variance across all options of a given time to expiration.

2.2 Survey Data

We use survey-based measures of consumers' expectations over the next 12 months in twelve euro area economies. The data we use are from the Joint Harmonized EU Programme of Business and Consumer Surveys (BCS) of European households.⁹ The sample size of the survey varies across countries and is generally positively related to their respective population size. In our paper we utilize the micro data set on consumers' quantitative inflation perceptions and expectations provided by the European Commission. The data are monthly, start from January 2004 to February 2025.

We use the responses from BCS survey questions 5 and 6 to construct the main variables in our baseline analysis. These are two-part questions where the respondent is asked to provide a quantitative number of consumer price change.

Data for consumers' price perception are obtained from Question 5: "How do you think that consumer prices have developed over the last 12 months?". Possible answers are categorical and include: "risen a lot", "risen moderately", "risen slightly", "stayed about the same", "fallen" and "don't know". If Question 5 was answered by "risen a lot", "risen

⁹This same dataset is used in Kourtellis et al. (2025) to investigate the relation between the distribution of current expectations of future inflation across households with current inflation realizations. An earlier edition of this dataset for May 2003 to December 2016 was used in Duca-Radu et al. (2021), before publicly released, to study the response of households' consumption intentions to their beliefs about future inflation.

moderately", "risen slightly" or "fallen", then the respondent is subsequently asked to provide a quantitative estimate in Question 51. Question 51 asks "By how many per cent do you think that consumer prices have gone up/down over the past 12 months? Consumer prices have increased by ____,_% / decreased by ____,_%." We rely on the quantitative responses from Question 51 as it contains more information on the magnitude of perceived past inflation, compared to the qualitative responses from Question 5. This variable, which we denote as "*Past Prices Perception*", serves as an explanatory variable in our regression analysis to capture household idiosyncracies which would otherwise be omitted.

Data for consumers' inflation expectations are obtained from Question 6: "By comparison with the past 12 months, how do you expect that consumer prices will develop in the next 12 months?". Possible answers are categorical and include: "increase more rapidly", "increase at the same rate", "increase at a slower rate", "stay about the same", "fall" and "don't know". If Question 6 was answered by "increase more rapidly", "increase at the same rate", "increase at a slower rate", and "fall", then the respondent is subsequently asked to provide a quantitative estimate in Question 61. Question 61 asks "By how many per cent do you expect consumer prices to go up/down change in the next 12 months? Consumer prices will increase by ____,_% / decreased by ____,_%." We rely on the quantitative responses from Question 61 as it contains more information on the magnitude of inflation expectations, as compared to the qualitative responses from Question 6. This variable, which we denote as "*Inflation Expectations*", is used to construct forecast errors and absolute forecast errors subsequently used as dependent variables in our analysis.

In preparing the data for our analysis, we assign a value of zero to Question 51 when the respondent's answer to Question 5 is "stay about the same" and analogously assign a value of zero to Question 61 when the respondent's answer to Question 6 is "stay about the same". We impose sign consistency by recoding responses such that the numerical entry in Question 51 is negative if the corresponding categorical response in Question 5 is "fallen" and similarly, the entry in Question 61 is negative if the categorical response in Question 6 is "fall". To mitigate the influence of outliers and prevent extreme responses from disproportionately

affecting the results, we follow Curtin (1996) and truncate the data at -10 and +50 percent. We further draw on survey information on household income, respondent occupation, education, gender, and age. These characteristics are included as controls in our regression specifications, thereby accounting for systematic differences in inflation perceptions across demographic groups.

2.3 Identifying Major Macroeconomic Disruptions

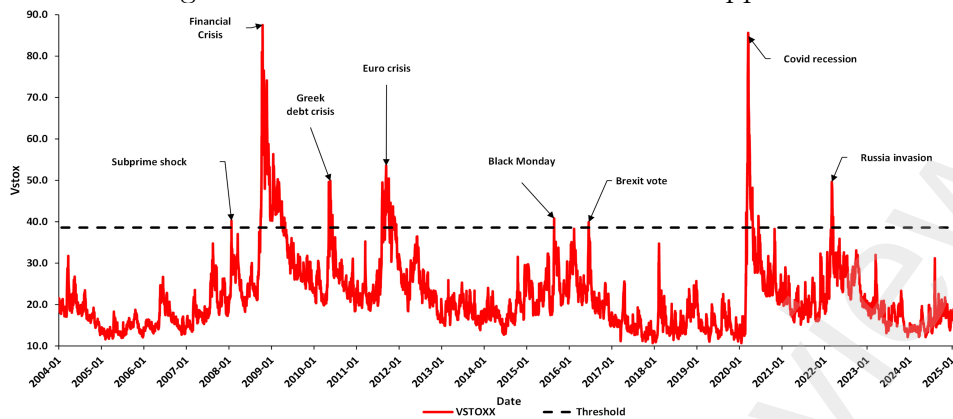
We begin by identifying market disruptions using a simple threshold-based approach applied to the VSTOXX index. We then also consider identification of adverse events based on the Markov Regime Switching approach (see Hamilton (1989)).

The VSTOXX index represents the markets' expectation of the 30-day forward volatility of EURO STOXX 50, the main European equity index. We define as substantial movement any VSTOXX level that is higher than the VSTOXX mean by at least 1.65 standard deviations, selected as the 5% one-tailed significance level treating each observation as independent. Applying this threshold to daily VSTOXX index data, we obtain 23 monthly events. As we can see in Figure 1, volatility jumps at the onset and during major events.

Unlike Bloom (2009) which treats events as realizations of an uncertainty shock, our selection algorithm treats each event as a potentially separate shock, where the stockmarket serves as a mirror reflecting large adverse events and helps more accurately assess their arrival time. As bad news typically elevate uncertainty (see e.g. Caldara et al., 2016; Berger et al., 2019), one interpretation of what we do is that in identifying these adverse shocks we utilize stock market volatility as a proxy of uncertainty (Bloom (2009)), where a spike of the VSTOXX index could indicate possible market disruptions in European markets.

The episodes (i.e., recurring events over several months) and monthly events we identify include the Subprime Mortgage Crisis that arrived in January 2008, the Global Financial Crisis (September 2008 to April 2009), the Greek Debt Crisis (May 2010 to June 2010), the European Sovereign Debt Crisis (from August 2011 to December 2011), the Black Monday stock market sell-off in August 2015, the Brexit Referendum in June 2016, the Covid

Figure 1: Threshold-based identification approach



Notes: VSTOXX measures the implied volatility of European STOXX 50 index. Implied volatility is derived from option values, which represents the estimates and assumptions of market participants. The threshold (mean + 1.65 standard deviation) is shown by the dotted line, with value 39.3. The events identified are above the dotted line.

Pandemic (from February 2020 to April 2020, and June 2020) and the Russian Invasion of Ukraine in March 2022. The complete list is shown in Table 1.

As an alternative to the threshold-based identification approach described above, we employ a Markov Regime Switching approach to detect episodes of elevated adversity. Before estimation, we first assess the time series properties of the VSTOXX by conducting an Augmented Dickey-Fuller (ADF) test. The results of the ADF test do not support the null of a unit root, indicating that the VSTOXX series is stationary.

We assume that regimes characterized by high volatility in the stock market correspond to the arrival of adverse events. To capture such dynamics, we estimate a two-state Markov Regime Switching model, specified with a regime-specific constant and common (rather than regime-specific) variance, as defined below:

$$\begin{aligned} Vstoxx_t &= \mu_{s_t} + \epsilon_t, \\ \epsilon_t &\sim \mathcal{N}(0, \sigma^2) \end{aligned} \tag{1}$$

where $Vstoxx_t$ is the Vstoxx market index, s_t is the latent regime at time t (1 or 2), following a Markov chain, μ_{s_t} is the regime-specific constant, and σ^2 is the common variance.

Using the Markov Regime Switching model, we identify 37 "VSTOXX Events", defined as

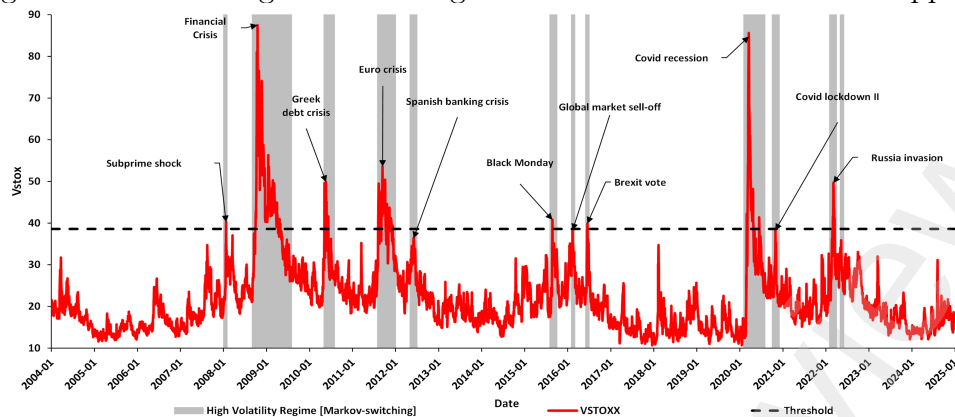
Table 1: Crisis Episodes, Labels, and Dating (Threshold-based vs. Markov-Switching)

Episode/Event	Label	Threshold-based	Markov-Switching
Subprime Mortgage Crisis and U.S. Recession Fears	Subprime shock	2008-01	2008-01
Global Financial Crisis	Financial crisis	2008-09 to 2009-04	2008-09 to 2009-07
Greek Debt Crisis	Greek debt crisis	2010-05 to 2010-06	2010-05 to 2010-07
European Sovereign Debt Crisis	Euro crisis	2011-08 to 2011-12	2011-08 to 2011-12
Spanish Banking Crisis and Bailout	Spanish banking crisis		2012-05 to 2012-06
Black Monday sell-off	Black Monday	2015-08	2015-08 to 2015-09
Global stock market sell-off	Global market sell-off		2016-02
Brexit Referendum	Brexit vote	2016-06	2016-06
Covid Pandemic	Covid recession	2020-02 to 2020-04, 2020-06	2020-02 to 2020-07
New Covid Lockdowns	Covid lockdown II		2020-10 to 2020-11
Russian Invasion	Russian invasion	2022-03	2022-02 to 2022-03, 2022-05

periods in which the estimated probability of being in the high-volatility regime at time t , conditional on the information set available up to t , exceeds 0.5. As we can see in Figure 2, the set of events identified based on the simple threshold approach is a subset of the adverse events identified based on the Markov Regime Switching approach. The latter approach identifies additional events such as the Spanish Banking Crisis and Bailout from May 2012 to June 2012, the Global stock market sell-off in February 2016, and the New Covid Lockdowns from October 2020 to November 2020. The complete list of events identified based on this second approach is again presented in Table 1.

The BCS Surveys are typically conducted during the first week of each month. Thus, when estimating the effects of the events on inflation expectations for a given month, it is essential to consider events identified in the preceding month. An event occurring in January 2008 would likely not influence the interviews recorded in the same month, as it would most

Figure 2: Markov Regime Switching VSTOXX-based identification approach



Notes: VSTOXX measures the implied volatility of European STOXX 50 index. Implied volatility is derived from option values, which represents the estimates and assumptions of market participants. The events identified when VSTOXX is in the high volatility regime, as estimated using the Markov Regime Switching approach, are shown by the grey shaded area.

likely have occurred after the interviews were conducted. Instead, its impact on inflation expectations is captured more accurately by considering survey responses in February 2008.

The impact of the events on Inflation and Unemployment

Along with the estimated effects of these adverse events on the expectations survey data, in Tables A1 to A6 we report their estimated 12-month cumulative impact on realized inflation using local projections (Jordà (2005)) as detailed in Appendix A.2. Presenting these alongside the baseline regressions provides a concise summary of the effects of these events on inflation across countries, facilitating direct comparison with the respective responses of households' inflation forecast errors. As we can see in Tables A1 to A6, the impact of the events on realized inflation, when statistically significant, is in the same direction across countries, with rare exceptions.¹⁰ Given the limited qualitative heterogeneity we observe in Tables A1 to A6 regarding the impact of the events on inflation across countries, we also estimate, for the sake of convenience, the pooled impact of the events on inflation across these countries and present this along with the country-specific estimates in Figure A1 of Appendix A.2. This shows the estimates of the impact of the events on inflation over a 12-

¹⁰The exceptions are Austria and Luxembourg during the Covid Pandemic (where we observe an increase in inflation only in these two countries), for Austria and Ireland in response to the Global market sell off in February 2016, and for Belgium during the Spanish Banking Crisis event.

month horizon, consistent with the horizon over which the surveyed households are asked to form expectations over. As we can see there, the impact on inflation is most visibly positive for the Russian Invasion, but is also estimated to be positive for the euro-crisis and the Greek Debt crisis. The estimated impact on inflation is negative for the other five shocks. Again, while the estimated impact on realized inflation is quantitatively different across countries, we observe limited heterogeneity qualitatively; notably, in Figure A1, only for Luxembourg and Austria during the Covid recession does inflation move in the opposite direction than in the other euro-area economies.

In Figure A2 of Appendix A.2, we also present the pooled estimates along with country-specific estimates for the impact of our identified events on unemployment over a 6-month horizon, capturing the immediate to short-run effects of these events on this measure of economic activity. As shown in Figure A2, except for the Brexit vote and the Russian Invasion which have no impact on unemployment, these events tend to increase the unemployment rate. We note, however, that in this case, there is some qualitative heterogeneity in the impact of some of the events on unemployment, notably in the aftermath of the Subprime shock, the Greek Debt Crisis, the Brexit Vote, and the Russian Invasion.

3 Estimation and Results

3.1 The Impact on Inflation Expectations Accuracy

We begin by trying to understand how the events we have identified affect the accuracy of inflation forecasts. More specifically, we explain the absolute forecast error of inflation expectations¹¹ with these events, by running country-by-country regressions as follows:

$$AFE_{c,i,t} = \alpha_{c,0} + \sum_{j=1}^n \beta_c^j Event_t^j + \alpha_{c,1} z_{c,i,t} + \lambda X_{c,i,t} + \psi_c W_{c,t} + \sum_{s=1}^{11} \gamma_c^s Month_t^s + u_{c,i,t} \quad (2)$$

¹¹We measure the degree of inaccuracy using absolute forecast errors as raw forecast errors would not accurately capture forecast accuracy. To see this, consider households that systematically tend to make large upward and large downward forecast errors that cancel each other out, and a second type of households that always make small negative forecast errors. In this case, while the latter households are in fact more accurate, their raw forecast errors will on average be greater than those of the former more inaccurate ones.

$$AFE_{c,i,t} = |\pi_{c,t+12} - \pi_{c,i,t}^e| \quad (3)$$

$AFE_{c,i,t}$	Inflation expectations absolute forecast error over the next 12 months for individual i , at time t , for country c
$\pi_{c,i,t}^e$	Inflation expectations over the next 12 months for individual i at time t for country c
$\pi_{c,t+12}$	12-month ahead inflation rate for country c at time t
$z_{c,i,t}$	Inflation perception over the past 12 months for individual i , at time t , for country c
$X_{c,i,t}$	Vector of individual i characteristics (age, gender, occupation, income, and education)
$W_{c,t}$	Vector of country c characteristics (unemployment rate, fuel inflation, and industrial production annual rate)
n	is the number of events identified

Controlling in Equation 2 for current perceptions, $z_{c,i,t}$, regarding inflation over the past 12 months, captures idiosyncratic aspects of each household, e.g. differences in their tendency to exaggerate when answering survey questions or differences in the basket of items consumed by the household, that would be impossible to capture using any of the other available variables here (see also Duca-Radu et al., 2021).¹²

We note that for episodes spanning over multiple months we consider joint predictions, i.e. the sum of β_c^j coefficients associated with those adjacent monthly events.

For the purpose of summarizing the admittedly large set of country-specific results, we also estimate a pooled variant of Equation 2, pooling the cross-country sample and adding country dummies, to obtain the pooled estimator β^j . This is intended as a mere visual summary of the country-by-country estimates, at best, since, to the extent that the homogeneity assumption regarding the impact of an event across countries is violated, the pooled model

¹²Interestingly, we find that individuals that believe inflation to have been higher over the past 12 months tend to make more inaccurate forecasts, and that this is the case in every single country.

will be mis-specified and will not always summarize well the country-by-country estimates.¹³

Higher absolute forecast errors in response to these shocks would imply that the degree of inaccuracy goes up. Indeed, as we can see in Figure 3 and Table A1, absolute forecast errors typically rise following the arrival of these events. As shown most visibly in the first sub-figure of Figure 3 where we present our pooled estimates, the sole exception is the Euro crisis. The latter actually led to higher inflation forecast accuracy in most of these euro-area economies, most strongly so in crisis-struck Greece and Spain, but also in Finland, Ireland, Germany, Belgium and Luxembourg in decreasing order of magnitude.¹⁴

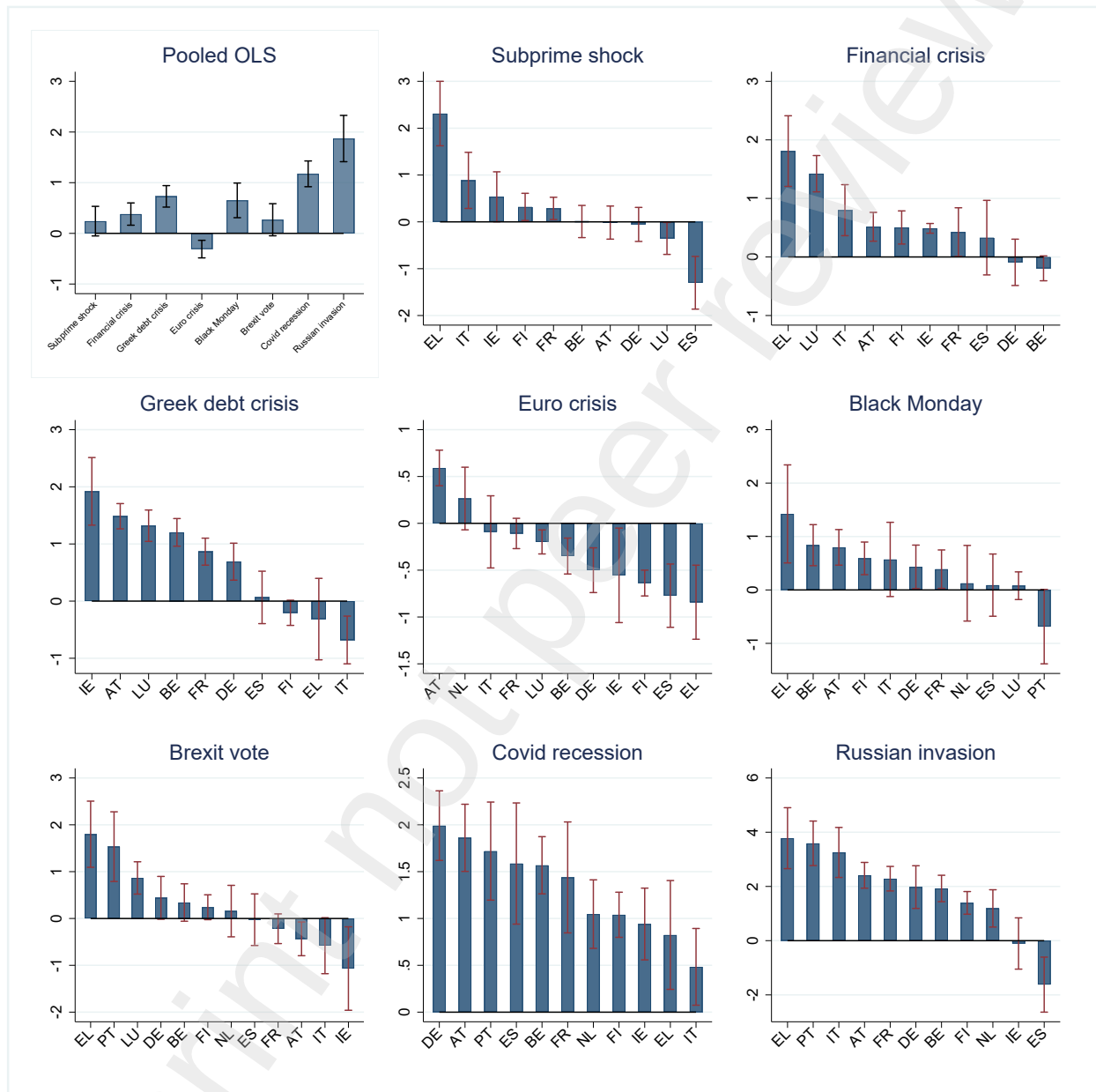
We note that, while we observe cross-country quantitative heterogeneity, the adverse events we identify typically have the same qualitative impact on inflation expectations forecast errors and the degree of inaccuracy of these forecast errors across countries. The impact is qualitatively different for a small fraction of the possible cases across events and countries with available data: 13 of the possible 86 cases in Figure 3 and Table A1, 12 of the 86 possible cases in Figure 4 and Table A2, and 16 of 119 cases in Figure 5 and Table A3 as well as in Figure 6 and Table A4.

Overall, our estimates suggest that macroeconomic adversity raises the inaccuracy of inflation forecasts. This appears at first inconsistent with rational inattention models which link adversity with higher marginal returns from forming accurate forecasts so that capacity is reallocated to allow increased accuracy when uncertainty increases. Alternatively, this increase in inaccuracy might suggest that the cost of paying attention (which relates to the noise to signal ratio) increases more than the benefits from paying attention following these adverse events, perhaps due to the extreme uncertainty induced by these adverse events.

¹³As this strong homogeneity assumption of the events' estimated quantitative impact across each one of the twelve economies is violated, we rely primarily on country-by-country estimates in what follows. We note, however, that for most of the events there is limited heterogeneity qualitatively in that the estimated impact on (absolute and raw) forecast errors is in the same direction across most of these economies.

¹⁴The drop in inaccuracy during the Euro Crisis is consistent with a rational inattention framework where the incentive to pay attention for individuals in crisis-struck economies such as Greece, Spain and Ireland and in concerned countries, such as Finland and Germany, where people felt they might pay the price, increased more than the cost of paying attention related to higher uncertainty.

Figure 3: Effects of Events on Absolute Forecast Errors



Notes: Absolute Forecast errors are in percentage points. For consecutive events, i.e. episodes, we show the average effect over the respective period. Bars corresponds to the estimated regression coefficients of equation 2, while whiskers represent the associated 95% confidence interval.

3.2 The Impact on Inflation Expectations Forecasting Errors

Next, we proceed to examine inflation expectations forecast errors which can help us understand our previous finding regarding heightened inaccuracy in response to macroeconomic disruptions. We explain inflation expectations forecast errors with the events by running country-by-country regressions, as in

$$FE_{c,t} = \alpha_{c,0} + \sum_{j=1}^n \beta_c^j Event_t^j + \alpha_{c,1} z_{c,i,t} + \lambda_c X_{c,i,t} + \psi_c W_{c,t} + \sum_{s=1}^{11} \gamma_c^s Month_t^s + u_{c,i,t} \quad (4)$$

$$FE_{c,i,t} = \pi_{c,t+12} - \pi_{c,i,t}^e \quad (5)$$

$FE_{c,i,t}$: inflation expectations forecast error over the next 12 months for individual i , at time t , for country c .

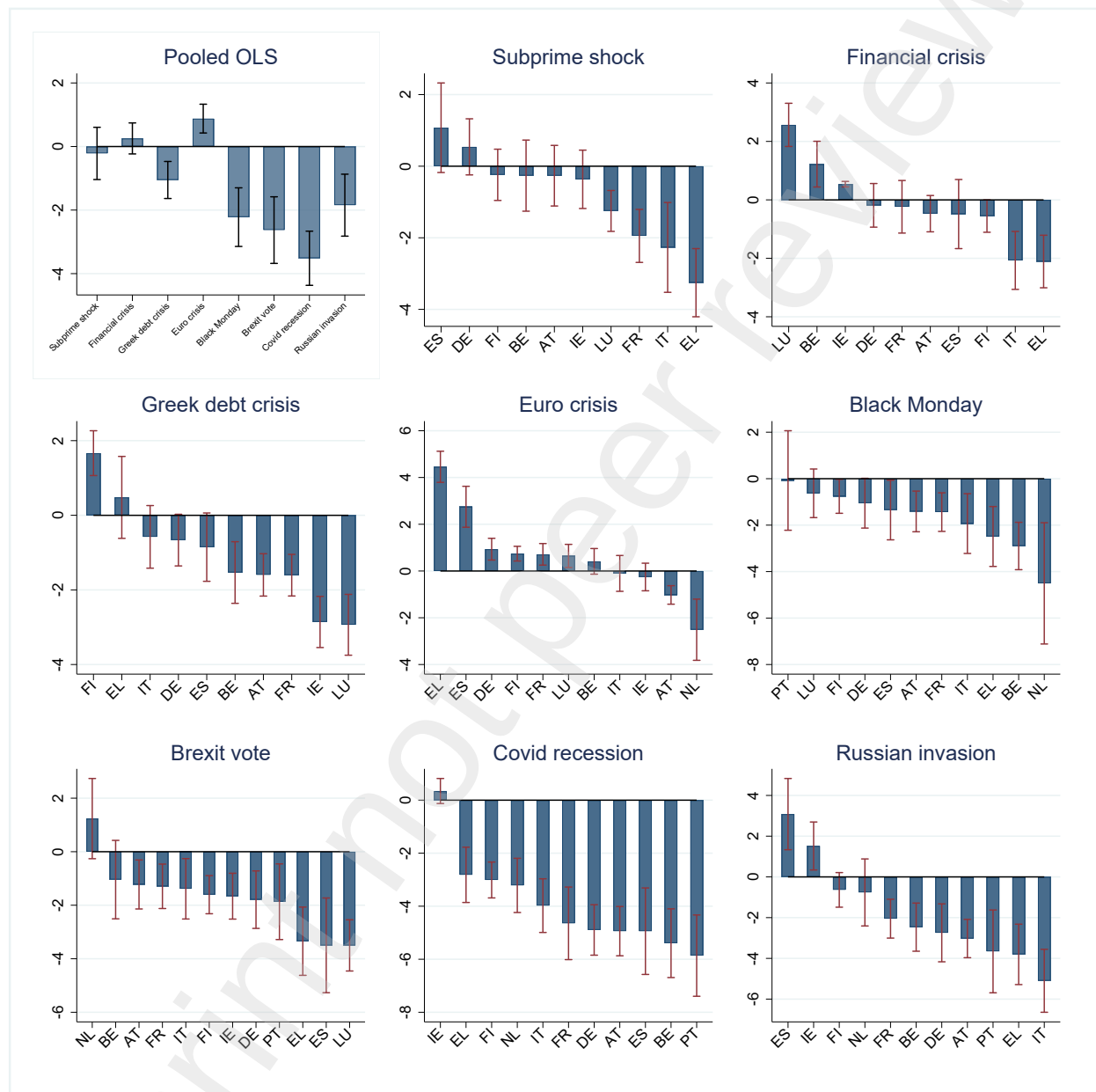
We define forecast errors following the previous literature going back to Coibion and Gorodnichenko (2015) which considers forecast revisions and defines forecast errors as inflation realizations 12 months ahead minus current inflation expectations so that negative estimates in a regression of the forecast error on forecast revisions implies overreaction. Defining forecast errors as inflation realizations 12 months ahead minus current inflation expectations, negative errors suggest that current expectations about future inflation increase more than 12-months ahead inflation, and negative estimates in a regression of the forecast error on current realizations of the forecasted variable or other inflationary news, like our identified inflationary event of the Russian Invasion, imply overreaction.¹⁵

As we can see in Figure 4 and Table A2, with the exception of the Euro crisis in crisis-struck Greece and Spain as well as, less so, in Germany, Finland, France and Luxembourg¹⁶, forecast errors typically go down in response to these adverse shocks, providing evidence

¹⁵We adopt the above definition for consistency with the literature but note that, as we do not consider forecast revisions, it would be more natural to define forecast errors as the difference between inflation expectations and realizations so that positive estimates would imply overreaction to news in that inflation expectations react more than 12-months ahead inflation.

¹⁶This observed under-prediction of inflation in response to the euro-crisis event could perhaps be explained by rational agents forming expectations under uncertainty while taking into account the Central Bank's primary mandate of low and stable inflation.

Figure 4: Effects of Events on Forecast Errors



for overestimation of inflation in these euro-area economies. This response of the forecast error implies that the heightened inaccuracy observed in the previous sub-section is due to individuals overestimating future inflation after the arrival of macroeconomic disruptions such as the ones we consider here. We note again that we control for the households' current perception of inflation over the past 12 months, which can capture the tendency of a specific household to overestimate inflation.¹⁷ Thus, our findings regarding pervasive overestimation of inflation, IAAB in the presence of non-inflationary shocks, and overreaction to inflationary shocks, are net of such idiosyncratic influences.

Notably, several adverse events are being perceived as inflationary even when they tend to bring inflation down as is more prominently evident for many countries (Austria, Germany, Italy, the Netherlands and Spain) for the event that occurred on August 2015 related to the Black Monday sell-off, providing striking evidence for IAAB. More generally, IAAB is a phenomenon where inflation expectations go up following adverse events that bring about a fall in inflation or have no inflationary effects in an economy. This occurs for most countries in the case of the Black Monday event (in Austria, Belgium, France, Germany, Greece, Italy, the Netherlands and Spain). It also occurs during Covid in most of the countries (for France, Greece, Italy, the Netherlands and Portugal where inflation falls in response to this adverse shock but also for Austria, Belgium, Finland, Germany and Spain where inflation does not rise), and again in the Brexit referendum event of June 2016 for ten of the twelve countries (in France, Finland and Ireland where inflation falls in response to this adverse shock, but also for Austria, Germany, Greece, Italy, Luxembourg, Portugal and Spain, where inflation does not go up in response to this shock). Finally, we also observe IAAB in some countries in response to the US-economy-related Subprime shock of January 2008 (for France, Greece, Italy and Luxembourg, where inflation actually falls in response to this adverse shock) and for the Global Financial Crisis episode (for Greece and Italy).

Importantly, we also observe direct evidence for overreaction to adverse inflationary events, notably the Russian Invasion, in that, in response to this inflationary shock, inflation ex-

¹⁷As we can see in Table A2, indeed households which perceived higher inflation over the past 12 months tend to overestimate inflation over the next 12 months and this is the case in every one of these countries.

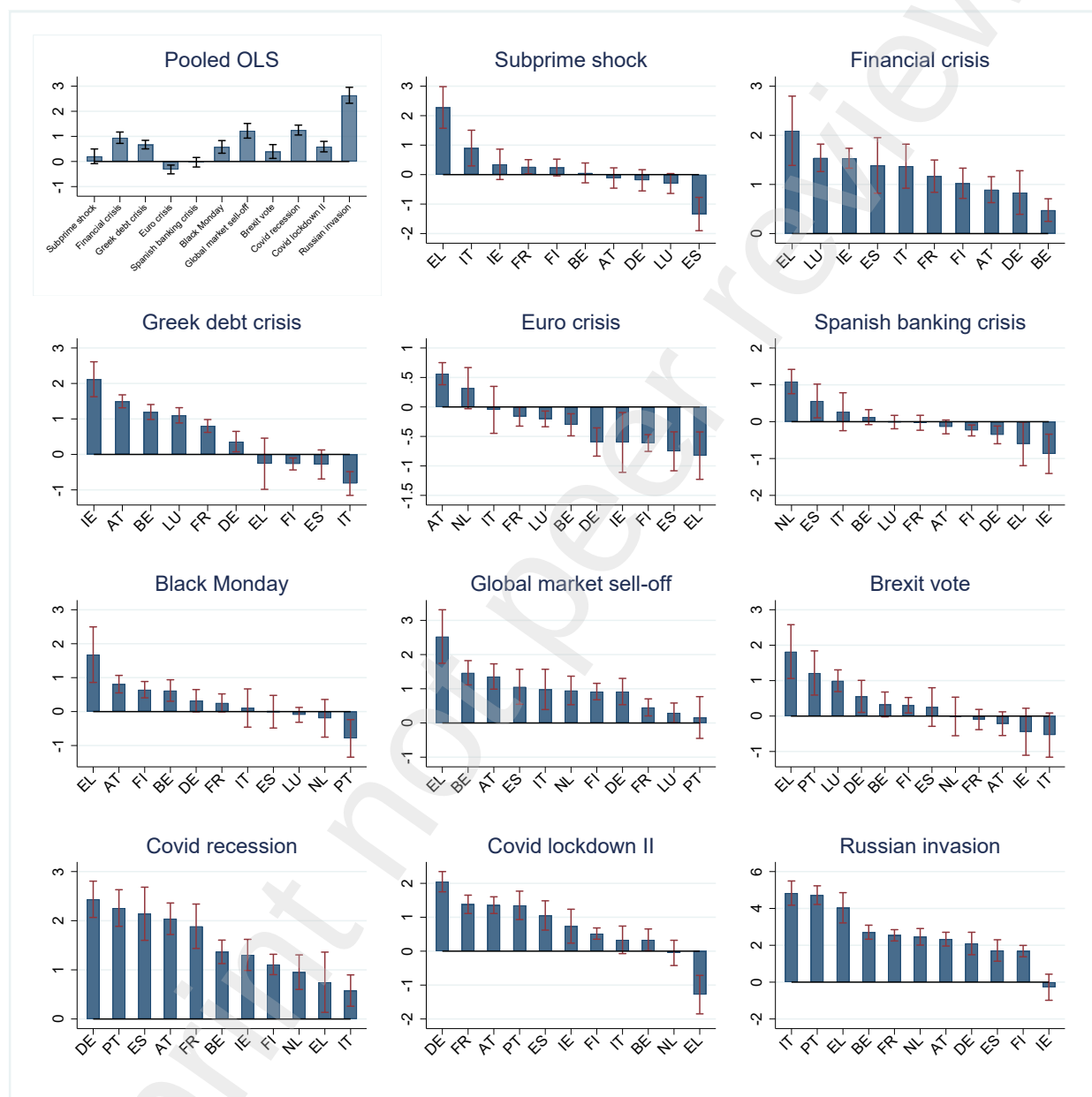
pectations go up by more than 12-month ahead inflation realizations in several euro-area countries. As we can see in the last row of Table A2, this shock that occurred on March 2022 raised inflation significantly in eight of the twelve euro-area economies we consider here, and in six of these eight euro area countries (Austria, France, Germany, Greece, Italy and Portugal), inflation expectations increased by more than inflation realizations. This provides empirical evidence for overreaction to recent inflationary news, as captured by our identification exercise.

Moreover, we find overreaction of inflation expectations to recent realizations of the forecasted variable, consistent with individuals extrapolating from recent conditions. This is evident by looking at the tenth row of Table A2, where the response of the forecast error to the recent realization of fuel inflation is shown to be significantly negative in all twelve euro-area economies considered here. We revisit this relation later in Table 2, section 3.4, where we consider HICP inflation and Food inflation in addition to Fuel inflation in a specification that more closely resembles Kohlhas and Walther (2021).

3.3 Utilizing Macroeconomic Disruptions identified by a Markov Regime-Switching approach

In this section, we consider the same specifications as in regression equations 2 and 4 for absolute and raw forecast errors respectively, but utilizing macroeconomic disruptions based on a Markov Regime Switching identification instead of the simple threshold-based methodology utilized in the last two subsections. As shown in Table 1 (3rd column), this provides a larger set of episodes and events that encompasses the subset of events and episodes identified based on our simple threshold approach. As such, it provides a check for the sensitivity of our main inferences to the specific identification approach applied in the previous subsections, even though, to the extent that the Markov Regime Switching methodology enables somewhat more objective identification as compared to the simple threshold approach, it is more than a mere robustness exercise. As shown in Figures 5 and 6 and Tables A3 and A4, our main results remain intact.

Figure 5: Effects of Events on Absolute Forecast Errors (selected based on the Markov Regime Switching approach)



Notes: Absolute Forecast errors are in percentage points. For consecutive events, i.e. episodes, we show the average effect over the respective period. Bars correspond to the estimated regression coefficients, while whiskers represent the associated 95% confidence interval.

More specifically, as we can see in Figure 5 and Table A3, similarly to the earlier results in Figure 3 and Table A1, absolute forecast errors typically rise following these macroeconomic disruptions, with the exception of the Euro Crisis and the newly identified Spanish Banking Crisis. This implies again an increase in the degree of forecast inaccuracy following macroeconomic disruptions related to high uncertainty.

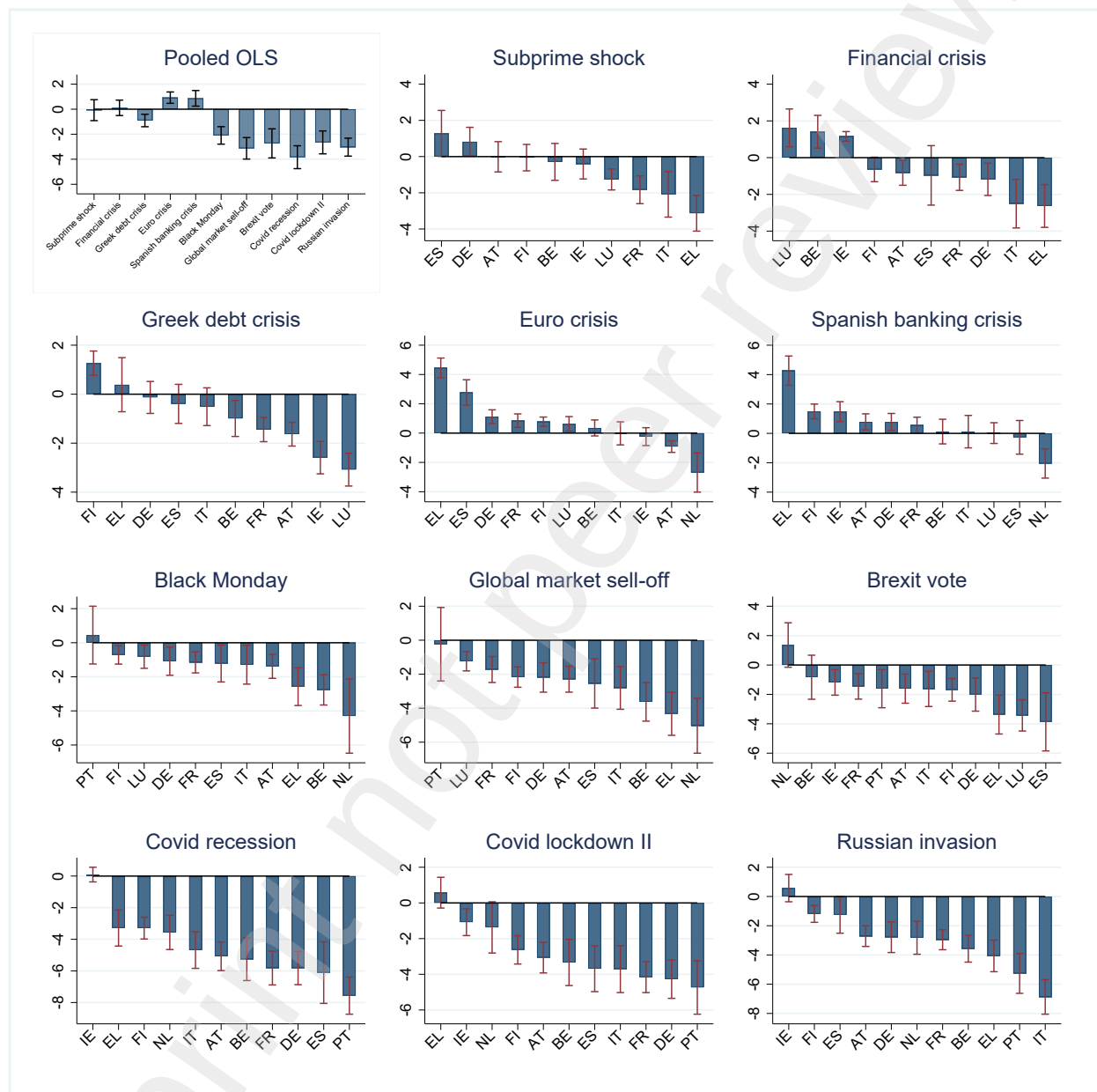
Moreover, in Figure 6 and Table A4, similarly to the results in Figure 4 and Table A2, we can see that this heightened forecast inaccuracy can be attributed to inflation expectations typically going up relative to 12-month ahead inflation as individuals overestimate future inflation after the arrival of macroeconomic disruptions such as the ones we identify here. As we can see there, with the exception of the Euro Crisis and the newly identified Spanish Banking Crisis, forecast errors become more negative in most countries.¹⁸ This, again, provides evidence of overestimation of inflation in these euro-area economies.

Once again, we observe striking evidence of IAAB. More specifically, in Figure 6 and Table A4 we see that forecast errors typically go down in response to non-inflationary shocks such as the Black Monday stock market sell-off that occurred in August 2015, the February 2016 Global stock-market sell-off, the Brexit referendum of June 2016 and the Covid Pandemic episode identified for February to July of 2020.

In the case of the 2015 Black Monday sell-off, IAAB is observed for Austria, Germany, Italy, Luxembourg, the Netherlands and Spain where inflation actually falls in response to this shock, but also for Belgium, Finland, France and Greece where inflation does not go up in response to this shock. For the newly identified February 2016 Global stock market sell-off event, IAAB is observed in most of these economies: Austria, Belgium, Finland, Germany, Italy, Luxembourg, the Netherlands and Spain, where inflation does not go up. For the Brexit referendum event of June 2016, IAAB is observed for ten of the twelve euro-area economies in our sample (Austria, Finland, France, Germany, Greece, Ireland, Italy,

¹⁸The pooled estimates for the impact of the subprime shock and the financial crisis are insignificant and appear misleading given the country-by-country estimates. Evidently, the homogeneity assumption regarding the impact of the financial crisis and the subprime shock across countries is violated. Thus, the pooled model is mis-specified and obviously does not adequately summarize the country-by-country estimates here.

Figure 6: Effects of Events on Forecast Errors (selected based on the Markov Regime Switching approach)



Notes: Forecast errors are in percentage points. For consecutive events, i.e. episodes, we show the average effect over the respective period. Bars correspond to the estimated regression coefficient, while whiskers represent the associated 95% confidence interval.

Luxembourg, Portugal and Spain where inflation does not go up). For the Covid Pandemic episode, we observe IAAB for nine of these euro-area economies (Belgium, Finland, France, Germany, Greece, Italy, the Netherlands, Portugal and Spain, where inflation actually goes down in response to this shock in the latter four countries).

Finally, we also observe IAAB in some countries in response to the Subprime shock of January 2008 (for France, Greece, Italy and Luxembourg, where inflation actually falls in response to this shock) and for the Global Financial Crisis episode (for Austria, France, Germany, Greece and Italy).

We conclude that, if anything, the evidence for IAAB is even stronger when considering the Markov Regime Switching identification methodology in this sub-section as compared to the simple threshold approach considered in the previous sub-section.

We also observe again evidence for overreaction of inflation expectations to inflationary shocks. More specifically, in response to the Russian Invasion episode, inflation expectations go up by more than 12-month ahead inflation realizations in several euro-area economies. As we can see in the last row of Table A4, this shock raised inflation significantly in eight of the twelve euro-area economies we consider here, and in seven of these eight countries (Austria, Finland, France, Germany, Greece, Italy and Portugal), inflation expectations increased by more than inflation realizations, providing evidence for overreaction to recent inflationary news as captured by the identification exercise of this sub-section.

Again, we also find overreaction of inflation expectations to recent realizations of the forecasted variable, consistent with individuals extrapolating from recent conditions. This is shown in the thirteenth row of Table A4, where the response of the forecast error to the recent realization of fuel inflation is significantly negative in all twelve euro-area economies considered here. We revisit this relation below in the next section.

3.4 Overreaction to recent outcomes

Next, we proceed to examine inflation expectations forecast errors' reaction to recent inflation realizations which can help us understand whether respondents extrapolate from and

overreact to recent events. Here, we consider a regression of forecast errors on current realizations of the forecasted variable that resembles Kohlhas and Walther (2021), with the addition of some control variables that capture individual characteristics:

$$FE_{i,t}^c = \alpha_0 + \lambda X_{i,t}^c + \gamma_c Inflation_{t-1}^c + u_{i,t}^c \quad (6)$$

$FE_{i,t}^c$: Inflation Expectations Forecast Error over the next 12 months for individual i , at time t , for country c .

$X_{i,t}^c$: Vector of individual i characteristics (age, gender, occupation, income and education)

$Inflation_{t-1}^c$: π_{t-1}^c or πe_{t-1}^c or πf_{t-1}^c

π_{t-1}^c : Inflation realization over the past 12 months at time $t - 1$ for country c

πe_{t-1}^c : Fuel Inflation realization over the past 12 months at time $t - 1$ for country c

πf_{t-1}^c : Food Inflation realization over the past 12 months at time $t - 1$ for country c

As compared to the Kohlhas and Walther (2021) specification, we do not incorporate individual fixed effects since we have repeated cross-sections where we do not observe the same individual at each point in time, rather than panel data as in the latter paper. Again, we define forecast errors similarly to the literature considering forecast revisions that goes back to Coibion and Gorodnichenko (2015), defining forecast errors as inflation realizations 12 months ahead minus current expectations of future inflation so that negative estimates in a regression of the forecast error on realized inflation indicate overreaction.

Indeed, in Table 2, we find that the forecast errors of the respondents react negatively to recent inflation realizations which suggests overreaction in that current expectations regarding inflation 12 months from now go up by more than 12-month ahead inflation realizations, after individuals observe that recent inflation has gone up. This result is strongest in magnitude using CPI inflation but is also present for fuel inflation (which was used in our baseline in the previous sub-section) that is found to be highly significant

Table 2: Inflation Expectation Forecast Error reactions across the Eurozone

Variable	AT	BE	DE	EL	ES	FI	FR	IT	LU	NL	IE	PT
Regression model 1: $FE_{i,t}^c = \alpha_0 + \lambda X_{i,t}^c + \gamma_c \pi_{i,t}^c + u_{i,t}^c$												
$Inflation_{t-1}$	-0.429*** (0.095)	-0.428*** (0.093)	-0.682*** (0.095)	-1.271*** (0.069)	-0.964*** (0.084)	-0.469*** (0.072)	-0.596*** (0.101)	-0.39*** (0.134)	-0.228** (0.115)	-0.308*** (0.087)	-0.312*** (0.081)	-0.867*** (0.123)

Regression model 2: $FE_{i,t}^c = \alpha_0 + \lambda X_{i,t}^c + \gamma_c \pi_{i,t-1}^c + u_{i,t}^c$												
$Inflation_{fuel,t-1}$	-0.087*** (0.007)	-0.064*** (0.011)	-0.113*** (0.01)	-0.125*** (0.017)	-0.164*** (0.014)	-0.094*** (0.007)	-0.094*** (0.009)	-0.142*** (0.02)	-0.061*** (0.013)	-0.148*** (0.02)	-0.068*** (0.011)	-0.188*** (0.028)

Regression model 3: $FE_{i,t}^c = \alpha_0 + \lambda X_{i,t}^c + \gamma_c \pi_{i,t-1}^c + u_{i,t}^c$												
$Inflation_{food,t-1}$	-0.225*** (0.072)	0.224*** (0.07)	-0.278*** (0.072)	-0.738*** (0.102)	-0.231** (0.094)	-0.092** (0.04)	-0.136* (0.071)	-0.065 (0.109)	0.465*** (0.134)	0.268*** (0.097)	-0.063 (0.056)	-0.447*** (0.09)
Observations	287883	297229	322769	240245	266897	269702	261443	261714	60349	115332	144825	82545
Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1 All regression models include household-specific characteristics (age, gender, occupation, income and education).												

in all twelve euro-area countries we consider here,¹⁹ and for food inflation except in Italy and Ireland.

3.5 Income-related Heterogeneity

In this subsection, we consider the potentially heterogeneous responses of individuals with high income by adding interactions of the latter with our previously identified shocks. The specifications in Tables A5 and A6 are otherwise identical to the baseline regressions in Tables A1 and A2 for absolute forecast errors and forecast errors respectively.

The estimates in Table A5 where we explain absolute errors of individual inflation forecasts, provide a somewhat mixed picture. For the Black Monday event that occurred in August of 2008, the Brexit referendum event of June 2016, the Covid Pandemic episode, and the Russian invasion, while we find a pervasive increase in the inaccuracy of inflation forecasts in most euro-area countries, we estimate the response of high-income individuals to be relatively more accurate in most cases. By contrast, for the Global Financial Crisis, while we also find a pervasive increase in the inaccuracy of inflation forecasts in most euro-area countries, we often estimate the response of high-income individuals to be even less accurate as compared to other individuals, possibly because the financial shock created relatively more uncertainty for high income individuals that are, e.g., more likely to own stock.

¹⁹As compared to Table A2, where we control in addition for the identified events, country characteristics, and country fixed effects, the estimates in Table 2 are generally larger in size, except for Portugal.

In Table A6, we turn to explaining inflation forecast errors and find that while, with the exception of the Euro crisis episode, individuals overestimate future inflation so that forecast errors typically become more negative in response to the shocks we consider here, high-income individuals tend to overestimate inflation less in response to some of these events. In particular, the latter occurs in several of these economies following the Black Monday event that occurred in August of 2008, the Brexit vote of June 2016, the Covid Pandemic episode, and the Russian invasion in March 2022. Thus, high-income individuals are not as prone to the IAAB malady (in the case of the first three non-inflationary events), nor as prone to overreaction in the case of the inflationary event related to the Russian invasion.

3.6 Robustness: episode-by-episode estimation

Last, we perform a robustness check to ensure the reliability of our baseline findings. Specifically, we run separate regressions for each of the episodes previously detailed in Table 1, to explain, first, the absolute forecast error and then, the raw forecast error of inflation expectations. This relaxes the baseline assumption of a common variance-covariance structure across events permitting for heterogeneity across events, and provides a robustness check for the homogeneity restriction embedded in our pooled baseline regression.

As we can see in Figures A5 and A6 in Appendix A.3 for absolute forecast errors and raw forecast errors respectively, results remain qualitatively similar, near identical to our baseline findings.

4 Policy Implications

Understanding how consumers' expectations respond to macroeconomic disruptions is especially important for policy making. Given the role inflation expectations play in monetary policy, such an understanding facilitates appropriate Central Bank communication strategies in an environment where the formation of consumers' inflation expectations deviates from that of hypothetical fully informed rational agents so that forward guidance and clarity in communicating the Central Bank's policy and intentions become especially important.

For example, in response to a disinflationary shock that brings about an increase in inflation expectations as in our IAAB finding, forward-guiding the public so as to reassure them that the Central Bank will fight any rise in inflation would help avoid the recessionary effects of falling consumption due to individuals foreseeing a fall in the present value of their wealth in line with their heightened inflation expectations. In Figures A3 and A4 in the Appendix, we show that, with the exception of the Brexit Vote and some observed variation across countries, consumption intentions and the expected financial position of the household both worsen in the aftermath of such shocks, consistent with a perceived fall in the present value of household income. As Coibion et al. (2023) show, the latter negative income effect can exceed the positive intertemporal substitution effect on consumption arising from higher inflation expectations via a standard Euler equation mechanism, consistent with the negative response of consumption intentions we find.

The above is consistent with the evidence in Candia et al. (2020) where households that associate higher inflation with a worsening economy tend to reduce spending when they anticipate higher inflation, so that Central Banks need to be careful in their communication to avoid such unintended effects as the provision of information about inflation to households may backfire in terms of their subsequent decisions if they interpret the news about inflation based on a supply-side model, as seems to be the case in our data. According to Candia et al. (2020), such supply-side IAAB interpretations lead to negative income effects that may depress economic activity as described in the previous paragraph.

Furthermore, while we observe quantitative heterogeneity across the euro-area in the updating of inflation expectations in response to macroeconomic disruptions, there is only limited heterogeneity qualitatively suggesting a certain degree of homogeneity in the subjective processes via which euro-area consumers form inflation expectations that the ECB should take into account in responding to adverse shocks.

5 Conclusion

We have utilized a large household-level dataset of inflation expectations across the euro-area during the period from 2004:1 to 2025:2, in order to assess the formation and accuracy of inflation expectations following major disruptions of the macroeconomy. Our main contributions have are to identify these macroeconomic disruptions in the euro area and to assess their impact on the formation and accuracy of households' inflation expectations.

We found that following the arrival of the adverse events we identified, the overall degree of inaccuracy of inflation expectations typically rises, driven by an increase in inflation expectations relative to the 12-month ahead inflation realizations. The latter finding suggests that households associate the arrival of adverse events with higher expected inflation, so that they tend to overestimate inflation following such events.

In the case of the inflationary event related to the Russian invasion of Ukraine, this overestimation implies overreaction of inflation expectations to recent inflationary news. The overreaction evidence suggests a need to go beyond standard imperfect information macroeconomic models to more elaborate rational models of limited attention such as Kohlhas and Walther (2021) and extensions of noisy rational expectations that allow forecasters to be overconfident as in Broer and Kohlhas (2024), or to models explicitly based on behavioral biases, along the lines of Bordalo et al. (2018), Bordalo et al. (2020) or Angeletos et al. (2021).²⁰ Instead, agents with rational expectations under uncertainty that take into account the ECB's primary mandate of low and stable inflation, would be more likely to under-predict future inflation in response to inflationary shocks.

In the case of disinflationary events such as the Covid Pandemic, the documented overestimation of inflation by households provides direct evidence of IAAB, where the arrival of adverse shocks is perceived as bad news and brings about pessimistic waves that increase inflation expectations even when these shocks do not increase inflation or even tend to bring future inflation down. This evidence on inflation being perceived by households as a negative phenomenon aligns with models that explicitly incorporate behavioral bias such as, e.g.

²⁰Their 'imperfect expectations' framework allows for belief mistakes such as over-extrapolation.

Bhandari et al. (2025) where subjective beliefs play a role in aggregate fluctuations so that an increase in pessimism generates upward biases in inflation forecasts. It also aligns with rational inattention models such as those of Zhang (2024) and Kamdar and Ray (2025), where rationally inattentive households pay more attention to supply shocks because these most affect labor income. One implication of our findings is thus, that such models are needed to reconcile the empirical evidence with theory and to understand how expectations respond to macroeconomic shocks.

The above IAAB reaction from households cannot be plausibly explained by rational agents optimally placing greater weight on worst-case scenarios when forming expectations under policy uncertainty. Rational households aware of the monetary policy target would not expect inflation to be higher than it turns out to be ex-post due to policy interventions that were uncertain at the time of expectation formation in this case, since that would entail that they expect the Central Bank to greatly overreact to disinflationary shocks to such an extent that it creates inflation, even though the ECB's main goal is to deliver low and stable inflation. Thus, the finding that forecast errors become more negative following disinflationary shocks, plausibly reflects behavioral bias or the specific circumstances of households (e.g., reliance on labor income of agents facing fundamental uncertainty about demand and supply shocks), rather than policy uncertainty.

Overall, our results suggest that the arrival of macroeconomic disruptions brings about an increase in the inaccuracy of households' inflation forecasts and that this increased inaccuracy can be associated with biases related to overreaction and IAAB phenomena among the population. Such behavioral forces appear to have played a role in the formation of economic expectations in the euro area during the past two decades.

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Appendix

A.1 Detailed Tables of main results

Table A1: Inflation Expectation Absolute Forecast Error Formation across the Eurozone

Variable	AT	BE	DE	EL	ES	FI	FR	IT	LU	NL	IE	PT
Subprime shock	-0.0546 (0.209)	0.0194 (0.221)	-0.0521 (0.220)	2.279*** (0.419)	-1.306*** (0.342)	0.316* (0.175)	0.292** (0.145)	0.868** (0.364)	-0.350* (0.199)		0.513 (0.324)	
Financial crisis	4.783*** (1.238)	-1.554 (1.150)	-0.978 (1.904)	13.260*** (2.739)	2.478 (3.152)	4.022*** (1.371)	3.110 (2.096)	6.140*** (2.175)	11.478*** (1.440)		3.913*** (0.395)	
Greek debt crisis	2.889*** (0.266)	2.341*** (0.271)	1.416*** (0.392)	-0.637 (0.880)	0.136 (0.553)	-0.401 (0.266)	1.748*** (0.289)	-1.340*** (0.507)	2.647*** (0.333)		3.899*** (0.710)	
Euro crisis	3.020*** (0.565)	-1.819*** (0.593)	-2.493*** (0.722)	-4.613*** (1.192)	-3.874*** (1.018)	-3.190*** (0.420)	-0.491 (0.486)	-0.423 (1.168)	-1.000** (0.395)	1.447 (1.089)	-2.807* (1.539)	
Black Monday	0.745*** (0.205)	0.878*** (0.238)	0.439* (0.247)	1.515*** (0.564)	0.0989 (0.344)	0.613*** (0.184)	0.400* (0.218)	0.581 (0.421)	0.0689 (0.155)	0.207 (0.441)		-0.687 (0.435)
Brexit vote	-0.443** (0.221)	0.313 (0.225)	0.437 (0.274)	1.770*** (0.439)	-0.0236 (0.334)	0.250 (0.162)	-0.258 (0.192)	-0.588 (0.360)	0.874*** (0.210)		-1.032** (0.517)	1.490*** (0.434)
Covid recession	7.947*** (0.936)	6.256*** (0.810)	7.849*** (0.902)	2.854** (1.402)	6.261*** (1.673)	4.202*** (0.576)	5.572*** (1.468)	1.818* (1.025)		4.361*** (0.862)	3.689*** (0.932)	6.595*** (1.230)
Russian invasion	2.462*** (0.286)	1.968*** (0.305)	1.984*** (0.468)	3.892*** (0.668)	-1.631*** (0.611)	1.377*** (0.252)	2.261*** (0.277)	3.251*** (0.559)		1.092** (0.433)	-0.0481 (0.577)	3.647*** (0.485)
Past Prices Perception	0.495*** (0.00847)	0.462*** (0.00784)	0.569*** (0.0114)	0.508*** (0.0123)	0.457*** (0.00813)	0.489*** (0.0119)	0.517*** (0.00980)	0.331*** (0.00793)	0.433*** (0.0130)	0.488*** (0.0175)	0.481*** (0.0180)	0.523*** (0.0159)
$Inflation_{fuel,t-1}$	0.0153*** (0.00536)	0.000499 (0.00501)	0.0329*** (0.00725)	0.0434*** (0.00940)	0.0379*** (0.00886)	0.0236*** (0.00472)	0.0227*** (0.00548)	0.0733*** (0.0140)	-0.0105** (0.00461)	0.0347*** (0.0115)	0.00752 (0.00795)	0.0937*** (0.0125)
$Unemployment_{t-1}$	0.362*** (0.0965)	0.0934 (0.0663)	-0.0569** (0.0247)	-0.0337* (0.0179)	-0.0132 (0.0198)	0.235*** (0.0477)	0.305*** (0.0459)	0.107*** (0.0349)	0.0237 (0.0793)	0.207** (0.101)	0.141*** (0.0280)	-0.0687 (0.0680)
$IndustrialProduction_{t-1}$	0.0133 (0.0150)	0.0213** (0.0106)	-0.0371** (0.0153)	0.0716** (0.0308)	-0.00144 (0.0193)	-0.0205** (0.0102)	-0.0130 (0.0207)	-0.0291*** (0.0111)	-0.0111 (0.00868)	-0.0322 (0.0315)	-0.00779 (0.00609)	-0.0321* (0.0179)
Constant	-0.451 (0.563)	0.921* (0.558)	1.503*** (0.300)	4.821*** (0.664)	3.274*** (0.582)	-0.537 (0.418)	-2.099*** (0.472)	1.095** (0.502)	1.776*** (0.481)	-0.110 (0.772)	1.778*** (0.460)	2.865*** (0.956)
Observations	282,987	265,292	315,857	223,785	247,305	261,339	224,216	239,081	58,595	107,972	139,348	72,651
R-squared	0.446	0.405	0.555	0.380	0.402	0.477	0.516	0.279	0.399	0.472	0.389	0.553

Impact of Each Event on 12 months ahead inflation

Subprime shock	-2.189**	-1.008	-1.727***	-3.059***	-2.761***	-0.098	-3.159***	-1.958***	-2.722***	-1.823**	-1.481**	-2.292***
Financial crisis	1.154	-11.413***	-7.862***	-9.137***	-4.135	-5.415	-10.052***	-10.052***	-0.484	-22.441***	-18.854**	-15.174***
Greek debt crisis	2.364***	1.590	0.674	-1.255	3.007**	3.312***	0.957**	0.644	0.275	-0.466	2.445**	3.634***
Euro crisis	2.783	0.324	-1.943	0.015	11.319***	6.843***	1.374	2.946*	1.049	8.393***	7.752***	5.340**
Black Monday	-2.206***	-0.620	-1.652***	0.192	-2.083**	-0.422	-0.266	-1.893**	-2.214***	-1.211***	-1.805***	-0.319
Brexit vote	0.009	-0.826**	0.182	0.130	0.077	-0.924*	-0.364*	-0.145	-0.626	-0.556*	-2.421***	-0.532
Covid recession	4.329	-10.213	0.278	-11.300***	-2.622	-1.870	-7.591**	-5.105***	9.969**	-9.145**	-2.420	-10.903**
Russian invasion	4.301***	1.311	4.488***	1.802**	-0.155	2.945***	2.951***	3.603**	-1.483	-0.664	3.961***	3.884***

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: In the above regressions, we control for demographic characteristics (age, gender, income, education, and occupation), month fixed effects (not reported in the tables), past prices perception, lagged fuel inflation, lagged unemployment, and lagged industrial production. Because the survey interviews are typically conducted in the first week of each month, we use the previous month's values of fuel inflation, the unemployment rate, and the annual change in industrial production to capture their influence on expectations reported in the subsequent month. To account for potential within-month correlation across multiple observations, standard errors are clustered at the monthly level. The variable Subprime shock is a dummy equal to 1 in February 2008 and zero otherwise, reflecting the January 2008 VSTOXX event that is observed in the February survey (see Section 2.3). Similarly for Black Monday, Brexit vote and Russian invasion. The variables Financial crisis, Greek debt crisis, Euro crisis and Covid recession correspond to the cumulative impact of events during the Global Financial Crisis, the Greek Debt Crisis, the European Sovereign Debt Crisis, and the COVID pandemic, respectively. For each of these episodes and events, the effect on 12-month-ahead realized inflation is estimated using the local projection method of Jordà (2005), as detailed in Appendix A.2. Missing data for Luxembourg, the Netherlands, Ireland and Portugal for specific sub-periods, preclude estimating the impact of some of these events.

Table A2: Inflation Expectation Forecast Error Formation across the Eurozone

Variable	AT	BE	DE	EL	ES	FI	FR	IT	LU	NL	IE	PT
Subprime shock	-0.0506 (0.495)	0.0322 (0.627)	0.535 (0.475)	-3.180*** (0.581)	1.094 (0.767)	-0.278 (0.428)	-1.977*** (0.450)	-2.190*** (0.758)	-1.436*** (0.342)		-0.320 (0.494)	
Financial crisis	-5.457 (3.310)	5.599 (4.092)	-0.960 (3.640)	-14.356*** (4.058)	-2.514 (5.478)	-4.215 (2.617)	-1.505 (4.516)	-17.392*** (5.046)	17.882*** (3.586)		4.343*** (0.456)	
Greek debt crisis	-3.178*** (0.708)	-2.484** (0.995)	-1.410* (0.842)	0.917 (1.369)	-1.975* (1.101)	3.243*** (0.712)	-3.205*** (0.680)	-1.062 (1.039)	-5.129*** (0.974)		-5.862*** (0.844)	
Euro crisis	-4.994*** (1.204)	2.137 (1.652)	4.683*** (1.408)	22.985*** (2.084)	14.265*** (2.684)	3.733*** (0.941)	3.401** (1.384)	-0.495 (2.330)	2.536* (1.444)	-18.582*** (3.624)	-1.298 (1.828)	
Black Monday	-1.228** (0.523)	-3.011*** (0.611)	-1.076* (0.651)	-2.647*** (0.789)	-1.614** (0.756)	-0.775* (0.447)	-1.454*** (0.502)	-1.905** (0.785)	-0.554 (0.604)	-6.103*** (1.367)		-0.0600 (1.305)
Brexit vote	-1.189** (0.565)	-0.754 (0.843)	-1.836*** (0.648)	-3.245*** (0.781)	-3.423*** (1.059)	-1.565*** (0.434)	-1.103** (0.500)	-1.392** (0.687)	-3.322*** (0.544)	1.874* (0.958)	-1.496*** (0.501)	-1.859** (0.843)
Covid recession	-20.803*** (2.423)	-23.325*** (3.274)	-19.394*** (2.326)	-10.378*** (2.441)	-19.494*** (3.954)	-11.856*** (1.631)	-18.338*** (3.351)	-16.295*** (2.577)		-16.899*** (2.576)	1.541 (1.160)	-23.466*** (3.772)
Russian invasion	-3.003*** (0.542)	-2.910*** (0.751)	-2.623*** (0.846)	-4.012*** (0.883)	3.423*** (1.043)	-0.658 (0.537)	-2.000*** (0.580)	-5.128*** (0.941)		-3.271*** (1.172)	1.556** (0.741)	-3.708*** (1.235)
Past Prices Perception	-0.512*** (0.00805)	-0.456*** (0.00997)	-0.600*** (0.0113)	-0.539*** (0.0140)	-0.441*** (0.0104)	-0.513*** (0.0132)	-0.546*** (0.00876)	-0.316*** (0.00937)	-0.473*** (0.0117)	-0.482*** (0.0179)	-0.537*** (0.0164)	-0.530*** (0.0139)
$Inflation_{fuel,t-1}$	-0.0458*** (0.0115)	-0.0360** (0.0148)	-0.0611*** (0.0136)	-0.0701*** (0.0148)	-0.0950*** (0.0215)	-0.0670*** (0.0125)	-0.0978*** (0.0122)	-0.121*** (0.0254)	-0.0775*** (0.0173)	-0.0981*** (0.0335)	-0.0339*** (0.0106)	-0.212*** (0.0254)
$Unemployment_{t-1}$	-1.241*** (0.264)	-1.149*** (0.212)	0.141*** (0.0430)	-0.0269 (0.0268)	-0.0471 (0.0322)	-0.531*** (0.123)	-1.446*** (0.141)	-0.638*** (0.0922)	-1.975*** (0.296)	-1.887*** (0.277)	-0.212*** (0.0377)	-0.564*** (0.140)
$IndustrialProduction_{t-1}$	-0.132*** (0.0289)	-0.166*** (0.0330)	-0.0498* (0.0279)	-0.169*** (0.0413)	-0.102*** (0.0327)	-0.117*** (0.0179)	0.0118 (0.0423)	-0.0653** (0.0294)	-0.103*** (0.0182)	-0.415*** (0.104)	-0.00363 (0.00901)	0.0176 (0.0519)
Constant	7.413*** (1.495)	10.94*** (1.817)	-0.524 (0.575)	-1.605* (0.849)	0.0706 (0.875)	4.898*** (1.075)	14.49*** (1.375)	6.851*** (1.183)	11.34*** (1.578)	14.67*** (2.098)	1.538** (0.615)	4.545** (1.815)
Observations	282,987	265,292	315,857	223,785	247,305	261,339	224,216	239,081	58,595	107,972	139,348	72,651
R-squared	0.394	0.323	0.520	0.345	0.312	0.433	0.451	0.188	0.379	0.359	0.388	0.468
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Impact of Each Event on 12 months ahead inflation												
Subprime shock	-2.189**	-1.008	-1.727***	-3.059***	-2.761***	-0.098	-3.159***	-1.958***	-2.722***	-1.823**	-1.481**	-2.292***
Financial crisis	1.154	-11.413***	-7.862***	-9.137***	-4.135	-5.415	-10.052***	-10.052***	-0.484	-22.441***	-18.854**	-15.174***
Euro crisis	2.364***	1.590	0.674	-1.255	3.007**	3.312***	0.957**	0.644	0.275	-0.466	2.445**	3.634***
Euro crisis	2.783	0.324	-1.943	0.015	11.319***	6.843***	1.374	2.946*	1.049	8.393***	7.752***	5.340**
Black Monday	-2.206***	-0.620	-1.652***	0.192	-2.083**	-0.422	-0.266	-1.893**	-2.214***	-1.211***	-1.805***	-0.319
Brexit vote	0.009	-0.826**	0.182	0.130	0.077	-0.924*	-0.364*	-0.145	-0.626	-0.556*	-2.421***	-0.532
Covid recession	4.329	-10.213	0.278	-11.300***	-2.622	-1.870	-7.591**	-5.105***	9.969**	-9.145**	-2.420	-10.903**
Russian invasion	4.301***	1.311	4.488***	1.802**	-0.155	2.945***	2.951***	3.603**	-1.483	-0.664	3.961***	3.884***
Robust standard errors in parentheses												
*** p<0.01, ** p<0.05, * p<0.1												

Note: In the above regressions, we control for demographic characteristics (age, gender, income, education, and occupation), month fixed effects (not reported in the tables), past prices perception, lagged fuel inflation, lagged unemployment, and lagged industrial production. Because the survey interviews are typically conducted in the first week of each month, we use the previous month's values of fuel inflation, the unemployment rate, and the annual change in industrial production to capture their influence on expectations reported in the subsequent month. To account for potential within-month correlation across multiple observations, standard errors are clustered at the monthly level. The variable Subprime shock is a dummy equal to 1 in February 2008 and zero otherwise, reflecting the January 2008 VSTOXX event that is observed in the February survey (see Section 2.3). Similarly for Black Monday, Brexit vote and Russian invasion. The variables Financial crisis, Greek debt crisis, Euro crisis and Covid recession correspond to the cumulative impact of events during the Global Financial Crisis, the Greek Debt Crisis, the European Sovereign Debt Crisis, and the COVID pandemic, respectively. For each of these episodes and events, the effect on 12-month-ahead realized inflation is estimated using the local projection method of Jordà (2005), as detailed in Appendix A.2. Missing data for Luxembourg, the Netherlands, Ireland and Portugal for specific sub-periods, preclude estimating the impact of some of these events.

Table A3: Inflation Expectation Absolute Forecast Error Formation across the Eurozone (Markov switching identification)

Variable	AT	BE	DE	EL	ES	FI	FR	IT	LU	NL	IE	PT
Subprime shock	-0.168 (0.203)	0.0485 (0.217)	-0.191 (0.218)	2.253*** (0.429)	-1.336*** (0.343)	0.242 (0.172)	0.273* (0.146)	0.882** (0.367)	-0.302 (0.196)		0.323 (0.313)	
Financial crisis	10.993*** (1.772)	5.645*** (1.705)	8.920*** (2.979)	20.788*** (4.401)	15.478*** (3.630)	11.142*** (2.043)	12.713*** (2.364)	14.800*** (3.043)	16.964*** (1.780)		16.694*** (1.284)	
Greek debt crisis	4.378*** (0.330)	3.476*** (0.386)	1.116** (0.524)	-0.905 (1.333)	-0.799 (0.747)	-0.775** (0.305)	2.400*** (0.337)	-2.449*** (0.608)	3.311*** (0.394)		6.451*** (0.887)	
Euro crisis	2.816*** (0.555)	-1.572*** (0.581)	-2.963*** (0.725)	-4.505*** (1.212)	-3.824*** (0.998)	-3.065*** (0.433)	-0.780 (0.494)	-0.211 (1.208)	-1.021** (0.410)	1.756 (1.133)	-3.033* (1.551)	
Spanish banking crisis	-0.172 (0.237)	0.232 (0.250)	-0.723** (0.291)	-1.253* (0.719)	1.146** (0.546)	-0.482*** (0.181)	-0.088 (0.256)	0.556 (0.619)	-0.021 (0.220)	2.161*** (0.395)	-1.769*** (0.640)	
Black Monday	1.534*** (0.316)	1.312*** (0.388)	0.650 (0.397)	3.518*** (1.003)	0.010 (0.576)	1.313*** (0.288)	0.524 (0.323)	0.215 (0.681)	-0.196 (0.264)	-0.240 (0.666)		-1.549** (0.672)
Global market sell-off	1.355*** (0.223)	1.509*** (0.218)	0.922*** (0.233)	2.601*** (0.478)	1.103*** (0.299)	0.905*** (0.147)	0.450*** (0.151)	0.993*** (0.359)	0.293* (0.176)	0.973*** (0.250)		0.184 (0.371)
Brexit vote	-0.202 (0.204)	0.295 (0.197)	0.557** (0.272)	1.768*** (0.473)	0.241 (0.328)	0.310** (0.134)	-0.143 (0.174)	-0.545 (0.377)	0.999*** (0.188)	-0.0230 (0.323)	-0.433 (0.367)	1.216*** (0.374)
Covid recession	13.076*** (1.241)	8.463*** (0.933)	14.490*** (1.375)	3.649* (2.167)	13.109*** (1.963)	6.692*** (0.745)	11.190*** (1.738)	3.339*** (1.196)		6.078*** (1.281)	7.754*** (1.170)	13.050*** (1.373)
Covid lockdown II	2.685*** (0.292)	0.923*** (0.352)	4.091*** (0.358)	-2.624*** (0.697)	2.111*** (0.520)	1.027*** (0.197)	2.720*** (0.326)	0.635 (0.490)		-0.055 (0.470)	1.582*** (0.594)	2.713*** (0.508)
Russian invasion	6.939*** (0.678)	8.259*** (0.724)	6.272*** (1.101)	12.479*** (1.462)	5.148*** (1.059)	5.046*** (0.558)	7.654*** (0.565)	14.496*** (1.195)		7.193*** (0.802)	-0.814 (1.270)	14.090*** (0.901)
Past Prices Perception	0.495*** (0.00833)	0.462*** (0.00767)	0.570*** (0.0112)	0.506*** (0.0123)	0.457*** (0.00791)	0.491*** (0.0119)	0.518*** (0.00975)	0.332*** (0.00783)	0.434*** (0.0129)	0.489*** (0.0175)	0.486*** (0.0174)	0.524*** (0.0157)
$Inflation_{fuel,t-1}$	0.0151*** (0.00533)	0.000895 (0.00515)	0.0340*** (0.00765)	0.0439*** (0.0102)	0.0404*** (0.00815)	0.0236*** (0.00456)	0.0248*** (0.00504)	0.0687*** (0.0141)	-0.00690 (0.00444)	0.0287*** (0.0111)	0.0195** (0.00824)	0.0827*** (0.00930)
$Unemployment_{t-1}$	0.304*** (0.0914)	0.160*** (0.0563)	-0.0763*** (0.0242)	-0.0251 (0.0175)	-0.00964 (0.0197)	0.246*** (0.0473)	0.350*** (0.0453)	0.123*** (0.0354)	0.0715 (0.0785)	0.256** (0.101)	0.138*** (0.0279)	-0.0249 (0.0620)
$IndustrialProduction_{t-1}$	0.0278** (0.0134)	0.0242** (0.0106)	-0.00766 (0.0162)	0.0748** (0.0332)	0.0254* (0.0140)	-0.00553 (0.0103)	0.0126 (0.0146)	-0.0199** (0.00808)	-0.00297 (0.00815)	-0.0316 (0.0321)	-0.00688 (0.00677)	-0.00533 (0.0128)
Constant	-0.135 (0.544)	0.427 (0.506)	1.598*** (0.290)	4.658*** (0.662)	3.261*** (0.574)	-0.647 (0.415)	-2.507*** (0.480)	1.007** (0.505)	1.449*** (0.484)	-0.439 (0.783)	1.651*** (0.447)	2.368*** (0.879)
Observations	282,987	265,292	315,857	223,785	247,305	261,339	224,216	239,081	58,595	107,972	139,348	72,651
R-squared	0.448	0.408	0.557	0.383	0.404	0.480	0.518	0.283	0.400	0.475	0.395	0.558

Impact of Each Event on 12 months ahead inflation

Subprime shock	-2.075***	-0.953	-1.734***	-2.952***	-2.513***	-0.017	-3.087***	-1.944***	-2.839***	-1.748*	-1.310***	-2.251***
Financial crisis	7.549	-9.937	-6.659**	-4.430	4.999	-3.664	-7.366	-12.135***	3.527	-28.927***	-19.082	-15.143**
Greek debt crisis	4.293***	3.633**	1.642	-1.736	5.608***	5.743***	1.502**	0.596	-0.621	0.653	2.820*	5.091***
Euro crisis	4.112*	0.580	-1.536	0.204	13.010***	7.176***	1.595*	3.321*	0.828	8.111***	7.225***	5.476**
Spanish banking crisis	1.717**	-1.442*	-0.293	0.794	3.678**	0.549	-0.064	-0.442	-0.572	4.656***	-0.335	1.150
Black Monday	-3.579***	-0.709	-2.773***	-0.448	-3.392*	-0.813	-0.345	-3.330**	-2.788***	-2.250***	-2.815***	-0.969*
Global market sell-off	-1.200*	0.629	0.250	1.543***	1.316	-0.035	0.623***	0.160	0.884	0.244	-0.918**	0.117
Brexit vote	0.129	-0.764**	0.328	0.178	0.303	-0.948*	-0.372	-0.0538	-0.386	-0.491	-2.233***	-0.494
Covid recession	10.287**	-14.790	3.716	-12.452***	2.716	-0.149	-8.748	-7.308***	32.979***	-11.076*	1.556	-14.446**
Covid lockdown II	2.847**	3.944	8.302***	1.544	7.009***	3.385***	2.297	4.949***	3.402	2.793	9.041***	0.162
Russian invasion	15.533***	4.320	12.096***	5.006*	2.084	8.969***	9.284***	15.354***	-4.011	6.580	9.842***	9.749***

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: In the above regressions, we control for demographic characteristics (age, gender, income, education, and occupation), month fixed effects (not reported in the tables), past prices perception, lagged fuel inflation, lagged unemployment, and lagged industrial production. Because the survey interviews are typically conducted in the first week of each month, we use the previous month's values of fuel inflation, the unemployment rate, and the annual change in industrial production to capture their influence on expectations reported in the subsequent month. To account for potential within-month correlation across multiple observations, standard errors are clustered at the monthly level. The variable Subprime shock is a dummy equal to 1 in February 2008 and zero otherwise, reflecting the January 2008 VSTOXX event that is observed in the February survey (see Section 2.3). Similarly for Global market sell-off and Brexit vote. The variables Financial crisis, Greek debt crisis, Euro crisis, Spanish banking crisis, Black Monday, Covid recession, Covid lockdown II and Russian invasion correspond to the cumulative impact of events during the Global Financial Crisis, the Greek Debt Crisis, the European Sovereign Debt Crisis, the Spanish Banking Crisis and Bailout, Black Monday sell-off, the Covid Pandemic, the New Covid Lockdowns and the Russian Invasion, respectively. For each of these episodes and events, the effect on 12-month-ahead realized inflation is estimated using the local projection method of Jordà (2005), as detailed in Appendix A.2. Missing data for Luxembourg, the Netherlands, Ireland and Portugal for specific sub-periods, preclude estimating the impact of some of these events.

Table A4: Inflation Expectation Forecast Error Formation across the Eurozone (Markov switching identification)

Variable	AT	BE	DE	EL	ES	FI	FR	IT	LU	NL	IE	PT
Subprime shock	0.219 (0.490)	0.0209 (0.642)	0.821* (0.479)	-3.071*** (0.601)	1.287 (0.780)	-0.110 (0.438)	-1.866*** (0.468)	-1.994*** (0.763)	-1.466*** (0.349)		-0.365 (0.501)	
Financial crisis	-11.544** (5.091)	8.920 (6.526)	-12.426** (5.974)	-24.036*** (7.272)	-9.126 (10.660)	-6.054 (4.284)	-11.414** (5.046)	-29.418*** (9.506)	13.932** (6.937)		13.202*** (1.645)	
Greek debt crisis	-4.777*** (0.917)	-1.978 (1.363)	-0.490 (1.196)	1.320 (2.067)	-1.524 (1.438)	3.686*** (0.877)	-4.293*** (0.900)	-1.349 (1.454)	-8.370*** (1.209)		-8.000*** (1.219)	
Euro crisis	-4.381*** (1.181)	1.773 (1.639)	5.617*** (1.429)	22.979*** (2.105)	14.462*** (2.656)	3.959*** (0.934)	4.108*** (1.382)	-0.029 (2.385)	2.447* (1.459)	-19.255*** (3.676)	-1.229 (1.893)	
Spanish banking crisis	1.089 (0.695)	-0.050 (1.036)	1.567** (0.710)	8.663*** (1.209)	-0.443 (1.391)	2.973*** (0.609)	1.233* (0.670)	0.238 (1.339)	-0.084 (0.852)	-3.414** (1.599)	3.033*** (0.828)	
Black Monday	-2.559*** (0.832)	-5.830*** (1.070)	-2.202** (1.004)	-5.458*** (1.352)	-2.746** (1.269)	-1.412** (0.666)	-2.338*** (0.749)	-2.538* (1.378)	-1.512* (0.799)	-10.338*** (2.016)		1.004 (2.018)
Global market sell-off	-2.290*** (0.460)	-3.491*** (0.705)	-2.186*** (0.523)	-4.514*** (0.783)	-2.893*** (0.866)	-2.027*** (0.353)	-1.698*** (0.452)	-2.759*** (0.763)	-1.188*** (0.345)	-4.682*** (1.022)		-0.152 (1.298)
Brexit vote	-1.618*** (0.613)	-0.569 (0.876)	-2.064*** (0.682)	-3.219*** (0.815)	-3.764*** (1.181)	-1.645*** (0.470)	-1.249** (0.523)	-1.653** (0.729)	-3.246*** (0.602)	1.950* (0.989)	-1.017** (0.494)	-1.720** (0.811)
Covid recession	-32.067*** (3.603)	-34.350*** (5.020)	-34.803*** (3.897)	-17.925*** (3.982)	-36.574*** (7.157)	-19.390*** (2.507)	-34.572*** (4.019)	-29.072*** (4.555)	-28.370*** (3.794)	0.744 (1.704)		-45.967*** (4.520)
Covid lockdown II	-6.193*** (0.997)	-7.478*** (1.497)	-8.645*** (1.305)	1.252 (1.059)	-7.338*** (1.560)	-5.125*** (0.983)	-8.171*** (1.042)	-7.585*** (1.580)	-2.737** (1.184)	-2.351*** (0.897)		-9.478*** (1.832)
Russian invasion	-7.648*** (1.254)	-11.830*** (1.764)	-8.173*** (1.897)	-13.025*** (1.935)	-3.642 (2.235)	-3.627*** (1.092)	-8.995*** (1.252)	-20.651*** (2.152)	-10.603*** (2.343)	1.768 (1.709)		-15.767*** (2.470)
Past Prices Perception	-0.512*** (0.00785)	-0.457*** (0.00943)	-0.602*** (0.0109)	-0.539*** (0.0137)	-0.443*** (0.00984)	-0.515*** (0.0129)	-0.549*** (0.00838)	-0.318*** (0.00905)	-0.474*** (0.0113)	-0.487*** (0.0179)	-0.536*** (0.0165)	-0.537*** (0.0128)
$Inflation_{fuel,t-1}$	-0.0464*** (0.0116)	-0.0409** (0.0161)	-0.0657*** (0.0146)	-0.0705*** (0.0168)	-0.102*** (0.0235)	-0.0708*** (0.0129)	-0.104*** (0.0123)	-0.127*** (0.0271)	-0.0808*** (0.0188)	-0.101*** (0.0331)	-0.0295** (0.0114)	-0.211*** (0.0229)
$Unemployment_{t-1}$	-1.091*** (0.248)	-1.314*** (0.219)	0.173*** (0.0454)	-0.0417 (0.0277)	-0.0506 (0.0331)	-0.524*** (0.125)	-1.535*** (0.136)	-0.667*** (0.0973)	-2.016*** (0.314)	-1.953*** (0.278)	-0.217*** (0.0391)	-0.627*** (0.142)
$IndustrialProduction_{t-1}$	-0.154*** (0.0293)	-0.160*** (0.0336)	-0.0938*** (0.0293)	-0.184*** (0.0446)	-0.135*** (0.0403)	-0.120*** (0.0212)	-0.0357 (0.0278)	-0.0859** (0.0404)	-0.108*** (0.0204)	-0.432*** (0.103)	-0.00127 (0.00969)	-0.0587 (0.0368)
Constant	6.566*** (1.416)	12.06*** (1.886)	-0.720 (0.582)	-1.364 (0.852)	0.0674 (0.889)	4.827*** (1.101)	15.25*** (1.357)	7.006*** (1.233)	11.63*** (1.710)	15.14*** (2.136)	1.501** (0.626)	5.115*** (1.842)
Observations	282,987	265,292	315,857	223,785	247,305	261,339	224,216	239,081	58,595	107,972	139,348	72,651
R-squared	0.398	0.330	0.526	0.349	0.317	0.439	0.458	0.196	0.381	0.370	0.392	0.482

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: In the above regressions, we control for demographic characteristics (age, gender, income, education, and occupation), month fixed effects (not reported in the tables), past prices perception, lagged fuel inflation, lagged unemployment, and lagged industrial production. Because the survey interviews are typically conducted in the first week of each month, we use the previous month's values of fuel inflation, the unemployment rate, and the annual change in industrial production to capture their influence on expectations reported in the subsequent month. To account for potential within-month correlation across multiple observations, standard errors are clustered at the monthly level. The variable Subprime shock is a dummy equal to 1 in February 2008 and zero otherwise, reflecting the January 2008 VSTOXX event that is observed in the February survey (see Section 2.3). Similarly for Global market sell-off and Brexit vote. The variables Financial crisis, Greek debt crisis, Euro crisis, Spanish banking crisis, Black Monday, Covid recession, Covid lockdown II and Russian invasion correspond to the cumulative impact of events during the Global Financial Crisis, the Greek Debt Crisis, the European Sovereign Debt Crisis, the Spanish Banking Crisis and Bailout, Black Monday sell-off, the Covid Pandemic, the New Covid Lockdowns and the Russian Invasion, respectively. For each of these episodes and events, the effect on 12-month-ahead realized inflation is estimated using the local projection method of Jordà (2005), as detailed in Appendix A.2. Missing data for Luxembourg, the Netherlands, Ireland and Portugal for specific sub-periods, preclude estimating the impact of some of these events.

Table A5: Inflation Expectation Absolute Forecast Error Formation across the Eurozone (including interactions with High Income)

Variable	AT	BE	DE	EL	ES	FI	FR	IT	LU	NL	IE	PT
HighInco	-0.141*** (0.0310)	-0.334*** (0.0444)	-0.103*** (0.0332)	-1.686*** (0.206)	-0.403 (0.0592)	-0.121*** (0.0202)	-0.154*** (0.0260)	-0.322*** (0.0456)	-0.183*** (0.0495)	-0.145*** (0.0336)	-0.291*** (0.0599)	-0.170*** (0.0620)
Subprime shock	0.0474 (0.208)	0.0169 (0.220)	0.209 (0.223)	2.954*** (0.456)	-0.976*** (0.347)	0.239 (0.175)	0.0642 (0.145)	0.607 (0.368)	-0.408** (0.200)		0.299 (0.332)	
HighInco#Subprime shock	-0.359*** (0.0337)	0.0227 (0.0620)	-0.727*** (0.0346)	-0.814*** (0.194)	-0.816*** (0.0658)	0.278*** (0.0206)	0.671*** (0.0259)	0.553*** (0.0482)	0.0182 (0.0583)		0.583*** (0.0715)	
Financial crisis	3.358*** (1.217)	-2.948** (1.146)	-1.794 (1.902)	13.572*** (2.766)	-1.358 (3.160)	2.603* (1.346)	2.339 (2.092)	6.077*** (2.179)	7.222*** (1.472)		3.243*** (0.383)	
HighInco#Financial crisis	3.889*** (0.262)	12.102*** (0.434)	2.058*** (0.246)	9.144*** (1.516)	7.939*** (0.518)	4.685*** (0.227)	2.164*** (0.212)	-0.033 (0.413)	8.070*** (0.403)		1.246*** (0.066)	
Greek debt crisis	3.133*** (0.266)	2.109*** (0.269)	1.600*** (0.394)	-1.148 (0.885)	-0.008 (0.561)	-0.389 (0.271)	1.757*** (0.291)	-1.732*** (0.509)	2.693*** (0.345)		3.929*** (0.700)	
HighInco#Greek debt crisis	-0.615*** (0.063)	1.734*** (0.107)	-0.496*** (0.060)	12.033*** (0.422)	0.293** (0.122)	-0.036 (0.044)	-0.041 (0.060)	1.348*** (0.093)	0.202** (0.097)		-0.062 (0.140)	
Euro crisis	4.102*** (0.568)	-1.820*** (0.595)	-2.254*** (0.727)	-4.920*** (1.199)	-3.644*** (1.020)	-3.150*** (0.421)	-0.729 (0.490)	-0.588 (1.166)	-0.696* (0.411)	1.805* (1.078)	-2.603* (1.559)	
HighInco#Euro crisis	-2.734*** (0.177)	0.370 (0.265)	-0.519*** (0.149)	6.827*** (0.981)	-0.252 (0.323)	-0.155 (0.124)	0.521*** (0.128)	0.566** (0.256)	-0.495** (0.227)	-1.005*** (0.212)	-0.454 (0.523)	
Black Monday	0.755*** (0.203)	0.905*** (0.238)	0.484* (0.248)	1.562*** (0.570)	-0.168 (0.344)	0.566*** (0.184)	0.423* (0.218)	0.648 (0.420)	0.191 (0.161)	0.289 (0.439)		-0.931** (0.433)
HighInco#Black Monday	-0.0490 (0.0322)	-0.279*** (0.0531)	-0.0890*** (0.0292)	-0.369* (0.199)	0.676*** (0.0661)	0.182*** (0.0241)	-0.0663** (0.0257)	-0.189*** (0.0446)	-0.355*** (0.0468)	-0.269*** (0.0430)		0.611*** (0.0618)
Brexit vote	-0.498** (0.220)	0.391* (0.224)	0.373 (0.273)	1.910*** (0.442)	0.0608 (0.330)	0.268 (0.162)	-0.186 (0.194)	-0.568 (0.360)	1.219*** (0.215)	0.262 (0.329)	-1.009* (0.517)	1.469*** (0.436)
HighInco#Brexit vote	0.199*** (0.0293)	-0.523*** (0.0568)	0.127*** (0.0290)	-2.555*** (0.211)	-0.437*** (0.0620)	-0.0997*** (0.0312)	-0.292*** (0.0321)	-0.0850* (0.0451)	-0.681*** (0.0623)	-0.373*** (0.0433)	0.0745 (0.0714)	0.0728 (0.0670)
Covid recession	8.560*** (0.922)	6.573*** (0.806)	9.746*** (0.910)	2.601* (1.399)	6.570*** (1.666)	4.406*** (0.566)	6.024*** (1.464)	1.380 (1.025)	5.039*** (0.832)	2.708*** (0.912)	6.152*** (1.232)	
HighInco#Covid recession	-1.361*** (0.131)	-1.433*** (0.222)	-3.422*** (0.143)	4.559*** (0.818)	-1.040*** (0.246)	-0.609*** (0.143)	-1.486*** (0.133)	1.708*** (0.134)	-1.939*** (0.210)	2.402*** (0.212)	1.396*** (0.241)	
Russian invasion	2.972*** (0.287)	2.076*** (0.302)	2.052*** (0.468)	4.100*** (0.665)	-1.505** (0.612)	1.220*** (0.253)	2.254*** (0.279)	3.561*** (0.564)	1.595*** (0.433)	-0.257 (0.583)	3.327*** (0.494)	
HighInco#Russian invasion	-0.963*** (0.0319)	-0.674*** (0.0509)	-0.128*** (0.0328)	-2.843*** (0.207)	-0.418*** (0.0640)	-0.624*** (0.0344)	0.0309 (0.0349)	-1.124*** (0.0519)	-1.329*** (0.0495)	0.511*** (0.0495)	0.931*** (0.0562)	
Past Prices Perception	0.496*** (0.00844)	0.463*** (0.00784)	0.570*** (0.0114)	0.508*** (0.0123)	0.458*** (0.00810)	0.490*** (0.0119)	0.518*** (0.00979)	0.332*** (0.00792)	0.488*** (0.0130)	0.481*** (0.0175)	0.523*** (0.0179)	
$Inflation_{fuel,t-1}$	0.0150*** (0.00533)	0.000462 (0.00499)	0.0329*** (0.00726)	0.0442*** (0.00947)	0.0379*** (0.00884)	0.0236*** (0.00473)	0.0226*** (0.00549)	0.0730*** (0.0141)	-0.0103*** (0.00472)	0.0347*** (0.0115)	0.00748 (0.00794)	0.0937*** (0.0125)
$Unemployment_{t-1}$	0.363*** (0.0955)	0.0947 (0.0660)	-0.0542** (0.0247)	-0.0279 (0.0176)	-0.0117 (0.0198)	0.235*** (0.0477)	0.305*** (0.0460)	0.109*** (0.0348)	0.0499 (0.0804)	0.215** (0.101)	0.143*** (0.0279)	-0.0684 (0.0679)
$IndustrialProduction_{t-1}$	0.0134 (0.0149)	0.0214** (0.0105)	-0.0371** (0.0153)	0.0695** (0.0307)	-0.00157 (0.0194)	-0.0205** (0.0102)	-0.0129 (0.0208)	-0.0289*** (0.0110)	-0.0113 (0.00897)	-0.0320 (0.0315)	-0.00774 (0.00609)	-0.0320* (0.0179)
Observations	282,987	265,292	315,857	223,785	247,305	261,339	224,216	239,081	58,595	107,972	139,348	72,651
R-squared	0.445	0.405	0.555	0.380	0.402	0.477	0.516	0.278	0.398	0.472	0.389	0.553

Impact of Each Event on 12 months ahead inflation

Subprime shock	-2.189**	-1.008	-1.727***	-3.059***	-2.761***	-0.098	-3.159***	-1.958***	-2.722***	-1.823**	-1.481**	-2.292***
Financial crisis	1.154	-11.413***	-7.862***	-9.137***	-4.135	-5.415	-10.052***	-10.052***	-0.484	-22.441***	-18.854**	-15.174***
Greek debt crisis	2.364***	1.590	0.674	-1.255	3.007**	3.312***	0.957**	0.644	0.275	-0.466	2.445**	3.634***
Euro crisis	2.783	0.324	-1.943	0.015	11.319***	6.843***	1.374	2.946*	1.049	8.393***	7.752***	5.340**
Black Monday	-2.206***	-0.620	-1.652***	0.192	-2.083**	-0.422	-0.266	-1.893**	-2.214***	-1.211***	-1.805***	-0.319
Brexit vote	0.009	-0.826**	0.182	0.130	0.077	-0.924*	-0.364*	-0.145	-0.626	-0.556*	-2.421***	-0.532
Covid recession	4.329	-10.213	0.278	-11.300***	-2.622	-1.870	-7.591**	-5.105***	9.969**	-9.145**	-2.420	-10.903**
Russian invasion	4.301***	1.311	4.488***	1.802**	-0.155	2.945***	2.951***	3.603**	-1.483	-0.664	3.961***	3.884***

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: In the above regressions, we control for demographic characteristics (age, gender, income, education, and occupation), month fixed effects (not reported in the tables), past prices perception, lagged fuel inflation, lagged unemployment, and lagged industrial production. Because the survey interviews are typically conducted in the first week of each month, we use the previous month's values of fuel inflation, the unemployment rate, and the annual change in industrial production to capture their influence on expectations reported in the subsequent month. To account for potential within-month correlation across multiple observations, standard errors are clustered at the monthly level. The variable Subprime shock is a dummy equal to 1 in February 2008 and zero otherwise, reflecting the January 2008 VSTOXX event that is observed in the February survey (see Section 2.3). Similarly for Black Monday, Brexit vote and Russian invasion. The variables Financial crisis, Greek debt crisis, Euro crisis and Covid recession correspond to the cumulative impact of events during the Global Financial Crisis, the Greek Debt Crisis, the European Sovereign Debt Crisis, and the COVID pandemic, respectively. For each of these episodes and events, the effect on 12-month-ahead realized inflation is estimated using the local projection method of Jordà (2005), as detailed in Appendix A.2. Missing data for Luxembourg, the Netherlands, Ireland and Portugal for specific sub-periods, preclude estimating the impact of some of these events.

Table A6: Inflation Expectation Forecast Error Formation across the Eurozone (including interactions with High Income)

Variable	AT	BE	DE	EL	ES	FI	FR	IT	LU	NL	IE	PT
HighInco	-0.0844 (0.0603)	0.553*** (0.0746)	-0.338*** (0.0836)	1.677*** (0.276)	-0.189** (0.0834)	0.281*** (0.0280)	0.214*** (0.0365)	0.357*** (0.0610)	-0.123* (0.0649)	0.382*** (0.0595)	0.364*** (0.0711)	0.213*** (0.0737)
Subprime shock	-0.138 (0.494)	0.0592 (0.633)	0.150 (0.473)	-3.859*** (0.636)	0.633 (0.772)	-0.184 (0.428)	-1.675*** (0.450)	-2.053*** (0.760)	-1.242*** (0.341)		-0.274 (0.501)	
HighInco#Subprime shock	0.297*** (0.0608)	-0.196*** (0.0648)	1.078*** (0.0788)	0.817*** (0.245)	1.115*** (0.0880)	-0.341*** (0.0275)	-0.895*** (0.0345)	-0.251*** (0.0537)	-0.286*** (0.0693)		-0.125* (0.0638)	
Financial crisis	-5.239 (3.320)	5.918 (4.128)	-2.182 (3.664)	-14.576*** (4.079)	-0.308 (5.569)	-4.800* (2.591)	-1.558 (4.513)	-20.111*** (5.061)	18.028*** (3.620)		3.893*** (0.455)	
HighInco#Financial crisis	-0.407 (0.484)	-5.256*** (0.503)	3.222*** (0.590)	-9.638*** (1.995)	-4.730*** (0.677)	2.056*** (0.221)	0.365 (0.269)	9.236*** (0.469)	1.953*** (0.546)		0.835*** (0.061)	
Greek debt crisis	-3.584*** (0.705)	-2.219** (1.005)	-1.843** (0.836)	1.365 (1.379)	-2.075* (1.103)	3.330*** (0.716)	-3.123*** (0.680)	-0.706 (1.042)	-5.369*** (0.993)		-5.579*** (0.842)	
HighInco#Greek debt crisis	1.149*** (0.116)	-1.769*** (0.127)	1.112*** (0.148)	-10.708*** (0.529)	0.375** (0.156)	-0.317*** (0.055)	-0.226*** (0.068)	-1.226*** (0.118)	0.259 (0.160)		-0.628*** (0.127)	
Euro crisis	-6.326*** (1.207)	2.125 (1.659)	3.609** (1.403)	23.438*** (2.089)	13.444*** (2.672)	3.417*** (0.943)	3.495** (1.391)	-0.127 (2.336)	1.091 (1.435)	-19.125*** (3.620)	-1.197 (1.851)	
HighInco#Euro crisis	3.387*** (0.321)	0.073 (0.325)	2.377*** (0.371)	-10.839*** (1.302)	2.014*** (0.405)	1.106*** (0.134)	-0.109 (0.168)	-1.307*** (0.342)	3.219*** (0.378)	1.614*** (0.296)	-0.290 (0.439)	
Black Monday	-1.346** (0.524)	-3.053*** (0.616)	-1.297* (0.659)	-2.691*** (0.792)	-1.478* (0.756)	-0.821* (0.448)	-1.473*** (0.501)	-1.871** (0.786)	-0.809 (0.608)	-6.101*** (1.364)		0.152 (1.302)
HighInco#Black Monday	0.343*** (0.0585)	0.236*** (0.0663)	0.438*** (0.0719)	0.331 (0.265)	-0.334*** (0.0830)	0.143*** (0.0280)	0.0517 (0.0342)	-0.160*** (0.0545)	0.680*** (0.0661)	-0.0159 (0.0603)	-0.533*** (0.0711)	
Brexit vote	-1.198** (0.569)	-0.835 (0.848)	-1.922*** (0.656)	-3.376*** (0.784)	-3.465*** (1.057)	-1.492*** (0.431)	-1.113** (0.500)	-1.404** (0.686)	-3.734*** (0.551)	1.793* (0.961)	-1.532*** (0.501)	-1.828** (0.847)
HighInco#Brexit vote	0.00742 (0.0555)	0.504*** (0.0685)	0.162*** (0.0610)	2.341*** (0.278)	0.267*** (0.0752)	-0.310*** (0.0458)	0.0748* (0.0400)	0.0558 (0.0591)	0.817*** (0.0780)	0.252*** (0.0629)	0.128 (0.0824)	-0.104 (0.0918)
Covid recession	-22.672*** (2.436)	-24.222*** (3.319)	-21.943*** (2.370)	-10.106*** (2.431)	-21.118*** (3.959)	-12.220*** (1.600)	-18.806*** (3.349)	-15.907*** (2.573)	-18.531*** (2.543)	1.162 (1.135)	-22.687*** (3.752)	
HighInco#Covid recession	3.641*** (0.236)	3.186*** (0.265)	4.592*** (0.256)	-4.794*** (1.089)	5.879*** (0.296)	1.200*** (0.194)	1.564*** (0.156)	-1.514*** (0.172)	4.709*** (0.269)	0.957*** (0.247)	-2.435*** (0.326)	
Russian invasion	-3.547*** (0.543)	-2.980*** (0.755)	-2.716*** (0.841)	-4.245*** (0.881)	3.385*** (1.044)	-0.384 (0.538)	-1.896*** (0.581)	-5.327*** (0.945)	-3.578*** (1.172)	1.894** (0.745)	-3.391*** (1.237)	
HighInco#Russian invasion	1.024*** (0.0585)	0.285*** (0.0679)	0.177*** (0.0663)	3.343*** (0.274)	0.156** (0.0759)	-1.080*** (0.0484)	-0.357*** (0.0383)	0.707*** (0.0602)	0.818*** (0.0681)	-0.813*** (0.0666)	-0.926*** (0.0872)	
Past Prices Perception	-0.512*** (0.00802)	-0.456*** (0.0101)	-0.601*** (0.0113)	-0.540*** (0.0140)	-0.442*** (0.0103)	-0.513*** (0.0132)	-0.547*** (0.00875)	-0.317*** (0.00934)	-0.473*** (0.0117)	-0.483*** (0.0179)	-0.537*** (0.0164)	-0.530*** (0.0138)
$Inflation_{fuel,t-1}$	-0.0456*** (0.0115)	-0.0366*** (0.0149)	-0.0612*** (0.0135)	-0.0708*** (0.0149)	-0.0951*** (0.0215)	-0.0669*** (0.0125)	-0.0978*** (0.0122)	-0.121*** (0.0255)	-0.0777*** (0.0175)	-0.0982*** (0.0335)	-0.0339*** (0.0106)	-0.212*** (0.0254)
$Unemployment_{t-1}$	-1.241*** (0.263)	-1.162*** (0.214)	0.138*** (0.0430)	-0.0324 (0.0265)	-0.0483 (0.0322)	-0.531*** (0.123)	-1.447*** (0.141)	-0.640*** (0.0923)	-2.003*** (0.300)	-1.896*** (0.277)	-0.212*** (0.0376)	-0.565*** (0.140)
$IndustrialProduction_{t-1}$	-0.132*** (0.0288)	-0.167*** (0.0332)	-0.0497* (0.0279)	-0.167*** (0.0411)	-0.102*** (0.0327)	-0.117*** (0.0179)	0.0117 (0.0423)	-0.0655** (0.0294)	-0.103*** (0.0183)	-0.416*** (0.104)	-0.00365 (0.00901)	0.0175 (0.0519)
Constant	7.653*** (1.496)	10.56*** (1.791)	-0.236 (0.573)	-1.237 (0.812)	0.494 (0.867)	5.025*** (1.080)	14.63*** (1.382)	7.068*** (1.183)	11.77*** (1.609)	14.79*** (2.093)	1.630*** (0.603)	4.632** (1.818)
Observations	282,987	265,292	315,857	223,785	247,305	261,339	224,216	239,081	58,595	107,972	139,348	72,651
R-squared	0.394	0.323	0.520	0.345	0.312	0.433	0.451	0.188	0.378	0.359	0.388	0.467
=====												
Impact of Each Event on 12 months ahead inflation												
Subprime shock	-2.189**	-1.008	-1.727***	-3.059***	-2.761***	-0.098	-3.159***	-1.958***	-2.722***	-1.823**	-1.481**	-2.292***
Financial crisis	1.154	-11.413***	-7.862***	-9.137***	-4.135	-5.415	-10.052***	-10.052***	-0.484	-22.441***	-18.854**	-15.174***
Greek debt crisis	2.364***	1.590	0.674	-1.255	3.007**	3.312***	0.957**	0.644	0.275	-0.466	2.445**	3.634***
Euro crisis	2.783	0.324	-1.943	0.015	11.319***	6.843***	1.374	2.946*	1.049	8.393***	7.752***	5.340**
Black Monday	-2.206***	-0.620	-1.652***	0.192	-2.083**	-0.422	-0.266	-1.893**	-2.214***	-1.211***	-1.805***	-0.319
Brexit vote	0.009	-0.826**	0.182	0.130	0.077	-0.924*	-0.364*	-0.145	-0.626	-0.556*	-2.421***	-0.532
Covid recession	4.329	-10.213	0.278	-11.300***	-2.622	-1.870	-7.591**	-5.105***	9.969**	-9.145**	-2.420	-10.903**
Russian invasion	4.301***	1.311	4.488***	1.802**	-0.155	2.945***	2.951***	3.603**	-1.483	-0.664	3.961***	3.884***

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: In the above regressions, we control for demographic characteristics (age, gender, income, education, and occupation), month fixed effects (not reported in the tables), past prices perception, lagged fuel inflation, lagged unemployment, and lagged industrial production. Because the survey interviews are typically conducted in the first week of each month, we use the previous month's values of fuel inflation, the unemployment rate, and the annual change in industrial production to capture their influence on expectations reported in the subsequent month. To account for potential within-month correlation across multiple observations, standard errors are clustered at the monthly level. The variable Subprime shock is a dummy equal to 1 in February 2008 and zero otherwise, reflecting the January 2008 VSTOXX event that is observed in the February survey (see Section 2.3). Similarly for Black Monday, Brexit vote and Russian invasion. The variables Financial crisis, Greek debt crisis, Euro crisis and Covid recession correspond to the cumulative impact of events during the Global Financial Crisis, the Greek Debt Crisis, the European Sovereign Debt Crisis, and the COVID pandemic, respectively. For each of these episodes and events, the effect on 12-month-ahead realized inflation is estimated using the local projection method of Jordà (2005), as detailed in Appendix A.2. Missing data for Luxembourg, the Netherlands, Ireland and Portugal for specific sub-periods, preclude estimating the impact of some of these events.

A.2 Impact on Inflation, Unemployment, Consumption Intentions, and Expected Financial Condition

Inflation

We estimate the adverse events impact on realized inflation, $\pi_{c,t}$, using the local projection method of Jordà (2005). Specifically, we estimate the following regression for horizons, h , ranging from zero to twelve months:

$$\pi_{c,t+h} = a_{c,h} + \sum_{j=1}^3 \delta_{c,j} \pi_{c,t-j} + \sum_{j=1}^3 \gamma_{c,j} U_{c,t-j} + \sum_{s=1}^n \beta_{c,h}^s Event^s + u_{c,t+h} \quad (A1)$$

where $\pi_{c,t+h}$ denotes realized inflation in country c at horizon h , $Event_j$ is an indicator for event j taking the value 1 on the event date and zero otherwise, $U_{c,t-j}$ is unemployment for country c at $t-j$, and $\beta_{c,j,h}$ measures the response of inflation to event j at horizon h for each country c or across these countries in the case of the pooled estimator $\beta_{j,h}$. The total number of events, n , is equal to 23 under the simple standard-deviation threshold approach. All specifications include lagged inflation and the unemployment rate as control variables. Standard errors are computed using the NeweyWest estimator with automatic bandwidth selection as in Newey and West (1994). To measure the aggregate impact of consecutive events, such as Covid or the Global Financial Crisis, it is necessary to compute a linear combination of the estimated coefficients, $\beta_{c,j,h}$ from each relevant regression event dummy.

Unemployment

We estimate the adverse events impact on unemployment, $U_{c,t}$, using the local projection method of Jordà (2005). Specifically, we estimate the following regression for horizons, h , ranging from zero to six months:

$$U_{c,t+h} = o_{c,h} + \sum_{j=1}^3 \theta_{c,j} \pi_{c,t-j} + \sum_{j=1}^3 \phi_{c,j} U_{c,t-j} + \sum_{s=1}^n \psi_{c,h}^s Event^s + v_{c,t+h} \quad (A2)$$

Consumption Intentions

Data for consumers' consumption intentions are obtained from Question 9: "Compared to the past 12 months, do you expect to spend more or less money on major purchases (furniture, electrical/electronic devices, etc.) over the next 12 months?". Possible answers are: "much more", "a little more", "about the same", "a little less", "much less" and "don't know". We assign value 2 to "much more", 1 to "a little more", 0 to "about the same", -1 to "a little less" and -2 to "much less". The equation estimated is

$$\begin{aligned} Intention_{c,i,t} = & \kappa_{c,0} + \sum_{j=1}^n \chi_c^j Event_t^j + \sum_{s=1}^{11} \epsilon_c^s Month_t^s + \lambda_c X_{c,i,t} \\ & + \sigma_c W_{c,t} + \alpha_{c,1} z_{c,i,t} + u_{c,i,t} \end{aligned} \quad (A3)$$

$X_{c,i,t}$	Vector of individual i characteristics (age, gender, occupation, income, and education)
$W_{c,t}$	Vector of country c characteristics (unemployment rate, fuel inflation, and industrial production annual rate)
$z_{c,i,t}$	Inflation perception over the past 12 months for individual i , at time t , for country c
n	is the number of events identified

Expected financial condition

The equation estimated is as follows, with variables' notation as in regression (A3):

$$\begin{aligned} Condition_{c,i,t} = & \mu_{c,0} + \sum_{j=1}^n \xi_c^j Event_t^j + \sum_{s=1}^{11} \zeta_c^s Month_t^s + \nu_c X_{c,i,t} \\ & + \omega_c W_{c,t} + \eta_{c,1} z_{c,i,t} + e_{c,i,t} \end{aligned} \quad (A4)$$

Data for consumers' expected financial condition are obtained from Question 2: "How do you expect the financial position of your household to change over the next 12 months?". Possible answers are: "get a lot better", "get a little better", "stay the same", "get a little worse", "get a lot worse" and "don't know". We assign value 2 to "get a lot better", 1 to "get a little better", 0 to "stay the same", -1 to "get a little worse" and -2 to "get a lot worse".

Figure A1: Impact on 12 months ahead inflation

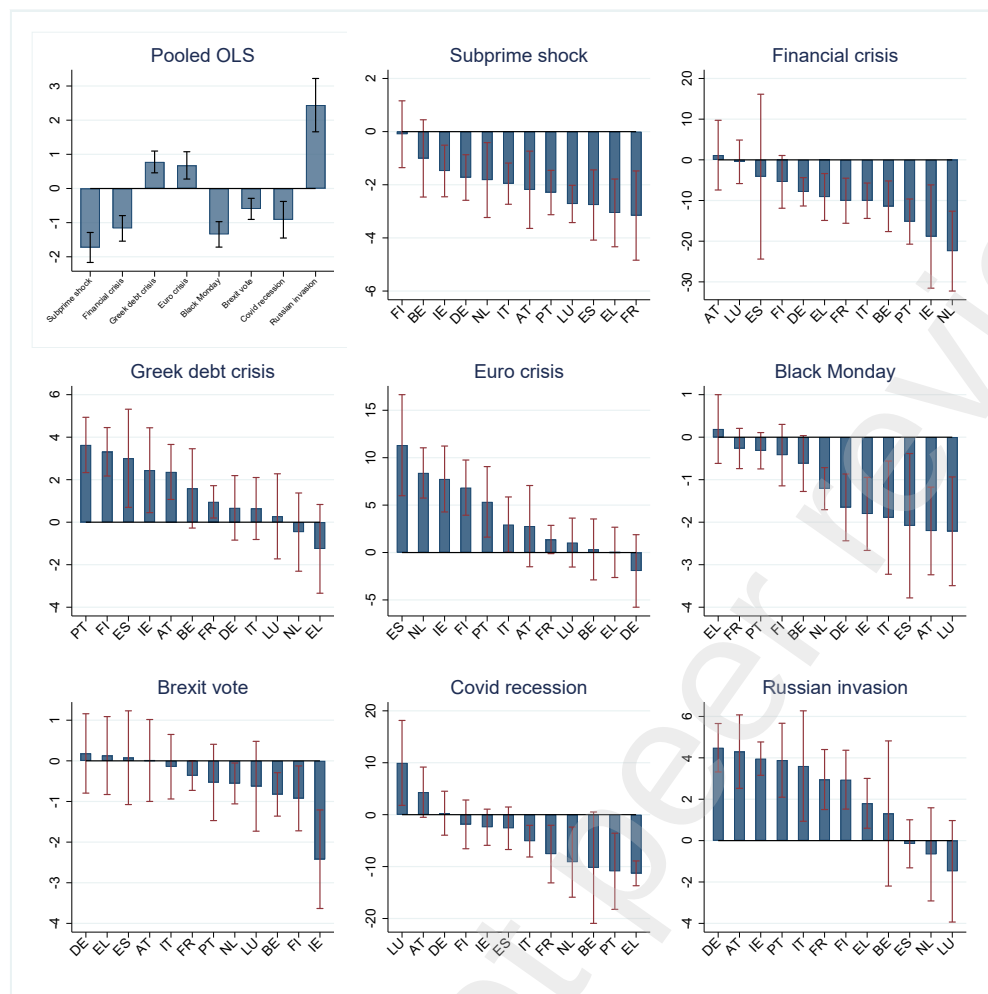


Figure A2: Impact on 6 months ahead unemployment

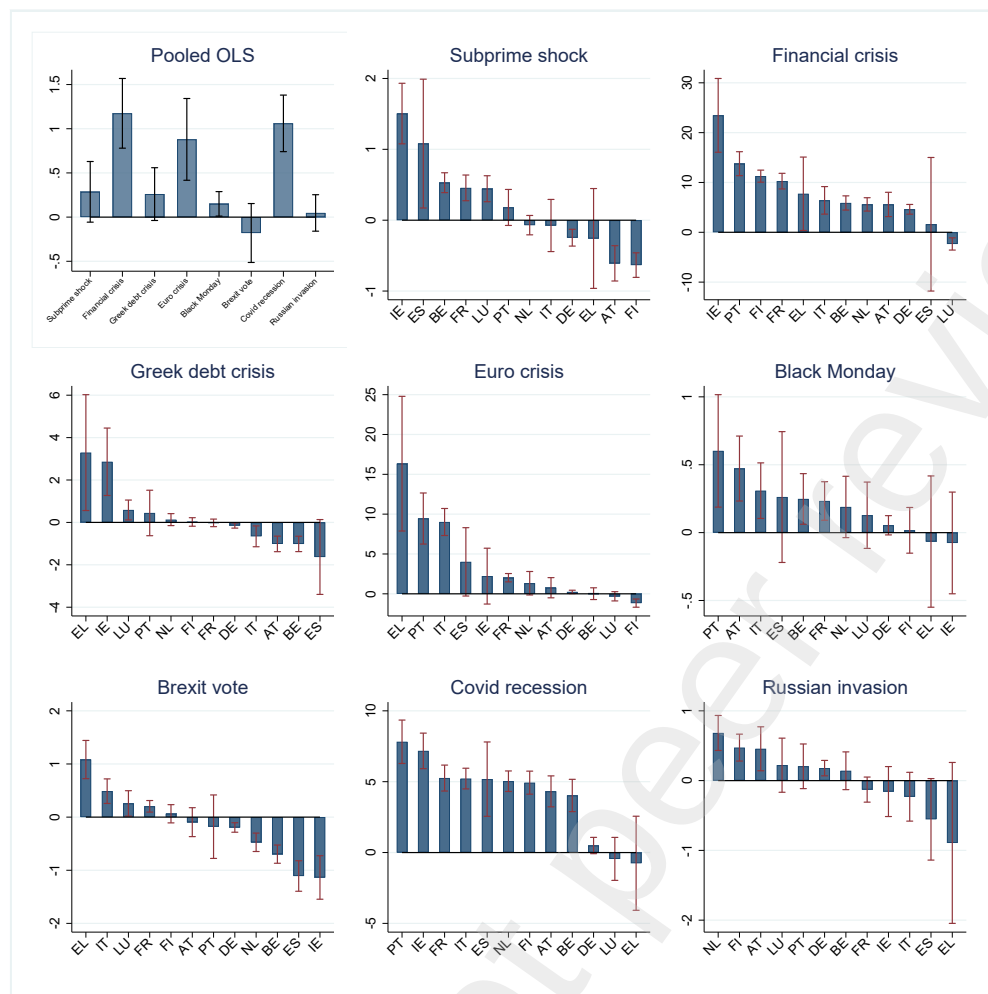


Figure A3: Effects of Events on households' Consumption Intentions

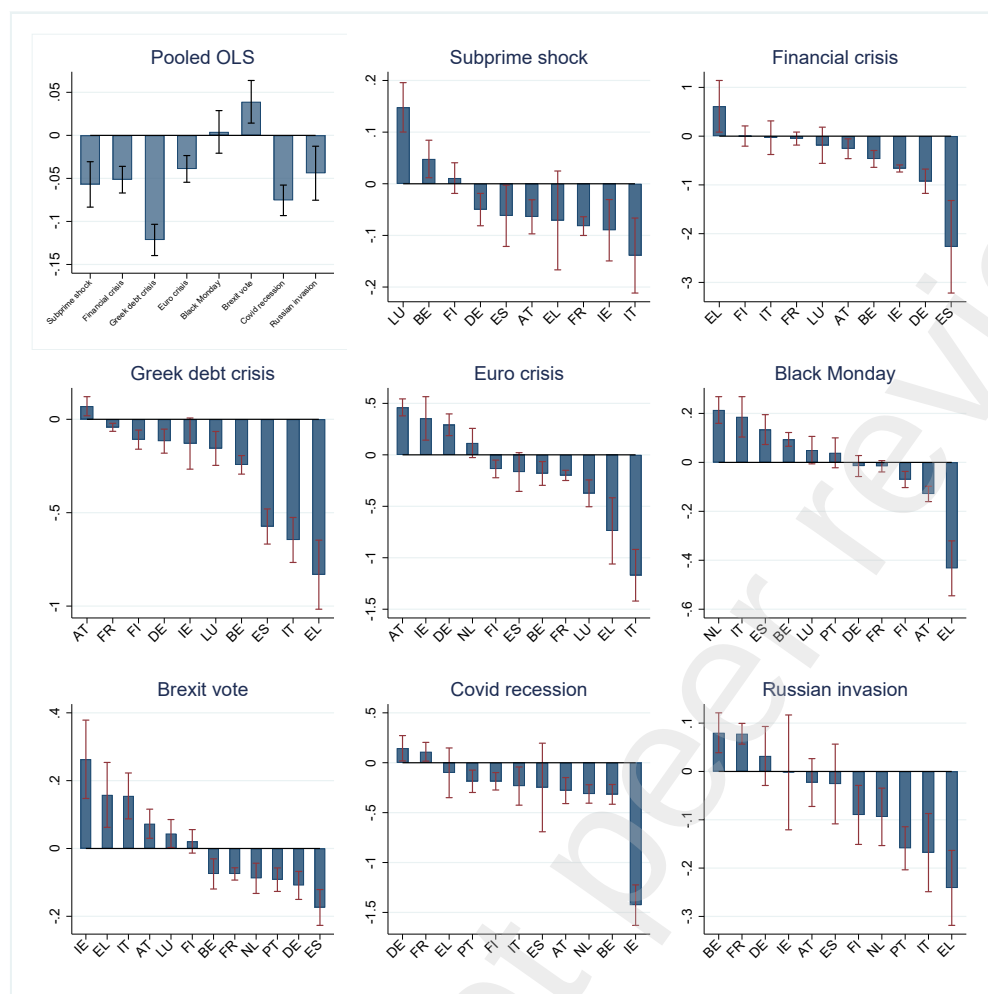
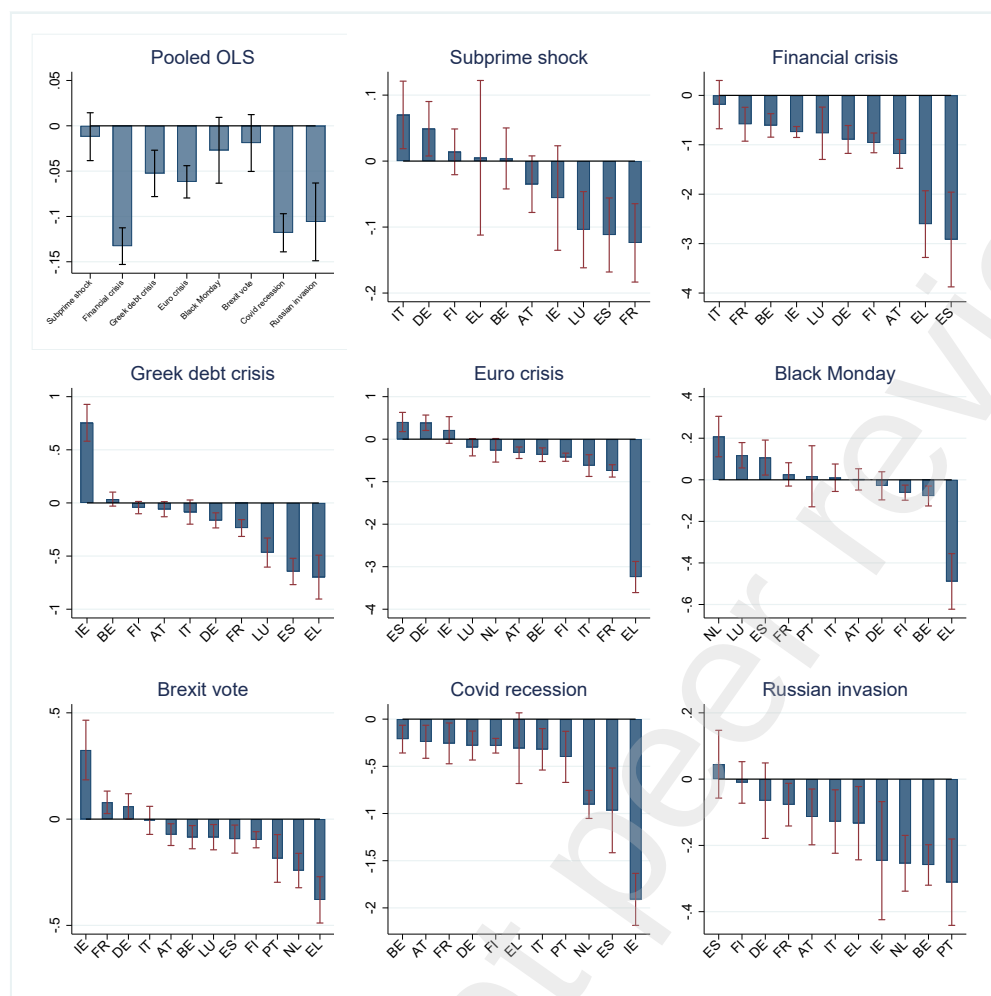


Figure A4: Effects of Events on households' expected financial condition



A.3 Episode-by-episode estimation

Figure A5: Impact of Each Event on Absolute Forecast Errors



Figure A6: Impact of Each Event on Forecast Errors

