

# Medium- vs. short-term consumer inflation expectations: evidence from a new euro area survey<sup>\*</sup>

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## Abstract

Using the ECB Consumer Expectations Survey, this paper investigates revisions of medium-term inflation expectations. We provide robust evidence that consumers adjust medium-term inflation views in response to changes in short-term inflation expectations and, to a lesser degree, to changes in inflation perceptions. We find that the strong adverse Covid-19 shock contributed to an increase in consumer inflation expectations. We show that consumers who declare high trust in the ECB adjust their medium-term inflation expectations to a lesser degree than consumers with low trust. Our results increase understanding of expectations formation, which is an important issue for medium-term oriented monetary policy.

*JEL:* D12, D84, E31, E58

*Keywords:* Inflation expectations, consumer survey, micro-data

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# 1 Introduction

Central banks are continuously monitoring and analysing inflation expectations of economic agents of various types (financial market participants, professional forecasters, and consumers/households) for different forecast horizons, as inflation expectations play a central role in monetary policy making. In recent years, monetary policy makers have quite intensively examined consumers inflation expectations in order to increase monetary policy effectiveness and improve communication to ordinary people. In the euro area, inflation expectations of consumers have not been widely analysed so far, partly due to the lack of data. Deficiency of fully comparable survey information, especially for expectations exceeding one-year forecast horizon, has been the main obstacle to comprehensive empirical analysis.

The ECB Consumer Expectations Survey (CES) is a new monthly online survey, the aim of which is to provide timely information on euro area households and consumers for monetary policy analysis. The CES covers several topics such as consumption, inflation, household income and financial conditions, as well as labour and housing markets. In particular, it provides information on both qualitative and quantitative inflation views of consumers for the current month, one-year ahead (short-term) and three-years ahead (medium-term).

In this paper, we employ the CES data to analyse formation of inflation expectations of euro area consumers. Using survey responses for six euro area economies we aim to answer to three questions. First, whether and how medium-term inflation expectations adjust to changes in inflation perceptions and short-term inflation expectations? Second, how the Covid-19 pandemic—a strong adverse shock to the economy, associated with high economic uncertainty—affected consumer inflation expectations? Thirdly, is there a link between trust in ECB institution and responsiveness of inflation expectations?

Our analysis is closely related to anchoring of inflation expectations, since firmly

anchored inflation expectations should not react to transitory economic developments. The notion of anchoring refers to a long-term horizon and captures more features of expectations than limited responsiveness to current events or shorter-term views (see e.g., Beechey et al., 2011; Ciccarelli and Osbat, 2017; Kumar et al., 2015; Lyziak and Paloviita, 2017). It is typically assumed that anchored expectations should be close to implicit or explicit inflation target of a central bank and stable over time. In particular, they should not react to transitory fluctuations and macroeconomic news. Anchoring may also refer to high certainty or low dispersion of views related to future inflation.

Even if the horizon of consumer inflation views available in the CES survey is no longer than three years—which typically is classified as medium-term—analysis of their responsiveness might be of interest for at least two reasons. Firstly, medium-term horizon is long enough for monetary policy making given time lags in the monetary policy transmission mechanism. Secondly, Coibion et al. (2020) state that inflation expectations of consumers in various horizons are ‘strikingly similar’, which means that medium-term inflation expectations might serve as a proxy for longer-term ones.<sup>1</sup>

Based on analysis of the CES data, we find that medium-term inflation expectations of euro area consumers clearly adjust to changes in short-term inflation expectations and, to a lesser extent, also to changes in inflation perceptions. Moreover, medium-term inflation expectations increased in response to the pandemic shock. Our analysis also reveals that consumers who have higher trust in the central bank adjust their inflation views to transitory economic developments to a lesser degree than consumers with lower trust.

Our paper contributes to the existing literature in several ways. First, it provides

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<sup>1</sup>Additionally, Wong (2015) finds similar response of one-year ahead and 5-to-10 years ahead consumer inflation expectations to oil price shock and Bems et al. (2018), when investigating the link between inflation expectations anchoring and inflation persistence, show that the same results hold for three-year-ahead and five-year-ahead inflation expectations.

new evidence of inflation expectations of euro area consumers based on a fully comparable, new data set for six euro area countries. The European Commission Consumer Survey (ECCS) also provides qualitative and quantitative estimates of inflation perceptions and inflation expectations but only for one-year-ahead forecast horizon.<sup>2</sup> The basic properties of inflation expectations in the ECCS have been analysed e.g. by Arioli et al. (2017), European Commission (2014), Stanisławska (2019) and Stanisławska et al. (2019). Other recently examined aspects include, for example, formation of inflation perceptions and expectations as well as the role of inflation expectations in consumers' economic decisions (Abildgren and Kuchler, 2021; Andrade et al., 2020; Duca-Radu et al., 2020; Easaw et al., 2013).

Second, our paper contributes to the literature on responsiveness (sensitivity) of inflation expectations, which has so far mainly focused on inflation views of professionals and financial market participants, not consumers (e.g. Apokoritis et al., 2019; Beechey et al., 2011; Buono and Formai, 2018; Corsello et al., 2019; Dovern and Kenny, 2020; van der Cruijssen and Demertzis, 2007; Levin et al., 2004; Lyziak and Paloviita, 2017; Moessner and Takáts, 2020; Yetman, 2020). There is scarce evidence on responsiveness of medium-term consumer inflation expectations in the euro area, but some authors analyse sensitivity of short-term inflation expectations. By examining aggregated survey responses in the ECCS, Lyziak and Paloviita (2017), find that one-year ahead inflation expectations of euro area consumers respond to current inflation and that this responsiveness increased after the global financial crisis. Easaw et al. (2013) demonstrate that changes in short-term expectations of Italian consumers are driven by changes in perceived inflation. Using the CES data set we fill this gap and provide micro-level evidence of responsiveness of medium-term inflation expectations of euro area consumers.

Third, we provide new survey-based evidence how the Covid-19 pandemic affected

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<sup>2</sup>In the ECCS, quantitative inflation views are treated as experimental and published only in limited scope. For more information, see: [https://ec.europa.eu/info/business-economy-euro/indicators-statistics/economic-databases/business-and-consumer-surveys\\_en](https://ec.europa.eu/info/business-economy-euro/indicators-statistics/economic-databases/business-and-consumer-surveys_en).

inflation expectations. Several papers have been recently published in this field. Binder (2020) documents that the pandemic contributed to higher inflation expectations, but according to Armantier et al. (2020) there was no clear upward or downward trend in aggregated inflation expectations after the outbreak of the pandemic. Apergis and Apergis (2020) and Dietrich et al. (2020) find that the pandemic contributed to higher inflation expectations, but the opposite is true in Coibion et al. (2020). We find that consumers' inflation expectations increased as a response to the Covid-19 pandemic.

Fourth, our results deepen understanding of the role of trust in the central bank in expectations formation.<sup>3</sup> This topic has been recently debated in the context of the Covid-19 pandemic.<sup>4</sup> Recent empirical studies show that higher trust in central bank contributes to lower inflation expectations and lower uncertainty, as well as to an increase in accuracy of expectations (Christelis, Georgarakos, Jappelli, and Rooij, 2020; Mellina and Schmidt, 2018; Rumler and Valderrama, 2020). According to our analysis, higher trust in the ECB is also linked with lower responsiveness of consumer inflation expectations to transitory fluctuations.

The remainder of the paper is structured as follows. Section 2 introduces the data set and Section 3 describes our empirical framework. We report estimation results in Section 4 and draw conclusions in Section 5.

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<sup>3</sup>Trust in the central bank is often described as confidence of the public that institution will fulfil its mandate. It is related to interpersonal trust but also to evaluation of institution's performance by the public (Mishler and Rose, 2001). Bursian and Faia (2018) note that the notion of trust in monetary authorities is more general than central bank reputation.

<sup>4</sup>See for example a speech by Schnabel, Member of the Executive Board of the ECB: [https://www.ecb.europa.eu/press/key/date/2020/html/ecb.sp201216\\_1~9caf7588cd.en.html](https://www.ecb.europa.eu/press/key/date/2020/html/ecb.sp201216_1~9caf7588cd.en.html).

## 2 Data description

### 2.1 Survey questions

We analyse fully comparable, anonymized individual survey responses in the ECB CES survey which was launched in its pilot phase in January 2020. The survey participants are from the six largest euro area economies (Belgium, France, Germany, Italy, the Netherlands, and Spain) which account for the major share of the euro area in terms of HICP weights (86%). The unique features of the CES, such as high (monthly) frequency, rotating panel structure, qualitative and quantitative questions on inflation views at various horizons, help establishing new empirical facts about expectations formation in the euro area.<sup>5</sup>

Our sample covers period from April 2020, when the survey reached the target sample size of approximately 10,000 households, to September 2020. The total number of euro area consumers who took part in the six pilot waves under investigation is 15,260. On average, each respondent participated in four survey waves. In total, the analysed data consists of almost 60,000 completed questionnaires.<sup>6</sup>

In the CES questionnaire consumers firstly reveal their views on inflation in the country they live—current inflation (inflation perceptions), inflation expectations one-year ahead (short-term) and inflation expectations three-years ahead (medium-term)—in qualitative terms, meaning that they choose between increase, decrease, and no change in prices in general.<sup>7</sup> More specifically, the available response categories are as follows:

*(1) Prices went up (will increase) a lot; (2) Prices went down (will de-*

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<sup>5</sup>See Georgarakos and Kenny (2021) for insights from the survey and ECB (2021, forthcoming) for the survey evaluation. Other recent papers examining the CES data are: Christelis, Georgarakos, Jappelli, and Kenny (2020), Christelis et al. (2021) and Coibion et al. (2021).

<sup>6</sup>Descriptive statistics for survey participants are reported in Table 1.

<sup>7</sup>Medium-term horizon refers to 12-month period ending in three years. Contrary to longer time periods (like the average inflation rate over several years), this kind of specific time period in the future is easier to understand for consumers (see a speech by Potter: <https://www.newyorkfed.org/newsevents/speeches/2016/pot160519>)

crease) a lot; (3) Prices went up (will increase) a little; (4) Prices went down (will decrease) a little; (5) Prices stayed (will be) exactly the same (that is 0% change).

Then, consumers are asked to respond to the following quantitative questions:

*How much higher/lower do you think prices in general are now compared with 12 months ago in the country you currently live in? Please give your best guess of the change in percentage terms.*

*How much higher/lower do you think prices in general will be 12 months from now in the country you currently live in? Please give your best guess of the change in percentage terms.*

*By about what percentage do you expect prices in general in the country you currently live in to increase/decrease over the 12-month period between [survey month, year+2] and [survey month, year+3]? Please give your best guess of the change in percentage terms.*

The survey was conducted in extraordinary circumstances, during the Covid-19 pandemic and lockdown measures in reaction. The pandemic shock resulted in strong collapse in the euro area economic activity in March and April 2020, followed by slow recovery related to relaxing lockdown rules in the following months (ECB, 2020). The ECB reacted to the shock by extending asset purchasing programs and taking other measures supporting access to credit. Due to distortions in the economy, as well as high health and economic uncertainty, the pandemic significantly affected economic decisions of consumers and, potentially, their inflation views. It is worth mentioning that due to the survey methodology (online, not face-to-face survey), the CES was able to be continued in the middle of the pandemic. Therefore, it provides unique information about consumers' opinions in this exceptional situation. We employ responses to one of the Covid-19 related question, in which survey participants are asked to assess how seriously they are concerned about the pandemic's influence

on economic situation of the country they live in.<sup>8</sup> The scale ranges from 0 (no concern) to 10 (extreme concern).

Another question of interest refers to trust in institutions, including the ECB.<sup>9</sup> Responding to this question consumers use scale from 0 (not trust at all) to 10 (complete trust) to rate their level of trust.

The survey provides also a great deal of information about individual respondents which we use as control variables in estimations. Apart from gathering demographic characteristics, the survey questions measure respondent's financial literacy and economic sentiment. The financial literacy questions check understanding of basic concepts such as compound interest rate, real rate of interest, and diversification of risk. The variables related to consumers' economic sentiment refer to their opinions on current unemployment rate, accessibility of credit, current financial situation, and availability of financial resources to cover unexpected payments.

## 2.2 Summary of the data set

The level of aggregate inflation views are summarized in Figure 1. Median inflation expectations one-year and three-year ahead decreased from slightly below 3% in April 2020 to about 2% in September 2020. Inflation perceptions took quite similar values. These numbers are substantially higher than the actual HICP inflation rate in that period (0.1% on average). The mean values are systematically higher than corresponding median values.

Distributions of individual survey responses to inflation expectations questions (Figure 2) reveal that the largest share of consumers expect prices to be stable, both in one year and three years, and relatively large share of consumers have expectations of 2% inflation rate. However, some consumers expect very high inflation rates,

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<sup>8</sup>Other Covid-19 related questions are related to the influence of the pandemic on respondent's health, his/her household's financial situation, and the world economy.

<sup>9</sup>Other institutions listed in the survey are the European Parliament, the European Commission, and the United Nations.



which is reflected in long right tails of the distributions. Another feature, typical for consumer surveys, is heaping of responses at round numbers (like multiples of 5 and 10), which might be indicative of consumers' uncertainty with regard to the future inflation.<sup>10</sup> All in all, the CES data confirm earlier empirical findings that consumers hold very dispersed inflation views, have tendency to overestimate current and future inflation rates and to provide rounded values (see for example Arioli et al. 2017, Duca-Radu et al. 2020, Meyler and Reiche 2021).

The CES survey reveals that consumers were highly worried about the Covid-19 pandemic (Figure 3). In April 2020 about 30% of consumers declared that they are 'extremely concerned' about the impact of the pandemic on their country's economic situation. The fear about the impact of the pandemic weakened a little bit in May and June 2020, but it still remained high.

Figure 4a displays distribution of the level of trust in the ECB declared by individual consumers. In general, dominant values lie typically between five and seven, suggesting that consumers' trust in the ECB is on a relatively high level. Figure 4b shows that the average level of trust among the euro area consumers remained relatively stable in the sample period.

Panel structure of the CES survey allows us to assess frequency and size of changes in individual inflation views, both qualitative and quantitative. The frequency of adjusting inflation expectations is related to attentiveness of consumers to new information, but only under implicit assumption that adjustments are driven by new information rather than noise (Andrade and Le Bihan, 2013). As shown in Table 2, on average about 75% of consumers adjust their quantitative inflation views each

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<sup>10</sup>Rounding behaviour is common in responses to numerical questions in surveys (see Binder, 2017, for overview). This may reflect the fact that quantitative responses may have qualitative features (Bryan and Palmqvist, 2005). Binder (2017) and Meyler and Reiche (2021) argue that rounded quantitative inflation expectations are related to high uncertainty (i.e. survey responses of uncertain consumers are typically multiples of 5 and 10). Others show that reporting of round numbers is linked to personal characteristics and question-level characteristics. For example, Gideon et al. (2017) find that rounding is more common for respondents with low ability and low motivation, as well for more difficult questions.

month. This number is much lower if we consider changes in qualitative inflation views: about 40%. Dräger and Lamla (2012) find similar patterns in one-year ahead and 5-10-years-ahead inflation expectations in the US data, but this comparison is not straightforward due to different frequencies of re-interviewing respondents in these surveys.<sup>11</sup> The consumers participating in the CES survey slightly more often changed their inflation expectations than perceptions and slightly more often revised their views downwards than upwards.

When it comes to the size of changes in individual inflation views from month to month, it does not differ much for shorter- and medium-term inflation expectations. According to Table 2, the mean absolute changes equal to 3.6 pp and 4.0 pp, respectively. These revisions are clearly larger than changes in the actual inflation rate.

### 3 Empirical framework

Our main research question concerns response of inflation expectations to various short-term developments. The CES data, due to its panel character, gives a unique opportunity to observe directly changes in expectations of individual consumers. Focusing on changes instead of levels of expectations has several advantages. First, we can leave aside the issue of the level of expectations which in consumer surveys typically suffers from the overestimation bias. The overestimation bias may be especially problematic at the time of pandemic. Secondly, the impact of all time-invariant characteristics of consumers (such as age, education level, financial literacy) on changes of expectations is likely to be reduced in comparison to the levels of expectations, as it cancels out when using the first differences.<sup>12</sup>

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<sup>11</sup>Dräger and Lamla (2012) use data from the Michigan Survey of Consumers, a monthly survey in which a fraction of respondents is re-interviewed only after six months. In the CES respondents are re-interviewed every month.

<sup>12</sup>The studies documenting heterogeneity of inflation expectations with respect to socio-economic characteristics include: Bruine de Bruin et al. (2010); Bryan and Venkatu (2001); Easaw et al.

### 3.1 Main regressions

Our main analysis is based on regressing changes in medium-term inflation expectations of individual consumer ( $\Delta\pi_{it}^{3Y}$ ) on changes in his/her inflation perceptions ( $\Delta\pi_{it}^P$ ) or short-term inflation expectations ( $\Delta\pi_{it}^{1Y}$ ), the pandemic shock ( $Cov_{it}$ ), and a set of control variables ( $X$ ) as expressed by the following equations:

$$\Delta\pi_{it}^{3Y} = \alpha_i + \beta\Delta\pi_{it}^P + \gamma Cov_{it} + \mu X_{it} + \epsilon_{it} \quad (1)$$

$$\Delta\pi_{it}^{3Y} = \alpha_i + \beta\Delta\pi_{it}^{1Y} + \gamma Cov_{it} + \mu X_{it} + \epsilon_{it} \quad (2)$$

Similar specification is applied to changes in short-term inflation expectations:

$$\Delta\pi_{it}^{1Y} = \alpha_i + \beta\Delta\pi_{it}^P + \gamma Cov_{it} + \mu X_{it} + \epsilon_{it} \quad (3)$$

The first specification focuses on adjustments of inflation expectations to changes in subjective views on current inflation rather than actual inflation. It is well documented that consumers pay more attention to prices they experience in everyday life than to official inflation figures when forming inflation expectations (e.g., D'Acunto et al., 2019; Bruine de Bruin et al., 2010, 2011). Additional biases in perception of price changes by consumers include paying more attention to price increases than decreases, ignoring small changes in prices, and being affected by media reporting (Brachinger, 2008; Hałka and Łyziak, 2015; Lamla and Lein, 2015; Stanisławska, 2019). Therefore, inflation perceptions seem better suited to analyse adjustments of inflation expectations.

In the second specification we use changes in survey participants' subjective views of short-term inflation outlook as a filter to isolate all kind of information shocks that 

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 (2013); Jonung (1981); Stanisławska et al. (2019).

are likely to affect medium-term inflation expectations (see e.g., Buono and Formai, 2018). These subjective views include all types of shocks, for example shocks in food and energy prices, changes in administrative prices, wages. Short-term inflation expectations capture also impact of subjective assessment of current price developments. It is worth worth noting that horizons of short-term and medium-term inflation expectations do not overlap as the former relates to next 12 months, while the latter refers to inflation over 12-month period ending in three years. Therefore, there is no direct (mechanical) dependency between these expectations.

In the third specification the focus is on short-term inflation expectations and their co-movement with changes in inflation perceptions. Results from such regression are useful references when assessing responsiveness of medium-term inflation expectations.

All equations include a dummy variable related to the Covid-19 outbreak ( $Cov$ ) to account for the influence of the pandemic on consumers' inflation expectations. It reflects changes in subjective assessment of the impact of the pandemic on the economy: it is equal to one if respondent in the current month is more concerned about the consequences of the pandemic on country's economic situation than in the previous month. Including the pandemic-related variable in the analysis allows us assess reaction of inflation expectations to an additional factor, apart from inflation views. Moreover, given the strong effect of the pandemic shock on the economy and consumers' behaviour, ignoring the Covid-19 pandemic in regression could lead to an omitted variable bias.

Inflation views of various horizons might be related to each other for various reasons. Therefore, we aim at controlling for many factors (consumer-specific, country-specific, and time-specific) which potentially affect changes in inflation views in various horizons. The vector  $X$  includes observed personal characteristics of consumers (gender, age, education level, employment status, income, household size, and score in financial literacy test). The impact of any omitted time invariant attributes,

like personal optimism or pessimism, on adjustment of inflation expectations is captured by individual effects.<sup>13</sup> Set of controls covers also country effects and common time effects to account for euro area wide macroeconomic conditions (e.g. monetary policy, common inflation trends, common component of economic activity).

As a robustness check, we modify and extend the set of control variables. Firstly, we replace common (euro area wide) time effects with country-specific time effects to allow for more heterogeneity across countries and add variables related to consumer sentiment (i.e. subjective assessment of current state of economy and household's economic situation) to account for their importance in shaping inflation expectations (Ehrmann et al., 2017). Secondly, we control for changes in consumer inflation uncertainty. This way we attempt to mitigate a disturbing effect of rounding behaviour on changes in inflation views in periods of varying uncertainty. As mentioned in Section 2.2, the extent to which consumers round quantitative inflation expectations responding to surveys might co-move with the level of uncertainty. Therefore, relatively high inflation expectations during the first months of the pandemic might reflect elevated uncertainty about future inflation rather than predictions of higher prices in the future (Meyler and Reiche, 2021). We derive uncertainty from a probabilistic question on short-term inflation expectations in the CES, using as a measure an entropy of distribution (Rich and Tracy, 2010; Wallis, 2006). Higher entropy informs that the underlying distribution of inflation expectations is more dispersed and, thus, signals more uncertainty of a consumer with regard to future prices.

## 3.2 Interactions with trust in the ECB

We extend our main analysis by investigating the link between trust in the ECB and the way consumers adjust their inflation expectations, the issue not previously

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<sup>13</sup>We find limited evidence in favour of individual effects as suggested by the Breusch and Pagan Lagrange-multiplier test for random effects (Breusch and Pagan, 1980). It is a consequence of specifying the regressions in terms of changes in inflation expectations instead of the levels. Nevertheless, we take a conservative approach and include such effects in the model.

addressed in the literature as far as we know. Our intuition is that high trust in the ECB institution should be related to more stable (less responsive) medium-term inflation expectations, reflecting consumers' confidence in effectiveness of the central bank in keeping the price stability. We account for such possibility by introducing in the baseline equations interactions of the main explanatory variables with a dummy variable ( $I_{it}$ ) taking value one if respondent declares high trust in the ECB and zero otherwise. A consumer is categorized to a 'high trust' group, if her/his level of trust in the ECB is equal to 6 (a median value in the data set) or higher. The specifications including the dummy variable for the trust in the ECB are expressed as follows:

$$\Delta\pi_{it}^{3Y} = \alpha_i + \beta_1\Delta\pi_{it}^P + \beta_1^*I_{it}\Delta\pi_{it}^P + \gamma Cov_{it} + \gamma^*I_{it}Cov_{it} + \beta_0I_{it} + \mu X_{it} + \epsilon_{it} \quad (4)$$

$$\Delta\pi_{it}^{3Y} = \alpha_i + \beta_1\Delta\pi_{it}^{1Y} + \beta_1^*I_{it}\Delta\pi_{it}^{1Y} + \gamma Cov_{it} + \gamma^*I_{it}Cov_{it} + \beta_0I_{it} + \mu X_{it} + \epsilon_{it} \quad (5)$$

$$\Delta\pi_{it}^{1Y} = \alpha_i + \beta_1\Delta\pi_{it}^P + \beta_1^*I_{it}\Delta\pi_{it}^P + \gamma Cov_{it} + \gamma^*I_{it}Cov_{it} + \beta_0I_{it} + \mu X_{it} + \epsilon_{it} \quad (6)$$

The equations above allow us to test whether there is a statistically significant difference between these two types of consumers in terms of response to the analysed factors.

### 3.3 Robustness check using qualitative inflation views

Apart from quantitative inflation views, the CES gathers also qualitative opinions on inflation in various horizons. Despite the fact that qualitative inflation views provide less precise information on consumers' beliefs than quantitative views, as they describe only directional change in prices (see Section 2.1), they have some advantages. First, qualitative formulation of survey question is potentially easier

for consumers, which might lead to more reliable responses (Jonung, 1986; Pesaran and Weale, 2006). Second, qualitative inflation views are not affected by rounding behaviour which might disturb inference (e.g. Schneeweiss et al., 2010), especially in period of changing level of uncertainty. Thirdly, as recently emphasized by Andrade et al. (2020), changes in broadly defined qualitative inflation expectations might play a greater role in economic decisions of consumers than adjustments in expected inflation rate within single qualitative categories. For these reasons, we complement analysis of adjustments of quantitative inflation expectations with analogous analysis based on qualitative opinions.

The change in qualitative inflation view of consumer  $i$  referring to horizon  $h$  ( $d\pi_{it}^h$ ) is defined:

$$d\pi_{it}^h = \begin{cases} 1 & \text{if consumer's qualitative opinion is shifted towards lower prices,} \\ 2 & \text{if consumer's qualitative opinion is not changed,} \\ 3 & \text{if consumer's qualitative opinion is shifted towards higher prices.} \end{cases}$$

We model probability of  $j$ -th outcome of  $d\pi_{it}^{3Y}$  and  $d\pi_{it}^{1Y}$  ( $j = 1, 2, 3$ ) using ordered multinomial choice models framework. Three model specifications analogous to equations (1)–(3) discussed in Section 3.1 are considered. In the first two, the probability of  $j$ -th outcome of  $d\pi_{it}^{3Y}$  depends on changes in qualitative inflation perceptions ( $d\pi_{it}^P$ ) or changes in qualitative short-term inflation expectations ( $d\pi_{it}^{1Y}$ ), the Covid-19 concerns, and the set of control variables. In the third specification, the probability of  $j$ -th outcome of  $d\pi_{it}^{1Y}$  depends on changes in qualitative inflation perceptions, the Covid-19 concerns, and the set of control variables.<sup>14</sup> In these models, we ignore the panel dimension of the CES data, since there is very little variability

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<sup>14</sup>The set of control variables is the same used in regressions (1)–(3) and discussed in Subsection 3.1, except for uncertainty.

between consumers and the likelihood-ratio test strongly favours standard ordered logistic model.

## 4 Evidence on adjustments in inflation expectations

### 4.1 Adjustments to short-term economic developments

Our main results are obtained from the full sample—that is using pooled data from six countries participating in the survey—with random effects estimator and robust standard errors clustered at country level.<sup>15</sup> In order to limit the effect of extreme observations, 1% of the highest and 1% of the lowest values from our data set are winsorized.

Table 3 summarizes our main results on responsiveness of short- and medium-term inflation expectations. We confirm previous findings documented in the literature that short-term inflation expectations of consumers are affected by assessments of current price developments. According to our estimates, 1 pp increase in inflation perceptions translates to 0.38 pp increase in one-year ahead inflation expectations. More importantly, we find robust evidence that also medium-term consumer inflation expectations react in a statistically significant way to changes in inflation perceptions and short-term inflation expectations. Their response to the 1 pp change in short-term inflation expectations equals 0.29 pp and is stronger than to changes in inflation perceptions (0.19 pp).

Assessment of anchoring based on responsiveness of three-year-ahead inflation expectations is not unambiguous. Comparing sensitivity of short- and medium-term inflation expectations to inflation perceptions, we find that the medium-term ex-

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<sup>15</sup>Results of the robust Hausman test indicate that random effects model is fully efficient (see Table 3).



expectations respond to a much smaller extent. Thus, lower sensitivity of inflation expectations in the medium-term suggests some degree of their anchoring. However, we can neither confirm nor exclude the possibility that they are firmly anchored. On the one hand, firmly anchored expectations should not respond to short-term developments at all. On the other hand, in the case of medium-term horizon, contrary to the long-term horizon, some degree of responsiveness might be natural and the requirement of zero-responsiveness might be too strict. Therefore, some responsiveness of medium-term consumer inflation expectations revealed in our analysis does not necessarily rule out firmly anchored expectations, unless one considers three-year horizon as relevant for anchoring or accepts medium-term expectations as a valid proxy for longer-term ones.

According to our estimations, increasing Covid-19 concerns about country's economic situation contribute significantly to higher shorter-term inflation expectations. Based on specification (1) including inflation perceptions, we find that the pandemic affected also medium-term inflation expectations, but to a lesser degree. In specification (2), including changes in short-term inflation expectations as the main regressor, statistical significance of the Covid-19 concerns variable depends on the set of controls.<sup>16</sup> In this case, weaker response of medium-term inflation expectations to the pandemic may reflect the fact that the the pandemic is already captured in changes of short-term inflation expectations, which filter all kind of available information relevant for formation of expectations.

The estimated parameters are qualitatively unchanged, if we take heterogeneity across the euro area countries and individual sentiments into account, or if we allow the level of uncertainty to change (Table 3, columns (b) and (c)). In particular, controlling for change in inflation uncertainty does not alter our finding that the Covid-19 contributed to increase in inflation expectations in the short- and medium-

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<sup>16</sup>In the latter case, the number of observations is lower due to missing data on individual uncertainty. Some consumers do not respond to the probabilistic question on expected inflation and some responses are excluded because the provided probabilities do not sum to 100.

term horizon. Thus, the finding on the positive association between the pandemic and consumer inflation expectations is not driven by changing extent of rounding related to the varying level of uncertainty.

In addition to the full sample, we considered the sample restricted to the four largest economies (France, Germany, Italy and Spain) for two reasons. Firstly, the sampling method applied in Belgium and the Netherlands differs from the one implemented in other countries (fully non-probabilistic vs mostly probabilistic sample). Secondly, Belgium and the Netherlands are slightly over-represented in the pooled data set in relation to size of their economies (Belgium and the Netherlands account for 4.4% and 6% in the HICP basket, but they account for 10% and 11% of observations in our sample). Compared to the main analysis, the conclusions based on the restricted sample are qualitatively unchanged. These results are available upon request.

#### 4.1.1 Controlling for inflation perceptions

One-year ahead inflation expectations filter many current and short-term factors that might affect medium-term inflation outlook. One of the most important driver of consumer inflation expectations is the perceived inflation. In this section we attempt to capture the effect of short-term factors on medium-term inflation expectations beyond the effect of the perceived inflation. To this end, we remove the influence of inflation perceptions and actual price changes on short-term inflation expectations by orthogonalising these expectations with respect to inflation perceptions, country-specific inflation ( $\pi_t$ ) and socio-demographic characteristics:<sup>17</sup>

$$\Delta\pi_{it}^{1Y} = \alpha_i + \beta\Delta\pi_{it}^P + \mu X_{it} + \delta\Delta\pi_t + \epsilon_{it} \quad (7)$$

The residuals from the regression above (denoted  $\tilde{\pi}_{it}^{1Y}$ ) represent changes of short-term inflation expectations, which is not related to the perceived or actual infla-

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<sup>17</sup>Here  $X_{it}$  does not include time effects, contrary to the previous specifications.

tion. We interpret them as a forward-looking component of short-term inflation expectations, related for example to an influence of forecasts of professional forecasters, macroeconomic news (except those regarding current inflation), and shocks not affecting current prices.<sup>18</sup> Next, in equation (2) we replace short-term inflation expectations with these residuals:

$$\Delta\pi_{it}^{3Y} = \alpha_i + \beta\tilde{\pi}_{it}^{1Y} + \gamma Cov_{it} + \mu X_{it} + \epsilon_{it} \quad (8)$$

The results presented in the last three columns of Table 3 indicate that medium-term inflation expectations react significantly to changes in short-term views, even if they are cleaned from the influence of inflation perceptions. The estimated reaction is only slightly lower than in the case of the baseline results. This suggests that forward-looking factors included in short-term inflation expectations—beyond those which are related to inflation perceptions—play a greater role in shaping medium-term inflation expectations than inflation perceptions.

#### 4.1.2 Adjustments to positive and negative changes

Another interesting question is about possible asymmetry of responses of medium-term inflation expectations to positive and negative changes in short-term inflation views. Some studies document asymmetric adjustments of euro area long-term inflation expectations of professional forecasters. For example, Corsello et al. (2019) show that long-term inflation expectations do not react to positive surprises in HICP releases, but they are sensitive to negative surprises (since mid-2013). Similar evidence is presented in Ehrmann (2015) for a group of countries with inflation targeting central banks, as well as the euro area, the US, and Switzerland. Moessner and Takáts (2020) find that only positive deviations of inflation from the inflation target

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<sup>18</sup>Forecasts of professionals constitute another important driver of consumer inflation expectations as suggested by the epidemiological model of expectations formation; see Carroll (2003; 2006).

affect long-term inflation expectations of professional forecasters.

We investigate presence of asymmetric sensitivity by decomposing changes in inflation perceptions and short-term inflation expectations into positive ( $\Delta\pi^{P+}$ ,  $\Delta\pi^{1Y+}$ ) and negative terms ( $\Delta\pi^{P-}$ ,  $\Delta\pi^{1Y-}$ ). After modification of our specifications we are able to separate these two effects and test for differences:

$$\Delta\pi_{it}^{3Y} = \alpha_i + \beta_1\Delta\pi_{it}^{P+} + \beta_2\Delta\pi_{it}^{P-} + \gamma Cov_{it} + \mu X_{it} + \epsilon_{it} \quad (9)$$

$$\Delta\pi_{it}^{3Y} = \alpha_i + \beta_1\Delta\pi_{it}^{1Y+} + \beta_2\Delta\pi_{it}^{1Y-} + \gamma Cov_{it} + \mu X_{it} + \epsilon_{it} \quad (10)$$

$$\Delta\pi_{it}^{1Y} = \alpha_i + \beta_1\Delta\pi_{it}^{P+} + \beta_2\Delta\pi_{it}^{P-} + \gamma Cov_{it} + \mu X_{it} + \epsilon_{it} \quad (11)$$

Table 4 provides parameter estimates and the Wald test statistics for symmetry of coefficients. They clearly indicate that responses of short- and medium-term inflation expectations are symmetric.

### 4.1.3 Results for individual countries

The main results on adjustment of medium-term inflation expectations obtained from the sample of pooled data from six euro area economies hold also when we consider individual countries. Response of three-years ahead inflation expectations to both inflation perceptions and one-year ahead inflation expectations is positive and statistically significant in all countries. The size of estimated parameters ranges from 0.15 to 0.30 for changes in inflation perceptions and from 0.26 to 0.32 for changes in short-term expectations (Table 5). Also in all countries the responsiveness of the medium-term inflation expectations to inflation perceptions is weaker than responsiveness of the short-term inflation expectations.

The degree to which medium-term inflation expectations adjust to short-term inflation outlook, which summarizes all kind of information relevant for future inflation, is remarkably similar across consumers living in single economies of the euro area.

It is virtually the same in France, Germany, and Italy and only somewhat lower in Belgium, the Netherlands, and Spain.

The empirical results for individual countries also confirm that the Covid-19 pandemic increased short-term inflation expectations: in five of six economies the concern about the consequences of the pandemic for the economy is statistically significant. We find less evidence on the link between the pandemic and the medium-term expectations. The largest increase in short-term and medium-term inflation expectations, associated with Covid-19 related concerns, is measured in Germany.

## 4.2 Role of trust in the ECB

Table 6 reports estimation results based on specifications which allow for heterogeneity of responses across the two groups of consumers determined by the trust in the ECB (specifications 4-6). Responsiveness of expectations in group of consumers having less trust in the central bank is given by parameter  $\beta_1$ , while for those having more trust in the central bank by parameters  $(\beta_1 + \beta_1^*)$ . The effect of pandemic-related concerns in these two groups is described by  $\gamma$  and  $(\gamma + \gamma^*)$ , respectively.

Table 6 shows that consumers trusting more in the ECB adjust their short- and medium-term inflation expectations to inflation perceptions to a lesser extent than consumers having lower trust in the central bank. The same applies to responsiveness of medium-term inflation expectations to short-term inflation expectations. The differences in sensitivities between the two groups are statistically significant in all cases. According to the Wald tests, medium-term expectations of both groups adjust to shorter-term inflation views, suggesting that the gain from high trust is not large enough to make consumer expectations fully insensitive.

There is some evidence that these two groups differ also in terms of adjustments of the medium-term inflation expectations during the the pandemic. According to

the Wald test, the response of expectations of consumers who declare high trust in the ECB is not statistically significant, contrary to the response of expectations of consumers with low trust in the central bank.

### 4.3 Insights from qualitative inflation views

Analysis of qualitative survey responses is based on ordered multinomial models, the parameters of which are not directly interpretable. Figure 5 displays adjusted predicted probabilities and Table 7 reports corresponding average marginal effects of changes in the qualitative views and the Covid-19 concerns. The upper panel of Table 7 shows the effect of change in the main regressors on probability of adjusting inflation view towards higher prices, while the lower panel shows the effect on probability of shifting opinion towards lower prices. The explanatory variables, i.e. change in inflation perceptions and short-term inflation expectations, are categorical themselves, so the corresponding marginal effects inform about differences from the base level which is no change in qualitative inflation views.

All marginal effects are highly statistically significant and have the expected sign, meaning that shift in qualitative opinion towards higher (lower) prices contributes to higher probability of increasing (decreasing) inflation expectations. The effects are non-negligible. For example, the predicted probability of revising upwards medium-term inflation expectations for a consumer who revised upwards his/her short-term inflation expectations equals 28% in comparison to 19% for a consumer who did not change his/her view, and to 12% for a consumer who revised it downwards (Figure 5b). Consistent with the analysis based on quantitative inflation views in Section 4.1, the responsiveness of medium-term inflation expectations to inflation perceptions is again smaller (Figure 5a): the predicted probabilities of increase in medium-term inflation expectations ranges from 16% (consumers who decreased inflation perceptions) to 24% (consumers who increased inflation perceptions).

Analysis of qualitative inflation views confirms our previous finding that increased Covid-19 concerns are related to higher inflation expectations, both in short-term and medium-term horizons. However, the size of the marginal effects is small (the marginal effects do not exceed 1.5 pp).

All in all, qualitative inflation views of consumers—which might be more reliable and more relevant for consumer decisions than corresponding quantitative views on inflation—also indicate that medium-term inflation expectations adjust to current economic developments.

## 5 Conclusions

The ECB CES online survey is the first source which provides fully comparable and timely information about qualitative and quantitative medium-term inflation expectations of euro area consumers. The survey indicates that consumer inflation views are very heterogeneous and systematically higher than the actual inflation.

Based on micro-level panel data from six countries participating in the survey, we provide robust evidence that medium-term inflation expectations of euro area consumers adjust to current economic developments. More specifically, we show that consumers revise their medium-term inflation expectations in response to their changing views of inflation in the short-term. Increase in inflation expectations is associated also with the Covid-19 pandemic and rising inflation perceptions, but the importance of the latter factor is relatively small. Contrary to Ehrmann (2015)—who investigates expectations of professional forecasters—we do not find evidence of asymmetric responses in the current low inflation environment. We find lower responsiveness of expectations in the case of those consumers who declare high trust in the ECB, which confirms previous findings that the trust in central bank plays an important role in expectations formation. The conclusions are broadly speaking similar if we consider individual euro area economies or qualitative inflation

expectations.

Our analysis sheds light on consumers' understanding of what drives inflation. The Covid-19 pandemic was an unexpected and huge shock, which led to an increased uncertainty and a strong contraction in economic activity. In response to that shock consumers' inflation expectations increased—a finding reported also in other studies. We show that it is unlikely that increase in inflation expectations in response to the pandemic is driven only by increased uncertainty. Some explanations of the evolution of inflation expectations during the pandemic may be related to the findings by Dräger et al. (2016) who show that only about one third of consumers hold inflation views consistent with the Phillips curve relationship, and by Ehrmann et al. (2017) who find that the bias of consumer inflation expectations is higher during recessions, suggesting that consumers misperceive link between inflation and economic activity. Thus, the evolution of inflation expectations in the middle of the pandemic may reflect the fact that consumers interpret inflation as a supply-side driven phenomenon and, as result, link economic slowdown with higher inflation (Coibion et al., 2019; Candia et al., 2020).

Analysis of the way consumers adjust their inflation expectations, based on the new euro area survey, is very useful for medium-term oriented monetary policy, as it provides new information on how shocks hitting the economy are passed to medium-term inflation expectations of consumers through their inflation perceptions and short-term inflation expectations. An ongoing assessment of responsiveness of consumer inflation expectations is especially important in the low inflation environment since persistently low inflation rates may change the way consumers form their expectations.



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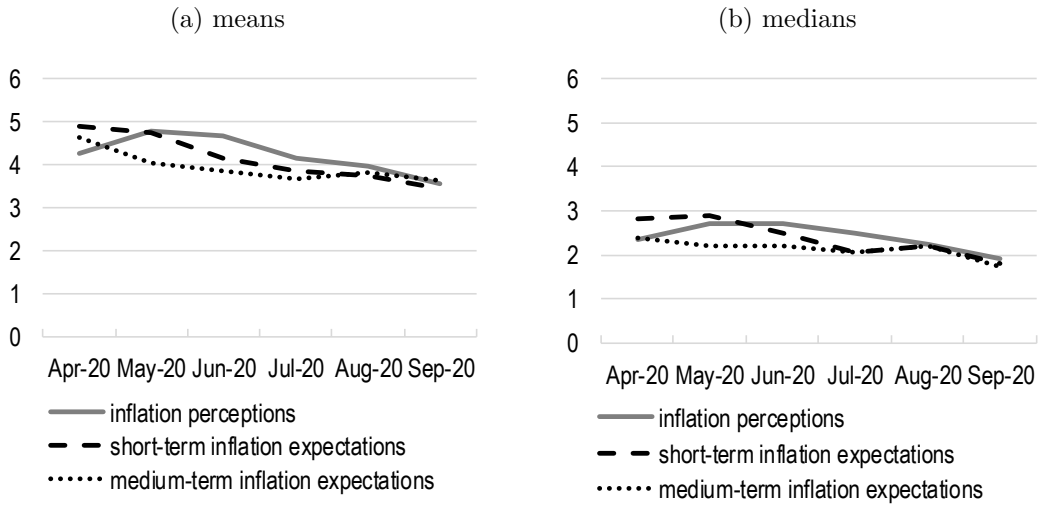
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# Figures and Tables

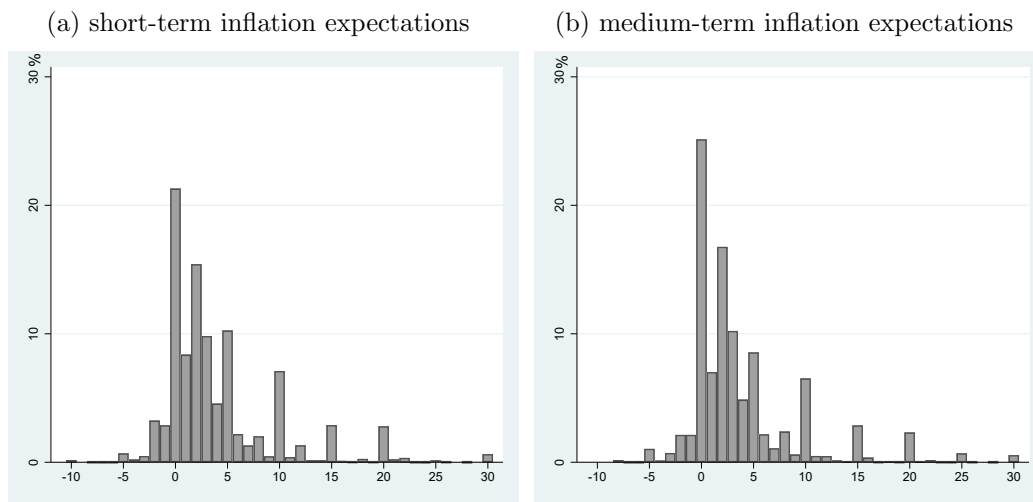
Figure 1: Level of inflation views



Note: The presented numbers are averages of statistics for individual countries, weighted with country HICP weights. Statistics for each country are calculated using sampling weights.

Source: own calculations based on CES data.

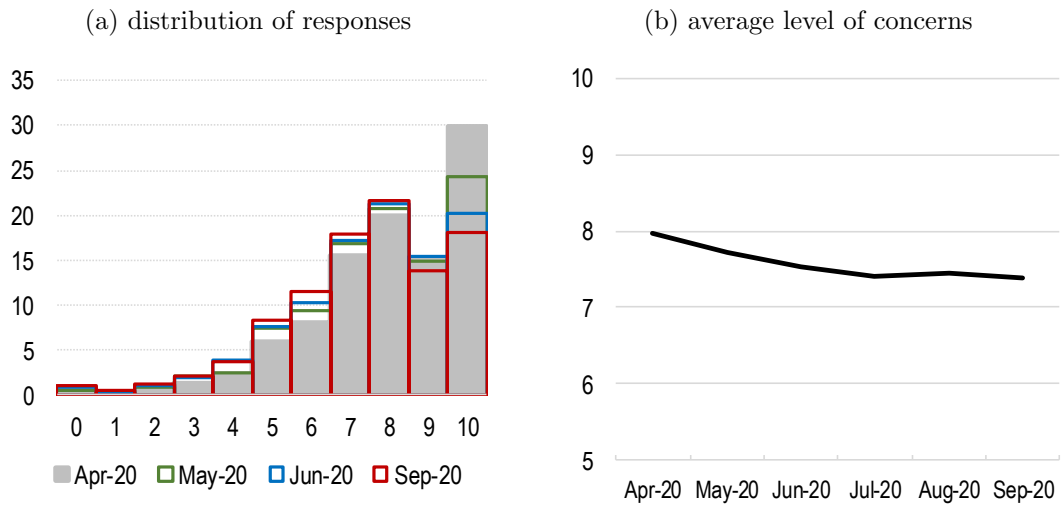
Figure 2: Distribution of individual inflation views



Source: own calculations based on CES data.

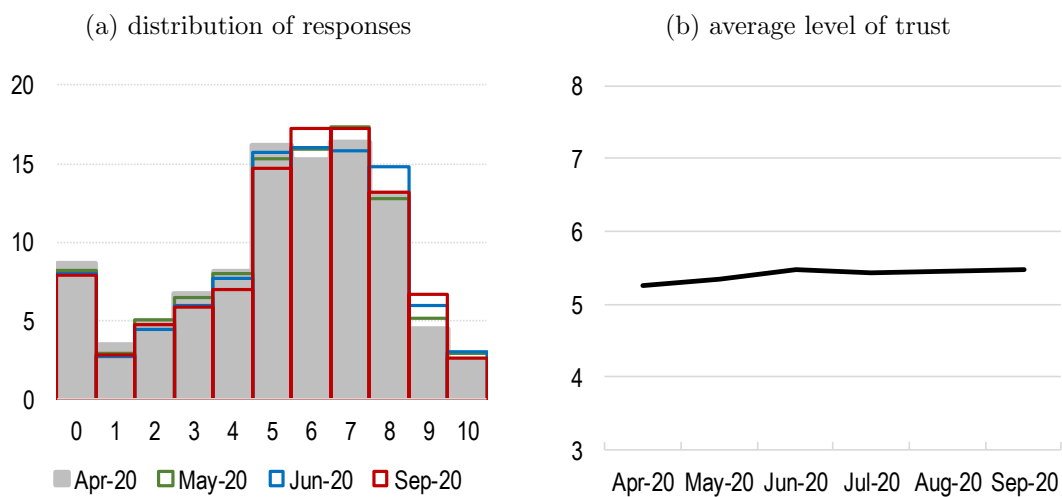


Figure 3: Concerns about impact of Covid-19 on country’s economic situation



Note: The presented numbers are averages of statistics for individual countries, weighted with country HICP weights. Statistics for each country are calculated using sampling weights.  
 Source: own calculations based on CES data.

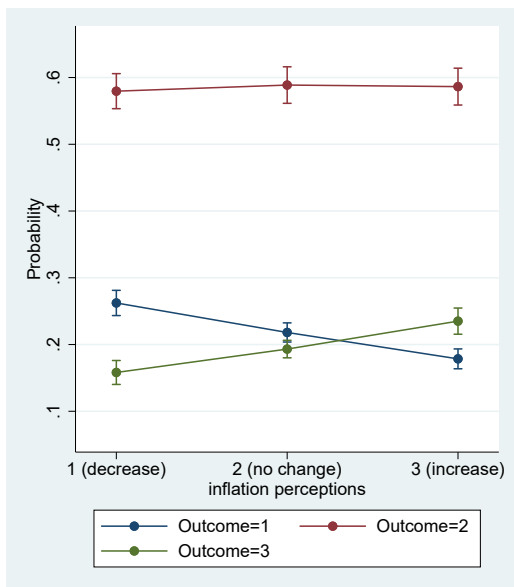
Figure 4: Declared trust in the ECB



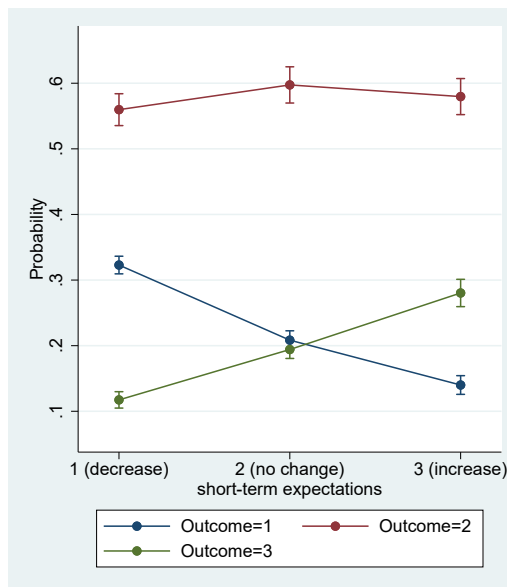
Note: The presented numbers are averages of statistics for individual countries, weighted with country HICP weights. Statistics for each country are calculated using sampling weights.  
 Source: own calculations based on CES data.

Figure 5: Adjustments of qualitative inflation expectations – average adjusted predictions

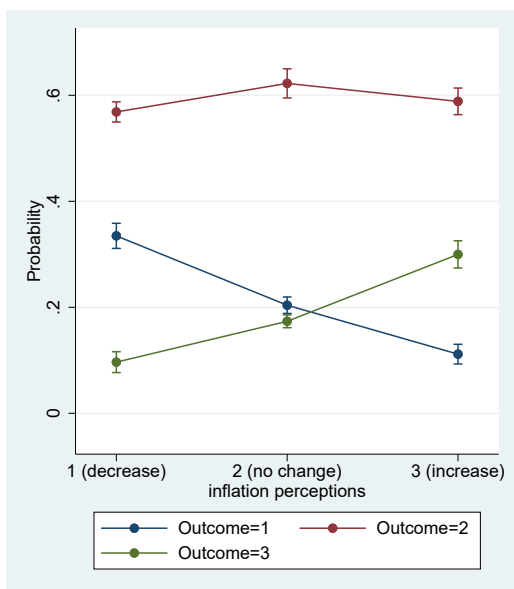
(a) Effect of change in inflation perceptions on medium-term expectations



(b) Effect of change in short-term inflation expectations on medium-term expectations



(c) Effect of change in inflation perceptions on short-term expectations



Note: Outcome 1 denotes decrease in inflation view, outcome 2 denotes no change in inflation view, and outcome 3 denotes increase in inflation view.

Source: own calculations based on CES data.

Table 1: Sample description

	All	Belgium	France	Germany	Italy	Netherlands	Spain
Gender							
Male	49.0	50.1	51.2	53.9	42.6	47.6	49.6
Female	51.0	49.9	48.8	46.1	57.4	52.4	50.5
Age							
18-34	21.3	19.7	24.3	23.8	19.1	18.2	20.6
35-54	46.4	44.0	42.7	38.0	54.0	42.3	52.6
55+	32.4	36.4	33.0	38.2	26.9	39.5	26.8
Employment status							
employed	63.9	56.5	62.9	66.3	64.7	62.9	66.2
unemployed	18.2	22.6	12.7	13.4	19.9	21.5	22.3
not active	17.9	20.9	24.4	20.3	15.4	15.6	11.5
Income							
less than €14,999	17.0	16.1	14.8	14.0	21.2	14.9	18.8
€15,000-€24,999	16.4	14.2	15.7	11.2	17.7	12.3	23.5
€25,000-€39,999	25.5	24.3	28.9	25.5	24.5	23.5	24.6
€40,000-€59,999	18.7	19.1	23.1	22.2	14.9	20.9	14.1
€60,000 or more	10.6	12.7	10.5	16.4	6.6	13.9	7.1
missing	11.9	13.6	7.0	10.8	15.1	14.5	12.0
Education							
ISCED 1 and 2	13.6	11.0	9.3	11.1	7.9	17.3	25.6
ISCED 3 and 4	31.6	35.0	23.4	34.4	45.9	37.6	16.9
ISCED 5 to 8	54.8	54.1	67.3	54.5	46.2	45.2	57.4
Household size							
1	17.5	22.0	24.4	21.1	12.9	22.3	8.0
2	32.9	38.5	31.9	39.6	24.7	43.4	28.7
3	21.9	20.0	17.1	18.4	28.5	15.8	26.8
4 or more	27.6	19.5	26.6	20.9	34.0	18.4	36.5
Financial knowledge							
mean	2.5	2.6	2.3	2.6	2.5	2.8	2.3
standard deviation	1.1	1.1	1.1	1.1	1.1	1.1	1.0
Trust in ECB							
mean	5.4	5.2	5.8	5.6	4.9	5.4	5.3
standard deviation	2.6	2.7	2.5	2.5	2.9	2.4	2.7
Covid related concerns							
mean	7.7	7.3	7.4	6.9	8.4	6.9	8.4
standard deviation	2.0	2.1	2.0	2.0	1.9	1.9	1.8
N	42 218	4 368	8 179	7 928	9 189	4 072	8 482

Note: Table shows relative frequencies or means and standard deviations. ISCED stands for International Standard Classification of Education. Financial knowledge refers to test score (ranging from 0 to 4).

Source: own calculations based on CES data.

Table 2: Characteristics of changes in inflation views of individual consumers

	inflation perceptions	short-term inflation expectations	medium-term inflation expectations
quantitative views			
Mean absolute change	3.2 pp	3.6 pp	4.0 pp
Standard deviation of absolute change	5.0 pp	5.5 pp	6.5 pp
Share of no change in view	28.0%	24.5%	24.3%
Share of increased views	34.4%	35.5%	36.1%
Share of decreased views	37.7%	39.6%	39.6%
qualitative views			
Share of no change in view	66.8%	60.9%	58.7%
Share of changes towards higher prices	15.2%	17.9%	19.3%
Share of changes towards lower prices	18.0%	21.3%	22.0%

Source: own calculations based on CES data.

Table 3: Adjustments of inflation expectations

	$\Delta\pi_{it}^1Y$			$\Delta\pi_{it}^2Y$			$\Delta\pi_{it}^3Y$		
	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)
$\Delta\pi_{it}^P$	0.380*** (0.013)	0.379*** (0.013)	0.366*** (0.016)	0.195*** (0.01)	0.193*** (0.01)	0.184*** (0.011)	-	-	-
$\Delta\pi_{it}^1Y$	-	-	-	-	-	-	0.293*** (0.01)	0.292*** (0.01)	0.286*** (0.013)
$\Delta\pi_{it}^2Y$	-	-	-	-	-	-	0.264*** (0.013)	0.264*** (0.013)	0.257*** (0.014)
$Cov_{it}$	0.337*** (0.08)	0.334*** (0.077)	0.367*** (0.072)	0.216** (0.105)	0.209** (0.1)	0.0278** (0.069)	0.117 (0.087)	0.112 (0.082)	0.176*** (0.060)
Demographic char.	yes	yes	yes	yes	yes	yes	yes	yes	yes
Country effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time effects (common)	yes	no	yes	yes	no	yes	yes	no	yes
Time effects (country)	no	yes	no	no	yes	no	no	yes	no
Individual sentiment	no	yes	no	no	yes	no	no	yes	no
Change in uncertainty	no	no	yes	no	no	yes	no	no	yes
Hausman test $\chi^2$ stat.	8.85 [0.001]	16.28 [0.092]	10.8 [0.013]	3.30 [0.192]	10.14 [0.428]	3.85 [0.278]	0.74 [0.692]	8.56 [0.574]	0.98 [0.805]
p-val.							0.82 [0.665]	13.30 [0.207]	1.10 [0.776]
overall $R^2$	0.119 42,218	0.121 42,218	0.113 36,733	0.024 42,218	0.026 42,218	0.023 36,733	0.066 42,218	0.068 42,218	0.064 36,733
$N$							42,218	42,218	36,733

Note: Random effects estimations with robust standard errors (clustered at country level, showed in parentheses). Hausman test results refer to robust (bootstrapped) version of the test. \* $p < .1$ ; \*\* $p < .05$ ; \*\*\* $p < .01$   
Source: own calculations based on CES data.

Table 4: Asymmetric effects in adjustments of inflation expectations

	$\Delta\pi_{it}^{1Y}$			$\Delta\pi_{it}^{3Y}$			$\Delta\pi_{it}^{3Y}$		
	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)
$\Delta\pi_{it}^{P-}$	0.382*** (0.030)	0.381*** (0.030)	0.361*** (0.032)	0.195*** (0.017)	0.194*** (0.016)	0.182*** (0.020)	-	-	-
$\Delta\pi_{it}^{P+}$	0.378*** (0.015)	0.376*** (0.015)	0.370*** (0.020)	0.194*** (0.009)	0.191*** (0.009)	0.186*** (0.006)	-	-	-
$\Delta\pi_{it}^{1Y-}$	-	-	-	-	-	-	0.292*** (0.014)	0.292*** (0.014)	0.284*** (0.011)
$\Delta\pi_{it}^{1+}$	-	-	-	-	-	-	0.294*** (0.024)	0.292*** (0.025)	0.288*** (0.026)
$Cov_{it}$	0.338*** (0.080)	0.334*** (0.077)	0.366*** (0.073)	0.216** (0.105)	0.209** (0.100)	0.278*** (0.069)	0.117 (0.088)	0.112 (0.083)	0.176*** (0.062)
Demographic char.	yes	yes	yes	yes	yes	yes	yes	yes	yes
Country effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time effects (common)	yes	no	yes	yes	no	yes	yes	no	yes
Time effects (country)	no	yes	no	no	yes	no	no	yes	no
Individual sentiment	no	yes	no	no	yes	no	no	yes	no
Change in uncertainty	no	no	yes	no	no	yes	no	no	yes
Test stat. $H_0 : \beta_1 = \beta_2$	0.01 [0.911]	0.01 [0.908]	0.04 [0.844]	0.00 [0.951]	0.04 [0.846]	0.03 [0.861]	0.00 [0.945]	0.00 [0.981]	0.02 [0.901]
overall $R^2$	0.119	0.121	0.113	0.024	0.026	0.023	0.066	0.068	0.064
$N$	42,218	42,218	36,773	42,218	42,218	36,773	42,218	42,218	36,773

Note: Random effects estimations with robust standard errors (clustered at country level, showed in parentheses). \* $p < .1$ ; \*\* $p < .05$ ; \*\*\*  $p < .01$   
Source: own calculations based on CES data.

Table 5: Adjustments of inflation expectations in individual euro area countries

## (a) Belgium and France

	Belgium				France			
	$\Delta\pi_{it}^{1Y}$	$\Delta\pi_{it}^{3Y}$	$\Delta\pi_{it}^{3Y}$	$\Delta\pi_{it}^{3Y}$	$\Delta\pi_{it}^{1Y}$	$\Delta\pi_{it}^{3Y}$	$\Delta\pi_{it}^{3Y}$	$\Delta\pi_{it}^{3Y}$
$\Delta\pi_{it}^P$	0.270*** (0.040)	0.154*** (0.044)	-	-	0.426*** (0.029)	0.210*** (0.028)	-	-
$\Delta\pi_{it}^{1Y}$	-	-	0.260*** (0.047)	-	-	-	0.303*** (0.025)	-
$\Delta\tilde{\pi}_{it}^{1Y}$	-	-	-	0.235*** (0.048)	-	-	-	0.268*** (0.028)
$Cov_{it}$	0.316** (0.160)	0.256 (0.188)	0.169 (0.183)	0.174 (0.185)	0.240** (0.122)	-0.029 (0.163)	-0.105 (0.159)	-0.101 (0.161)
overall $R^2$	0.082	0.026	0.057	0.046	0.162	0.030	0.067	0.045
$N$	4,368	4,368	4,368	4,368	8,179	8,179	8,179	8,179

## (b) Germany and Italy

	Germany				Italy			
	$\Delta\pi_{it}^{1Y}$	$\Delta\pi_{it}^{3Y}$	$\Delta\pi_{it}^{3Y}$	$\Delta\pi_{it}^{3Y}$	$\Delta\pi_{it}^{1Y}$	$\Delta\pi_{it}^{3Y}$	$\Delta\pi_{it}^{3Y}$	$\Delta\pi_{it}^{3Y}$
$\Delta\pi_{it}^P$	0.403*** (0.027)	0.247*** (0.028)	-	-	0.385*** (0.026)	0.182*** (0.034)	-	-
$\Delta\pi_{it}^{1Y}$	-	-	0.316*** (0.025)	-	-	-	0.304*** (0.029)	-
$\Delta\tilde{\pi}_{it}^{1Y}$	-	-	-	0.270*** (0.026)	-	-	-	0.282*** (0.030)
$Cov_{it}$	0.539*** (0.112)	0.423*** (0.125)	0.284** (0.122)	0.343*** (0.123)	0.485** (0.217)	0.475* (0.28)	0.318 (0.272)	0.313 (0.276)
overall $R^2$	0.147	0.055	0.097	0.066	0.12	0.022	0.067	0.052
$N$	7,928	7,928	7,928	7,928	9,189	9,189	9,189	9,189

## (c) The Netherlands and Spain

	the Netherlands				Spain			
	$\Delta\pi_{it}^{1Y}$	$\Delta\pi_{it}^{3Y}$	$\Delta\pi_{it}^{3Y}$	$\Delta\pi_{it}^{3Y}$	$\Delta\pi_{it}^{1Y}$	$\Delta\pi_{it}^{3Y}$	$\Delta\pi_{it}^{3Y}$	$\Delta\pi_{it}^{3Y}$
$\Delta\pi_{it}^P$	0.432*** (0.062)	0.297*** (0.056)	-	-	0.354*** (0.033)	0.174*** (0.03)	-	-
$\Delta\pi_{it}^{1Y}$	-	-	0.267*** (0.057)	-	-	-	0.265*** (0.025)	-
$\Delta\tilde{\pi}_{it}^{1Y}$	-	-	-	0.202*** (0.066)	-	-	-	0.240*** (0.026)
$Cov_{it}$	0.262* (0.135)	-0.131 (0.168)	-0.209 (0.165)	-0.194 (0.167)	0.119 (0.174)	0.103 (0.185)	0.071 (0.185)	0.073 (0.188)
overall $R^2$	0.145	0.059	0.064	0.038	0.101	0.028	0.072	0.055
$N$	4,072	4,072	4,072	4,072	8,482	8,482	8,482	8,482

Note: Random effects estimations with robust standard errors showed in parentheses. All specifications include respondent's demographic characteristics, individual sentiment variables, and time effects. \* $p < .1$ ; \*\* $p < .05$ ; \*\*\* $p < .01$ .

Source: own calculations based on CES data.

Table 6: Adjustments of inflation expectations and trust in the ECB

	$\Delta\pi_{it}^1Y$		$\Delta\pi_{it}^3Y$		$\Delta\pi_{it}^3Y$	
	(a)	(b)	(a)	(b)	(a)	(b)
$\Delta\pi_{it}^P$	0.399*** (0.013)	0.398*** (0.013)	0.224*** (0.007)	0.222*** (0.008)	0.218*** (0.006)	0.218*** (0.006)
$I_{it} \times \Delta\pi_{it}^P$	-0.055** (0.024)	-0.056** (0.024)	-0.068*** (0.024)	-0.067*** (0.023)	-0.085*** (0.025)	-0.085*** (0.025)
$\Delta\pi_{it}^1Y$	-	-	-	-	0.325*** (0.020)	0.324*** (0.020)
$I_{it} \times \Delta\pi_{it}^1Y$	-	-	-	-	-0.070** (0.030)	-0.069** (0.030)
$Cov_{it}$	0.435*** (0.080)	0.430*** (0.084)	0.434*** (0.119)	0.427*** (0.116)	0.459*** (0.137)	0.459*** (0.137)
$I_{it} \times Cov_{it}$	-0.169 (0.146)	-0.164 (0.150)	-0.343* (0.188)	-0.343* (0.184)	-0.294 (0.239)	-0.268 (0.182)
$I_{it}$	0.008 (0.109)	0.007 (0.102)	0.022 (0.096)	0.038 (0.098)	0.053 (0.090)	0.017 (0.067)
Demographic char.	yes	yes	yes	yes	yes	yes
Country effects	yes	yes	yes	yes	yes	yes
Time effects (common)	yes	no	yes	no	yes	no
Time effects (country)	no	yes	no	yes	no	yes
Individual sentiment	no	yes	no	yes	no	yes
Change in uncertainty	no	no	no	no	no	no
$H_0 : \beta_1 + \beta_1^* = 0$	212.97 [0.000]	212.07 [0.000]	39.66 [0.000]	38.95 [0.000]	26.03 [0.000]	264.61 [0.000]
$H_0 : \gamma + \gamma^* = 0$	4.21 [0.040]	4.48 [0.034]	0.36 [0.547]	0.33 [0.564]	1.62 [0.203]	0.02 [0.888]
overall $R^2$	0.116	0.118	0.025	0.027	0.024	0.067
$N$	40,911	40,911	40,911	40,911	35,504	40,911
						576.01 [0.000]
						0.54 [0.463]
						0.067
						35,504

Note: Random effects estimations with robust standard errors (clustered at country level, showed in parentheses). \*p<.1; \*\*p<.05; \*\*\* p<.01  
Source: own calculations based on CES data.



Table 7: Adjustments of qualitative inflation views

	$d\pi_{it}^{1Y}$		$d\pi_{it}^{3Y}$		$d\pi_{it}^{3Y}$	
	(a)	(b)	(a)	(b)	(a)	(b)
Effects on $Pr(d\pi_{it}^h = 3)$						
$d\pi_{it}^P = 1$	-0.077***	-0.077***	-0.035***	-0.035***	-	-
$d\pi_{it}^P = 3$	0.126***	0.125***	0.042***	0.042***	-	-
$d\pi_{it}^{1Y} = 1$	-	-	-	-	-0.077***	-0.077***
$d\pi_{it}^{1Y} = 3$	-	-	-	-	0.086***	0.086***
$Cov_{it}$	0.013***	0.013***	0.007**	0.007**	0.005*	0.005**
Effects on $Pr(d\pi_{it}^h = 1)$						
$d\pi_{it}^P = 1$	0.131***	0.131***	0.044***	0.043***	-	-
$d\pi_{it}^P = 3$	-0.092***	-0.092***	-0.040***	-0.039***	-	-
$d\pi_{it}^{1Y} = 1$	-	-	-	-	0.114***	0.115***
$d\pi_{it}^{1Y} = 3$	-	-	-	-	-0.068***	-0.068***
$Cov_{it}$	-0.015***	-0.015***	-0.007**	-0.0079**	-0.005*	-0.006**
Control variables						
Demographic char.	yes	yes	yes	yes	yes	yes
Country effects	yes	yes	yes	yes	yes	yes
Time effects (common)	yes	no	yes	no	yes	no
Time effects (country)	no	yes	no	yes	no	yes
Individual sentiment	no	yes	no	yes	no	yes
pseudo $R^2$	0.020	0.022	0.003	0.004	0.015	0.016
$N$	42,218	42,218	42,218	42,218	42,218	42,218

Note: Table shows average marginal effects based on multinomial logit model, in reference to the base levels:  $d\pi_{it}^P = 2$ ,  $d\pi_{it}^{1Y} = 2$  (no change in inflation view). \*p<.1; \*\*p<.05; \*\*\*p<.01.

Source: own calculations based on CES data.