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Euro area inflation expectations: A focus on consumers' expectations

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Abstract
Central banks routinely analyse measures of inflation expectations to gain insights into the private sector's perspectives on inflation developments and to evaluate the credibility of monetary policy in fulfilling its mandate. While the analysis of inflation expectations typically focuses on market-based measures and professional forecasters' surveys, the expectations of consumers and firms are also considered relevant as they are believed to influence economic decisions. This article examines inflation expectations among euro area consumers, focusing on the European Central Bank's Consumers Expectations Survey and comparing it with the European Commission's Business and Consumers Surveys. In line with previous results in the literature, the empirical findings confirm an upward bias in consumer's inflation perceptions and expectations relative to actual inflation, and support the link between observed inflation, perceptions, and 1-year ahead expectations. Furthermore, consumers' inflation expectations differ according to age and income. Finally, the article illustrates the use of diverse inflation expectation measures, including those derived from consumers, in computing real rates, emphasising their utility in assessing the monetary policy stance. (JEL: D12, D84, E31, E52, H31)

1. Introduction

Inflation expectations are the rate at which agents, including consumers, firms, financial market analysts, and investors, expect prices of goods and services to change in the future. Inflation expectations are central to macroeconomic theory. Optimal intertemporal decisions (including price and wage setting and consumption-saving decisions) hinge on real variables, i.e., nominal variables adjusted

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for expected inflation (see, e.g., ECB (2011)). In various macroeconomic models, inflation expectations, namely those influencing consumption and investment decisions, are a key determinant of macroeconomic variables, including inflation. Expectations of financial market agents have been shown to affect asset prices, such as stock prices and interest rates (see, e.g., Bernanke and Kuttner (2005)). Additionally, the effectiveness of the central bank's communication and the public's confidence in its monetary policy can be gauged by resorting to measures of inflation expectations (see e.g., Christelis *et al.* (2020) and Mellina and Schmidt (2018)). Hence, inflation expectations are an important component of the information set guiding monetary policy authorities in pursuing their inflation objective, while ensuring that long-run inflation expectations remain well-anchored at that goal.

Inflation expectation measures may be obtained from various sources, including financial instruments and surveys. On the one hand, inflation-linked securities (such as inflation-linked bonds, inflation-linked swaps, and inflation-linked options) serve as important real-time monitoring measures for inflation expectations, though they are prone to include risk premia (e.g., inflation risk premium[1]). Still, their interpretation under the assumption of risk neutrality yields a measure of inflation expectations that corresponds to the average expected inflation rate over the security's term. On the other hand, surveys of different types of agents (e.g., market analysts, consumers, and firms) are typically available at a lower frequency than market data. Surveys of professional analysts provide direct measures of inflation expectations for various time horizons but are released with a monthly or quarterly frequency. There are also surveys that monitor expectations of consumers and firms. In fact, these may be particularly relevant as they reflect the expectations that likely influence these agents' economic decisions and may differ from financial market participants'/professional forecasters' expectations.

Monetary authorities routinely monitor measures of inflation expectations both at short and long horizons. The information set of central banks most frequently includes measures based on financial market instruments and professional analysts. To a large extent, this results from data unavailability regarding surveys of other types of agents, as recognised by Gomes *et al.* (2021), although this information gap has been closing. In addition, it has been argued that consumers may be poorly informed (see, e.g., Coibion and Gorodnichenko (2015)). Their answers tend to be volatile and dispersed, they tend to overestimate observed inflation and they appear to be strongly influenced by their own subjective experience (see, e.g., D'Acunto *et al.* (2021)). Fundamentally, there is still limited knowledge about consumers' inflation expectations.

If one believes there is some role for expectations in decision making, then following consumers' and firms' inflation expectations becomes relevant, namely for policymakers. In addition, the monitoring of inflation expectations is important to assess the stance of monetary policy. In fact, the stance of interest rate policy can be gauged by comparing the level of real interest rates, i.e., nominal rates adjusted by a measure

1. The inflation risk premium corresponds to the compensation investors demand for bearing risks related to the uncertainty surrounding future inflation.

of inflation expectations, with that of the equilibrium real rate often called the natural interest rate. The availability of diverse measures for inflation expectations, reflecting the perspectives of different agents, enables the computation of distinct real rates, thereby providing hints regarding different perceptions of the monetary policy stance.

Up to recently, the only source of consumer's inflation expectations measures for the euro area was the Business and Consumer Surveys (BCS) conducted by the European Commission (EC) at quarterly frequency. However, in January 2020, the European Central Bank (ECB) launched a pilot Consumer Expectations Survey (CES) which collected information at a monthly frequency on the perceptions and expectations of euro area consumers across several economic dimensions, including inflation. The pilot phase confirmed the overall high quality of the CES data and ended in June 2021, when a new development phase with further enhancements started, such as an increased sample size, a broader country and topical coverage, among other measures aimed at strengthening the quality of CES analysis at both the aggregate and micro levels. This survey represents a relevant step to fill knowledge gaps regarding euro area household sector analysis.

The contribution of this study is threefold. Firstly, it analyses the results of the CES regarding inflation perceptions and expectations. While prior analyses have already focused on the CES (e.g., Bańkowska *et al.* (2021)), this article covers the period up to December 2023, thereby including the recent surge in inflation and subsequent fall. Despite the richness of the survey, it is noteworthy to acknowledge it is relatively new, so this article also provides a comparison with the quantitative inflation perceptions and expectations from the EC's BCS, which is available since 2004. Even though there are differences between the design of the two surveys, it is informative to compare them as they give information regarding the same type of agents. Secondly, using publicly available microdata (i.e., data at the individual level) from the CES, this article explores some variables affecting consumes' inflation perceptions and expectations at the individual level. Thirdly, acknowledging the pivotal role of inflation expectations, this article computes several euro area real interest rate gaps based on various measures of 1-year ahead inflation expectations and provides an interpretation in terms of the monetary policy stance.

This article is structured as follows. Section 2 examines the euro area consumers' inflation expectations derived from the CES and the BCS. Section 3 analyses the microdata from the CES, aiming to illustrate factors that influence individual inflation perceptions and expectations. In Section 4, different measures of inflation expectations are compared in terms of implications for the monetary policy stance, in particular through the calculation of real interest rates and comparison to the euro area natural rate. Finally, Section 5 presents some concluding remarks.

2. Consumers' inflation expectations in the euro area

The methodologies of opinion surveys, in particular surveys of consumers, exhibit some differences, for example regarding sample representativeness, the way information is

collected and how questions are formulated. In addition, survey results are influenced by several factors, including individual characteristics (such as age or income), potential overemphasis on specific personal experiences, and the experience in survey participation.[2]

The next two sub-sections offer a concise overview of the ECB's CES and the EC's BCS and compare the information on consumers' inflation expectations of the two surveys.

2.1. Characterisation of the surveys

The ECB's CES is an online survey initiated in 2020, conducted monthly by the ECB (implementation was outsourced to Ipsos Public Affairs), encompassing both monthly and quarterly questions.[3] The target population of the CES is the population aged 18 and above, residing in the countries included in the CES sample. The sample aims to be representative by age, gender, and region.[4] During the initial (pilot) phase, the survey targeted approximately 10,000 respondents, and this increased to around 14,000 as of end-2023. The euro area aggregates are computed based on existing country coverage, which, up do December 2023, included Belgium, Germany, Spain, France, Italy, and the Netherlands.[5] The main aggregate results of the CES are published monthly on the ECB's website whereas microdata is published on the website following a quarterly release schedule.

This survey includes, on a monthly basis, quantitative questions regarding consumer perceptions about past inflation as well as expectations about future inflation, namely:

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. You can provide a number up to one decimal place. ___._%

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. You can provide a number up to one decimal place. ___._%

These questions refer to changes in prices in general instead of using the term "inflation" (or "deflation") to avoid the need of familiarity with these economic concepts. Besides inflation, which is the focus of this article, the survey also covers other themes, namely income and consumption, labour markets and economic growth, and housing markets and credit. Regarding inflation, the survey covers information on

2. Repeating survey participants tend to exhibit lower inflation expectations and reduced uncertainty compared to new participants, which suggests that repeating participants learn and become more informed about inflation as they engage more with the survey (see, e.g., Kim and Binder (2023)).

3. The fact that the survey is conducted online may lead to a bias towards more educated people. For a description of the ECB's CES see Bańkowska *et al.* (2021) and Georgarakos and Kenny (2022).

4. While respondents can be aged 70 or above, the requirements for sample representativeness were initially set to include only the 18-70 age range, given the difficulty of recruiting participants aged 70+.

5. From January 2024 onwards, the euro area aggregate includes Austria, Ireland, Finland, Greece, and Portugal and these countries also have publicly available microdata.

inflation perceptions over the past 12 months and inflation expectation for the next 12 months, as well as 3 years ahead. Public data are categorised by: (i) country, (ii) age group and (iii) income quintile.

The EC's BCS is published monthly by the Directorate-General for Economic and Financial Affairs and is derived from surveys conducted by national institutes in the European Union Member States and the candidate countries, based on a common methodology and timetable.[6] The target population of the BCS includes individuals aged 16 and above. The sample size varies across countries according to the heterogeneity of their economies and is generally positively related to their respective population size. In what regards the consumers, around 25,000 individuals are surveyed across the euro area. The aggregate results of the BCS are monthly, published on the EC's website. Some parts of the survey, including consumers' inflation perceptions and expectations, are only available quarterly.

The BCS collects, on a quarterly basis, quantitative questions on inflation perceptions and inflation expectations since 2004 (regularly published since 2019), namely:[7]

By how many percent do you think that consumer prices have gone up/down over the past 12 months? (Please give a single figure estimate): consumer prices have increased by ___._% / decreased by ___._%.

By how many percent do you expect consumer prices to go up/down in the next 12 months? (Please give a single figure estimate): Consumer prices will increase by ___._% /decrease by ___._%.

The survey questions are intentionally vague as regards the meaning of consumer prices, so respondents make their own interpretation as to what basket of goods to consider. In addition to overall figures, results are further disaggregated for specific categories, including by: (i) income level, (ii) gender, (iii) age group, (iv) occupation, and (v) education level.

2.2. Comparison between surveys

This sub-section compares the information on consumers' inflation expectations of the two surveys. The analysis focuses on inflation perceptions and 1-year ahead inflation expectations, as they are available in the two surveys. In general, the analysis of the surveys is mainly focused on median figures (rather than the mean) as they are less sensitive to outliers and this choice follows common practice in this literature.

It is a well-established fact in the literature that consumer surveys' results tend to present a bias relative to observed inflation[8] (see, e.g., Arioli *et al.* (2017), Abildgren and Kuchler (2021) and Weber *et al.* (2022)). The literature relates an upward bias of

6. For a description of the EC's BCS methodology see EC (2024).

7. The EC's BCS also includes qualitative questions about inflation developments over the last and the next 12 months, which were also explored in previous literature (see, e.g., Berk (2002) and Dias *et al.* (2010)).

8. Inflation is defined as the year-on-year change of the Harmonised Index of Consumer Prices (HICP).

consumers surveys on inflation to various factors (see, e.g., Coibion and Gorodnichenko (2015) and Trehan (2011)). For example, consumers tend to pay more attention to their own cost of living/shopping basket and their experience regarding observed inflation over their life, or households tend to be more inclined to give greater attention to items that they purchase frequently or that have a large weight in their consumption basket, such as food and gasoline (see, e.g., Weber *et al.* (2022)). Additionally, individuals have a downward-biased memory of the past level of prices, i.e., thinking that prices were lower in the past than what they actually were (see, e.g., Weber *et al.* (2022)).

Table 1 shows that, on average, inflation perceptions are higher than observed euro area HICP inflation in the BCS and the CES, with a more pronounced difference in the former. It is worth noting that, despite posing a similar question to the same type of respondents, the BCS responses concerning both inflation perceptions and expectations are considerably higher than those reported in the CES, particularly during the overlapping period. This discrepancy could be attributed to the design differences between the two surveys, such as the CES being conducted online, which provides easier access to information, and its use of recurring respondents who may gain experience and refine their responses over time, potentially aligning them more closely with observed inflation. While the results of a survey are an estimate of "true" consumer inflation expectations, the proximity of CES responses to the actual measured levels of inflation, such as the HICP, highlights its potential usefulness in enriching the set of available household's inflation views. Nevertheless, as can be seen in Figure 1, the existing co-movement between inflation perceptions and observed inflation is also an indication of its usefulness.

		BCS		CES
		Since 2004Q1	*Since 2020Q2*	*Since April 2020*
Inflation perceptions past 12m	Mean (%)	9.8	14.4	6.4
	Median (%)	7.1	10.7	5.2
	P75-P25 (p.p.)	8.1	11.3	6.4
Inflation expectations next 12m	Mean (%)	6.5	10.2	4.6
	Median (%)	4.4	7.3	3.3
	P75-P25 (p.p.)	5.6	8.9	5.9
Observed Inflation	Mean (%)	2.1	4.4	4.4

TABLE 1. CES and BCS descriptive statistics for the euro area

Sources: ECB, EC, and authors' calculations.
Notes: Mean/Median across consumers' replies. Interquartile range – difference between the 75 and 25 percentiles of the distribution of inflation perceptions/expectations.

Figure 1 illustrates that while observed inflation is consistently below inflation perceptions in the BCS, in the CES this is only the case from April 2020 to April 2021 and afterwards this bias inverted. In fact, only in April 2021, when HICP inflation had already risen to 2%, did inflation perceptions and expectations start to rise. Inflation expectations stopped increasing in early 2022, while inflation and inflation perceptions continued to increase further. This behaviour suggests that consumers expected inflation to peak and start declining within the following 12 months. Even though observed

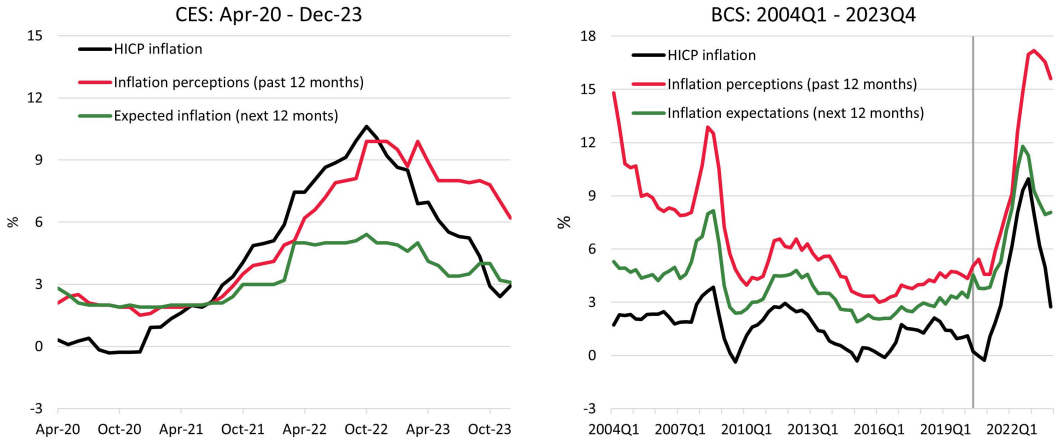

FIGURE 1: Inflation perceptions, 1-year ahead expectations and observed inflation

Sources: ECB, EC, and Eurostat.
Notes: Vertical bar on the right-hand chart identifies the beginning of the CES sample period. Inflation perceptions/expectations – median. The 2nd and 98th percentiles of the weighted distribution of responses for each CES survey round and each country were discarded.

inflation is always lower than BCS inflation perceptions and expectations, the gap widened significantly since mid-2022. The delayed response of inflation perceptions and expectations compared to the recent decline in observed inflation seen in the CES is also noticeable in the BCS. Thus, in both surveys, consumers reported a turn in inflation perceptions and expectations only after the peak in actual inflation, and until December 2023 the decline fell short of the magnitude of the fall of observed inflation.

Table 1 also displays the interquartile range (IQR) of the distribution of both inflation perceptions and expectations which serves as a disagreement measure among consumers about past and future inflation, respectively. The IQR is higher for perceptions compared to expectations and larger in the BCS for the overlapping period with the CES. Figure 2 shows this measure over time. In the BCS there is a clear relationship of IQR with the level of inflation or, equivalently, with the level of perceptions/expectations. This relationship is less clear in the case of the CES, given the relatively short time span. Still, IQR in the CES does seem to have risen in the period when inflation was increasing, especially from September/October 2021 when inflation was around 4% and median inflation perceptions/expectations were already displaying an upward trajectory. In both surveys, IQR remained elevated even after inflation started to fall.

Even though euro area consumers' inflation perceptions seem biased compared to observed inflation, both surveys exhibit a high contemporaneous correlation between inflation perceptions and observed inflation, as shown in Table 2. Also, inflation perceptions and 1-year ahead inflation expectations are highly correlated, as shown in Figure 1.

Previous research has identified substantial heterogeneity in inflation expectations, both across countries and individuals. This variation is related to sociodemographic characteristics such as age, gender, education, and income (see, e.g., Abildgren and

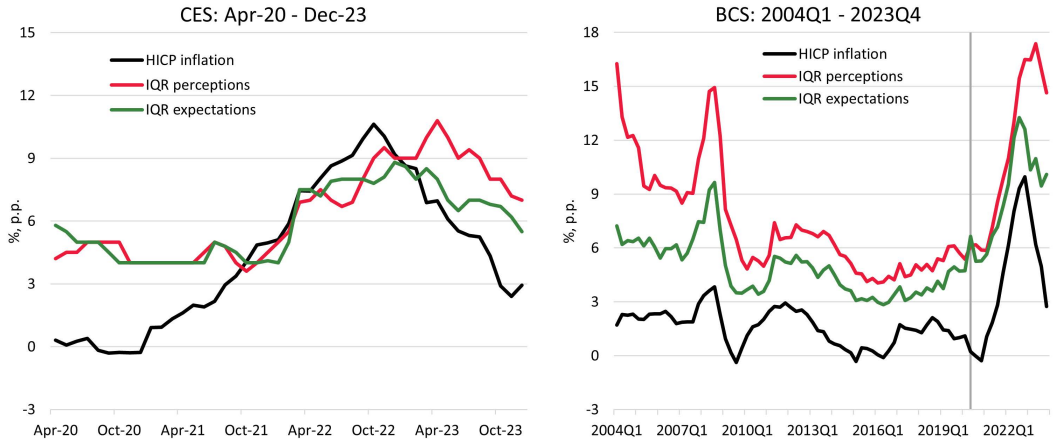

FIGURE 2: Interquartile range in inflation perceptions and 1-year ahead inflation expectations

Sources: ECB, EC, and authors' calculations.
Notes: Vertical bar on the right-hand chart identifies the beginning of the CES sample period. The 2nd and 98th percentiles of the weighted distribution of responses for each CES survey round and each country were discarded.

		Perception vs. Obs. Inflation	Perception vs. Expectation
CES	Since April 2020	0.86	0.90
BCS	Since 2020Q2	0.80	0.85
	Since 2004Q1	0.77	0.89

TABLE 2. Contemporaneous correlations

Sources: ECB, EC, and authors' calculations.

Kuchler (2021); Arioli *et al.* (2017), Bryan and Venkatu (2001); Ehrmann *et al.* (2017) and Jonung (1981)). Next, this study examines inflation perceptions and expectations across two dimensions available in both surveys: age and income brackets. Figure 3 displays consumers' inflation expectations in the CES and the BCS by income and age groups.

The first panel of Figure 3 shows median inflation expectations per income level in both surveys. Consumers with lower incomes generally tend to anticipate higher inflation compared to respondents with higher incomes in the BCS. Differences across income brackets are quite small in the CES, which could be related with the fact that the survey started recently and that the number of respondents has increased gradually. The literature has presented evidence suggesting that agents with more favourable financial situations tend to anticipate lower inflation rates (see, e.g., del Giovane *et al.* (2009); Ehrmann *et al.* (2017); Galati *et al.* (2021)). This result has been linked to a greater degree of uncertainty surrounding future inflation and a more pessimistic assessment of the economic outlook by lower income respondents.

Shifting the focus to the behaviour of inflation expectations across different age groups, the two surveys present divergent findings. In the EC survey, older individuals anticipate lower inflation in the next year, while the results of the CES signal the opposite, i.e., older consumers have higher inflation expectations. In fact, the literature

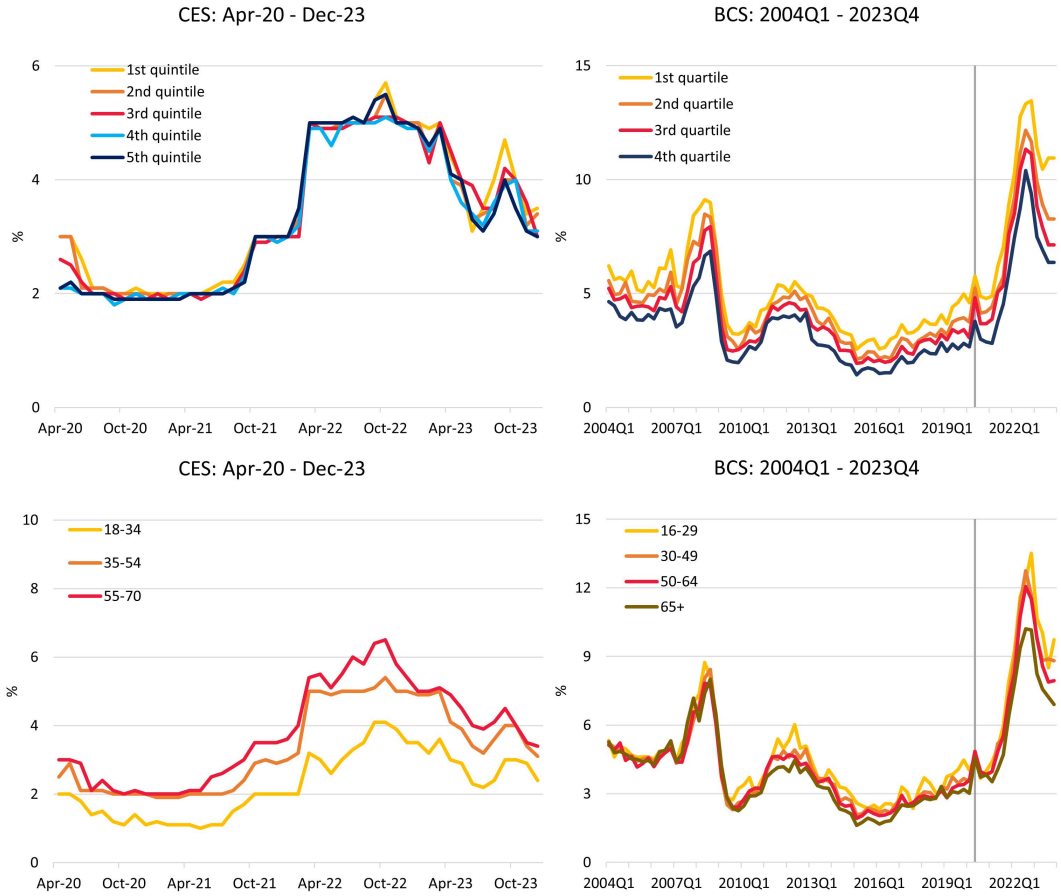

FIGURE 3: Median inflation expectations per income and age brackets

Sources: ECB, and EC.
Notes: Vertical bar on the right-hand chart identifies the beginning of the CES sample period. The figure shows median inflation expectations per income level/age bracket in both surveys. The figure displays publicly available aggregate data for each survey.

on the relationship between age and inflation expectations yields differing results. Some research highlights that inflation expectations are influenced by the inflation history experienced by the respondents (see, e.g., Malmendier and Nagel (2016)). Older respondents base their perceptions on data spanning their entire lifetime, thus covering periods of both low and high inflation, which results in less sensitivity to current inflation rates. In turn, younger consumers' expectations will depend more on the level of inflation seen in the years closer to the date at which the survey is conducted, given their shorter lifetimes. Therefore, if younger respondents predominantly experienced a high inflation period, their perceived inflation expectations will tend to be higher, as Jonung (1981) found in a survey of Swedish consumers conducted in the late 1970s following decades of high inflation. Diamond *et al.* (2020) focus on the post-1995 period

in Japan (a period of low inflation, so younger generations would have experienced mostly low inflation) and find that inflation expectations increase with age.[9]

3. Deeper analysis of the ECB's CES

This section shifts the analysis to the individual level, conducting a more in-depth exploration of the CES publicly available microdata, aiming to confirm the results of the previous section and to clarify the relationship between inflation expectations and consumers' social and demographic characteristics. Following the ECB's guide to the computation of CES aggregate statistics, we exclude the 2nd and 98th percentiles of the weighted distribution of responses for each survey round and country. A panel dataset is then defined with survey results for the available euro area countries, i.e., Belgium, Germany, Spain, France, Italy, and The Netherlands, comprising the period from April 2020 to December 2023. The analyses focus on the answers to the quantitative questions on both inflation perceptions and 1-year ahead inflation expectations,[10] as well as respondents' details regarding age, income level and country. The dataset can be described as an unbalanced panel (i.e., a sample where entities are observed a different number of times), in which a sizeable share of respondents has only responded sporadically. While this could raise some concerns about the robustness of the empirical exercise, we have replicated the analyses with a restricted sample (considering only respondents who participated in the survey at least 24 editions), and the results are similar to those presented in this section.

3.1. Inflation perceptions and observed inflation

To begin the exploration of the CES microdata, this study analyses the link between inflation perceptions in the CES with actual inflation. Employing a simple linear regression, inflation perceptions are modelled as a function of observed inflation. Formally, this relationship is expressed in equation 1 as follows:

$$\pi_{it}^{P} = \mu_i + \beta\pi_{it} + u_{it} \tag{1}$$

where pi_{it}^{P} corresponds to inflation perceptions of individual i at time t and π_{it} is observed inflation in country of individual i at time t. μ_i is an individual specific effect, which is assumed to be fixed. Current inflation is included as the regressor because the goal is to assess if consumers' perceptions are related to inflation and not whether

9. Juselius and Takats (2015) focus on trend (i.e., low frequency) inflation (not inflation expectations) over the 1955–2010 period for 22 advanced economies and found that the larger the proportion of young and old in the total population, the higher inflation. In other words, when the working-age population is larger, the effect is disinflationary. This result holds for a large number of countries across all time periods.

10. Questions regarding inflation expectations and perceptions ask about prices in the country the respondent lives in. Therefore, when comparing the responses at the individual level to actual inflation outcomes this study considers the respective country inflation.

the available information, namely regarding the HICP, influences their perceptions.[11] The estimation results for the full sample period are detailed in Table 3. The estimate for parameter β in equation 1 is statistically significant at the usual significance levels, indicating that, on average, across the entire sample, a 1 p.p. increase in observed inflation is associated with a 0.55 p.p. increase in perceptions.[12]

Coefficient of obs. inflation (β)	0.55 ***
	(0.01)
N	547850
Within R^2	0.10
Overall R^2	0.08

TABLE 3. Estimation results of equation 1

Notes: This table records the results of the estimation of equation 1 from April 2020 to December 2023. The estimate for the constant is not reported, as it lacks an interpretation when estimating the regression with fixed effects. Robust standard errors in brackets. $*$, $**$ and $***$ denote significance at the 10%, 5% and 1% level, respectively.

Next, considering the substantial changes in actual inflation throughout the full sample as well as the widening gap between actual and perceived inflation since the first quarter of 2022 (see Figure 1), regression 1 is also estimated with an expanding window that starts with data ranging from April 2020 to April 2022 and concludes with data from April 2020 to December 2023, as well as with a rolling 24-month window. Figure 4 depicts the estimation results. The estimates for parameter β increase up to early-2023 and decline thereafter, noticeably in the rolling window regression. In both cases, the estimated coefficient is always positive and statistically significant, confirming that there is a relationship between respondents' inflation perceptions and actual inflation, although varying over time.

3.2. Factors influencing 1-year inflation expectations

Next, this study explores in more detail 1-year ahead inflation expectations and investigates not only the link with inflation perceptions, but also whether consumers' social and demographic characteristics play a role in individual inflation expectations. To achieve this, alternative specifications are considered:

$$\pi_{it}^{E} = \mu_i + \omega\pi_{it}^{P} + \vartheta\pi_{it-1}^{E} + u_{it} \;\; i = 1, ..., N \;\text{ and }\; t = 1, ..., T \tag{2}$$

$$\pi_{it}^{E} = \alpha + \omega\pi_{it}^{P} + \vartheta\pi_{it-1}^{E} + \beta X_{it} + u_{it} \;\; i = 1, ..., N \;\text{ and }\; t = 1, ..., T \tag{3}$$

11. If the goal was to analyse the use of available HICP by consumers to form expectations, then it would make sense to include lagged inflation as a regressor, because at the time of the survey for a given month the corresponding HICP data has not been released.

12. Equation 1 was also estimated including the 1-month lagged inflation perception as a regressor and the estimates for all the parameters are statistically significant at the conventional levels.

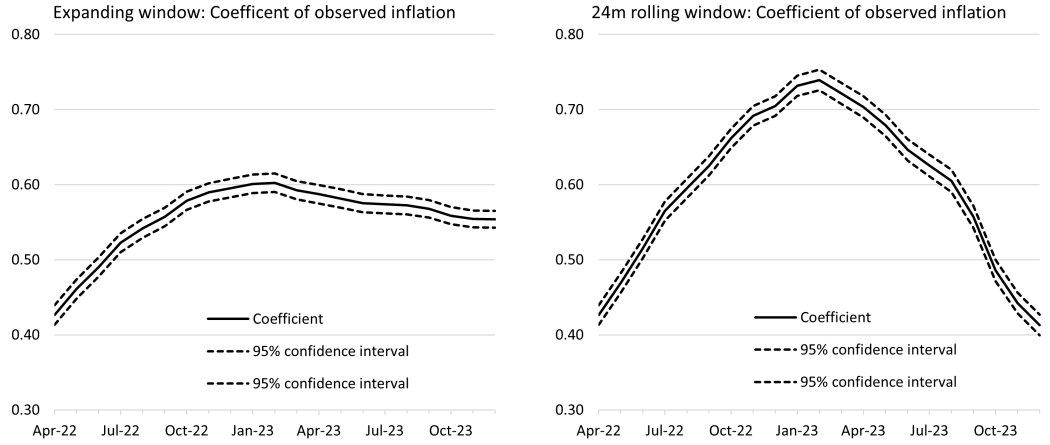

FIGURE 4: Estimation results for equation 1 with an expanding window and a rolling window

where π_{it}^{E} corresponds to consumers' inflation expectations 12-months ahead at time t for individual i, πit^{P} corresponds to consumers' inflation perceptions in the last 12 months at time t for individual i, N and T are the number of cross sections and time periods, respectively. In equation 2, μ_i is an individual specific effect, which is assumed to be fixed. In equation 3, fixed effects are discarded, and a row vector of exogenous explanatory variables related to social and demographic features of dimension k denoted by X_{it} is added, with β representing a k by 1 vector of coefficients.

Given the potential link between inflation perceptions and 1-year ahead inflation expectations, equation 2 is firstly estimated by means of a regression where the only regressor are inflation perceptions. Table 4 shows the results of this specification in regression A, confirming that 1-year ahead inflation expectations are positively and significantly correlated with inflation perceptions at the individual level.

Regression B expands the previous regression by adding 1-year ahead inflation expectations lagged by 1 period as a regressor. Inflation perceptions remain statistically significant and the estimate for the parameter of lagged inflation expectations (ϑ) is also statistically different from zero. Thus, this regression points to some persistence in expectations regarding inflation 12-months ahead.

Equation 3 allows to test the role of consumers' social and demographic features, as described in Section 2. First, regression C1 expands regression B with the age group of each consumer. Regression C2 includes information on the income level of the respondent instead of its age, while regression C3 includes both age and income variables. Overall, the results broadly support the view that older consumers and those with lower incomes tend to expect higher inflation expectations. These estimations confirm the divergence found in Section 2.2 between the CES and the BCS regarding the role of age in inflation expectations. The relationship between income level and inflation expectations in the CES can also be interpreted more clearly, pointing to the same inverse relation between income and inflation expectations that was present in the BCS results.

Considering regression C3, we repeat this estimation for the individuals of each country separately. The results are presented in Table 5. Overall, the main conclusions reported for the euro area still apply for each individual country: (i) the estimates for the

	Regressions				
	A	B	C1	C2	C3
Constant term			0.74 ***	1.11 ***	0.93 ***
			(0.03)	(0.03)	(0.04)
Inflation perceptions	0.42 ***	0.39 ***	0.37 ***	0.37 ***	0.37 ***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
1m lagged inf. expectations		0.15 ***	0.23 ***	0.23 ***	0.23 ***
		(0.00)	(0.00)	(0.00)	(0.00)
Age (omitted: 18-34 Years-old)					
35-49 Years old			0.19 ***		0.22 ***
			(0.03)		(0.03)
50-70 Years old			0.26 ***		0.29 ***
			(0.04)		(0.04)
Over 71 Years old			0.38 ***		0.40 ***
			(0.06)		(0.06)
Income quintiles (omitted: 1st)					
2nd quintile				-0.10 **	-0.10 **
				(0.04)	(0.04)
3rd quintile				-0.16 ***	-0.17 ***
				(0.04)	(0.04)
4th quintile				-0.31 ***	-0.33 ***
				(0.04)	(0.04)
5th quintile				-0.40 ***	-0.42 ***
				(0.04)	(0.04)
N	547850	446279	446279	446279	446279
Within R^2	0.25	0.27	0.27	0.27	0.27
Overall R^2	0.40	0.48	0.50	0.50	0.50

TABLE 4. Estimation results of equation 2 over the full dataset

Notes: This table records the estimates for specifications 2 and 3 from April 2020 to December 2023 for the euro area. Robust standard errors in brackets. $*$, $**$ and $***$ denote significance at the 10%, 5% and 1% levels, respectively.

parameter associated with inflation perceptions remain significant at conventional levels in all cases; (ii) the estimates for the parameter ϑ are statistically significant at the 1% level, supporting specifications that include some persistence in inflation expectations; (iii) the impact of social and demographic features on the behaviour of 1-year inflation expectations is also relevant at the country level, in particular in the case of the age brackets, but can be less compelling in some countries.

4. 1-year ahead inflation expectations measures and real interest rate gaps

As argued above, inflation expectations influence economic decisions, such as wage and price setting, as well as investment, saving, and consumption choices. Thus, inflation expectations play a key role in the monetary policy transmission mechanism. Economic decisions hinge on the real interest rate, which is the nominal return adjusted for expected inflation (see, e.g., Armantier *et al.* (2015) and Duca-Radu *et al.* (2021)). An expected rise (fall) in inflation in future periods leads to a decline (rise) in the real interest rate. However, there are challenges related to the computation of the real interest rate:

	EA	BE	DE	ES	FR	IT	NL
Constant	0.93 ***	0.61 ***	0.84 ***	1.24 ***	0.91 ***	0.92 ***	0.84 ***
	(0.04)	(0.11)	(0.07)	(0.10)	(0.06)	(0.11)	(0.10)
Inflation perceptions	0.37 ***	0.36 ***	0.43 ***	0.34 ***	0.45 ***	0.36 ***	0.34 ***
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
1m lagged infl. expect.	0.23 ***	0.25 ***	0.19 ***	0.21 ***	0.18 ***	0.26 ***	0.24 ***
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Age (omitted: 18-34 years)							
35-49 years	0.22 ***	0.22 **	0.08	0.28 ***	0.06	0.49 ***	0.19 **
	(0.03)	(0.09)	(0.05)	(0.09)	(0.06)	(0.10)	(0.09)
50-70 years	0.29 ***	0.37 ***	0.14 **	0.33 ***	0.15 **	0.55 ***	0.26 ***
	(0.04)	(0.10)	(0.06)	(0.10)	(0.06)	(0.12)	(0.09)
Over 71 years	0.40 ***	0.34 *	0.20 **	0.75 ***	0.13	0.83 ***	0.38 ***
	(0.06)	(0.17)	(0.09)	(0.20)	(0.09)	(0.19)	(0.15)
Inc. quint. (omitted: 1st)							
2nd quintile	-0.10 **	0.13	0.03	-0.29 ***	-0.24 ***	-0.03	0.05
	(0.04)	(0.12)	(0.07)	(0.10)	(0.07)	(0.13)	(0.12)
3rd quintile	-0.17 ***	-0.15	0.01	-0.39 ***	-0.23 ***	-0.01	-0.14
	(0.04)	(0.12)	(0.07)	(0.11)	(0.07)	(0.13)	(0.11)
4th quintile	-0.33 ***	-0.20 *	-0.13 *	-0.30 ***	-0.30 ***	-0.76 ***	-0.15
	(0.04)	(0.11)	(0.07)	(0.11)	(0.07)	(0.13)	(0.11)
5th quintile	-0.42 ***	-0.27 **	-0.21 ***	-0.70 ***	-0.30 ***	-0.65 ***	-0.04
	(0.04)	(0.11)	(0.07)	(0.11)	(0.07)	(0.12)	(0.11)
N	446279	34376	91011	93247	94113	99639	33893
Within R^2	0.27	0.31	0.33	0.22	0.29	0.27	0.32
Overall R^2	0.50	0.54	0.50	0.45	0.49	0.50	0.49

TABLE 5. Estimation results of regression C3 for each country

Notes: This table records the estimates for equation 3 from April 2020 to December 2023, by country. Robust standard errors in brackets.∗, ∗∗ and ∗ ∗ ∗ denote significance at the 10%, 5% and 1% level, respectively. EA – Euro area; BE – Belgium, DE – Germany, ES – Spain, FR – France, IT – Italy, NL – The Netherlands.

while the nominal interest rate choice usually focuses on the short-term horizon (e.g., the policy rate or a short-term market rate), the selected measure of inflation expectations is not straightforward. In fact, the availability of diverse measures of inflation expectations, for example representing different agents' perspectives, allows for the computation of distinct real interest rates.

In general, the primary monetary policy instrument is the policy rate (see, e.g., ECB (2021)). By steering the level of (very) short-term interest rates, monetary policy influences the level of other nominal interest rates and real interest rates. If the observed real interest rate is above the equilibrium real interest rate, frequently called the natural rate,[13] then policy is said to be restrictive. Conversely, if it is below the natural rate, i.e., there is a negative real interest rate gap, then policy is deemed accommodative. However, employing the natural real interest rate as a benchmark

13. Various definitions of the natural interest rate are present in the literature. The foundational concept was introduced by Wicksell (1898) and can be characterised as (i) the interest rate that ensures the equilibrium in the savings/investment markets, (ii) the rate associated with the return on capital, and (iii) the interest rate, which is neutral in respect to prices, as tends neither to raise or lower them. In general, the natural interest rate tends to be interpreted as the real interest rate that would prevail under circumstances considered as desirable from the standpoint of macroeconomic stabilisation.

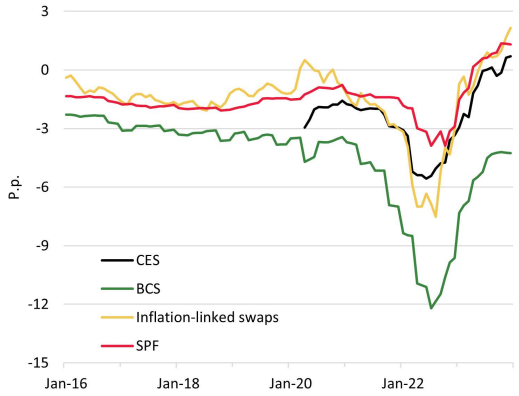

FIGURE 5: Euro area real interest rate gaps

Sources: ECB, EC, LSEG and authors' calculations.
Notes: Real interest rate gaps – differential between real interest rates, (computed as the difference between a nominal interest rate and inflation expectations) and the natural interest rate (median of estimates reported in related box of Brand *et al.* (2024)). Nominal interest rate: €STR from Oct-19 onwards, backdated using the EONIA rate.

for assessing monetary policy stance presents at least two major challenges: it is an unobservable variable, and its level evolves over time. Inferences about the natural interest rate are subject to high uncertainty, as its estimates and their interpretation are model and data dependent. As there are alternative ways to estimate the natural interest rate, this study considers a range of measures recently published by the ECB (Brand *et al.* (2024)) and uses the median of those estimates. It is also worth highlighting that some of the natural rate measures provided by the ECB are based on macroeconomic models, which contain measures of inflation expectations that are not necessarily the same as the ones considered here. This exercise acknowledges but does not tackle the uncertainty surrounding the estimation of the natural rate. Instead, this study focuses on the implications of considering different inflation expectations to the assessment of the euro area monetary policy stance.

Several real interest rate gaps for the euro area are calculated as the difference between different real interest rates and the natural rate. In practice, the differences among these measures result solely from the different measures of inflation expectations: those implied by the two consumer surveys (BCS and CES), financial market instruments (inflation-linked swaps), and the ECB Survey of Professional Forecasters (SPF).[14] Each of these measures can be seen as the perceived stance of monetary policy by each group of economic agents. Figure 5 displays the various alternative measures of real interest rate gaps in the euro area.

The use of different inflation expectation measures yields somewhat different real interest rate gaps. Since 2016, all available measures show that monetary policy stance

14. The SPF collects information on expected inflation rates, real GDP growth, and unemployment levels across various time-frames within the euro area, presenting both point forecasts and probability distributions to quantify risk and uncertainty, with publication occurring quarterly since 1999.

was consistently expansionary, though as expected the degree varies. In the pandemic crisis period, all measures show a drop, but this is considerably stronger in the BCS. Since mid-2022, all measures show an increase in the real rate gap, that only in the case of the BCS remains negative. Given the unobservable nature of consumers' expectations, it is unfeasible to determine which survey provides the best measure of consumer inflation expectations. Therefore, the CES emerges as a valuable addition to the array of euro area inflation expectation measures that policymakers should monitor.

5. Conclusion

Inflation expectations hold significant importance in so far as they influence the decisions of economic agents. Accordingly, central banks routinely monitor inflation expectation measures to gain valuable insights into the private sector's perspectives on the inflation outlook and to evaluate the credibility of monetary policy. In this vein, central banks typically examine various measures of inflation expectations, encompassing both market-based measures and survey-based measures provided by professional analysts. However, the relevance of inflation expectations extends beyond market participants and professional forecasters, including expectations of households and firms.

This article examines inflation expectations among euro area consumers, with a specific focus on the ECB's CES. In particular, it compares key findings with those of the EC's BCS. The analyses confirm that consumers in the euro area tend to show an upward bias relative to observed inflation, both in terms of inflation perceptions and inflation expectations, thereby corroborating previous research.

The empirical exercises using CES microdata reveal a link between inflation perceptions and observed inflation, and that 1-year inflation expectations are related to past expectations, inflation perceptions and social and demographic characteristics (such as age and income).

Finally, a comparison among various measures of 1-year ahead inflation expectations is conducted. Recognising that monitoring inflation expectations for monetary policy is crucial not only for anticipating inflation developments but also for assessing the effectiveness of the central bank's communication and ultimately the stance of monetary policy, several measures of the real interest rate are computed. This exercise considers a proxy for the (nominal) monetary policy rate at any given moment and different inflation expectation measures. Although some expected similarities exist, the analysis illustrates that the use of different measures of inflation expectations may lead to different conclusions regarding the degree of accommodation or restrictiveness over time. By comparison with the EC's BCS, the CES measure of inflation expectations aligns more closely with two established indicators of inflation expectations (those of professional analysts and market expectations).

In short, this article finds that the CES adds value to the range of inflation expectation measures in the euro area. Policymakers should continue to monitor it alongside other

surveys, as it is difficult to determine which one best represents the "true" consumers' inflation expectations in the euro area.

References

Abildgren, Kim and Andreas Kuchler (2021). "Revisiting the inflation perception conundrum." *Journal of Macroeconomics*, 67(C).

Arioli, Rodolfo, Colm Bates, Heinz Christian Dieden, Ioana Duca, Roberta Friz, Christian Gayer, Geoff Kenny, Aidan Meyler, and Iskra Pavlova (2017). "EU consumers´ quantitative inflation perceptions and expectations: an evaluation." Occasional paper series, European Central Bank.

Armantier, Olivier, Wändi Bruine de Bruin, Giorgio Topa, Wilbert van der Klaauw, and Basit Zafar (2015). "Inflation Expectations And Behavior: Do Survey Respondents Act On Their Beliefs?" *International Economic Review*, 56(2), 505–536.

Bańkowska, Katarzyna, Ana Maria Borlescu, Evangelos Charalambakis, António Dias da Silva, Davide di Laurea, Maarten Dossche, Dimitris Georgarakos, Juha Honkkila, Neale Kennedy, and Kenny (2021). "ECB Consumer Expectations Survey: an overview and first evaluation." Occasional Paper Series 287, European Central Bank.

Berk, Jan Marc (2002). "Consumers' Inflation Expectations And Monetary Policy In Europe." *Contemporary Economic Policy*, 20(2), 122–132.

Bernanke, Ben S. and Kenneth N. Kuttner (2005). "What Explains the Stock Market's Reaction to Federal Reserve Policy?" *Journal of Finance*, 60(3), 1221–1257.

Brand, Claus, Noëmie Lisack, and Falk Mazelis (2024). "Estimates of the natural interest rate for the euro area: an update." *Economic Bulletin Boxes*, Issue 1.

Bryan, Michael F. and Guhan Venkatu (2001). "The demographics of inflation opinion surveys." *Economic Commentary*, (October).

Christelis, Dimitris, Dimitris Georgarakos, Tullio Jappelli, and Maarten van Rooij (2020). "Trust in the Central Bank and Inflation Expectations." *International Journal of Central Banking*, 16(6), 1–37.

Coibion, Olivier and Yuriy Gorodnichenko (2015). "Information Rigidity and the Expectations Formation Process: A Simple Framework and New Facts." *American Economic Review*, 105(8), 2644–2678.

D'Acunto, Francesco, Ulrike Malmendier, Juan Ospina, and Michael Weber (2021). "Exposure to Grocery Prices and Inflation Expectations." *Journal of Political Economy*, 129(5), 1615–1639.

del Giovane, Paolo, Silvia Fabiani, and Roberto Sabbatini (2009). "What's Behind ´Inflation Perceptions´ A Survey-Based Analysis of Italian Consumers." *Giornale degli Economisti*, 68(1), 25–52.

Diamond, Jess, Kota Watanabe, and Tsutomu Watanabe (2020). "The Formation of Consumer Inflation Expectations: New Evidence From Japan's Deflation Experience." *International Economic Review*, 61(1), 241–281.

Dias, Francisco, Cláudia Duarte, and António Rua (2010). "Inflation expectations in the euro area: are consumers rational?" *Review of World Economics (Weltwirtschaftliches Archiv)*, 146(3), 591–607.

Duca-Radu, Ioana, Geoff Kenny, and Andreas Reuter (2021). "Inflation expectations, consumption and the lower bound: micro evidence from a large multi-country survey." *Journal of Monetary Economics*, 118(C), 120–134.

EC (2024). "The Joint Harmonised EU Programme of Business and Consumer Surveys - User guide (updated January 2024)." Tech. rep., European Commission.

ECB (2011). "Inflation Expectations in the euro area: a review of recent developments." *Economic Bulletin Articles*, 2011.

ECB (2021). "The ECB's monetary policy strategy statement." URL `https://www.ecb.europa.eu/home/search/review/html/ecb.strategyreview_monpol_strategy_statement.en.html`.

Ehrmann, Michael, Damjan Pfajfar, and Emiliano Santoro (2017). "Consumers' Attitudes and Their Inflation Expectations." *International Journal of Central Banking*, 13(1), 225–259.

Galati, Gabriele, Richhild Moessner, and Maarten van Rooij (2021). "The anchoring of long-term inflation expectations of consumers: insights from a new survey." BIS Working Papers 936, Bank for International Settlements.

Georgarakos, Dimitris and Geoff Kenny (2022). "Household spending and fiscal support during the COVID-19 pandemic: Insights from a new consumer survey." *Journal of Monetary Economics*, 129(S), 1–14.

Gomes, Sandra, Nikolay Iskrev, and Pedro Pires Ribeiro (2021). "Euro area inflation expectations during the COVID-19 pandemic." *Banco de Portugal Economic Studies*, 7(4), 3–24.

Jonung, Lars (1981). "Perceived and Expected Rates of Inflation in Sweden." *American Economic Review*, 71(5), 961–968.

Juselius, Mikael and Elod Takats (2015). "Can demography affect inflation and monetary policy?" BIS Working Papers 485, Bank for International Settlements.

Kim, Gwangmin and Carola Binder (2023). "Learning-through-Survey in Inflation Expectations." *American Economic Journal: Macroeconomics*, 15(2), 254–278.

Malmendier, Ulrike and Stefan Nagel (2016). "Learning from Inflation Experiences." *The Quarterly Journal of Economics*, 131(1), 53–87.

Mellina, Sathya and Tobias Schmidt (2018). "The role of central bank knowledge and trust for the public's inflation expectations." Discussion Papers 32/2018, Deutsche Bundesbank.

Trehan, Bharat (2011). "Household inflation expectations and the price of oil: it's déjà vu all over again." *FRBSF Economic Letter*, May23.

Weber, Michael, Francesco D'Acunto, Yuriy Gorodnichenko, and Olivier Coibion (2022). "The Subjective Inflation Expectations of Households and Firms: Measurement, Determinants, and Implications." *Journal of Economic Perspectives*, 36(3), 157–184.

Wicksell, Knut (1898). *Interest and Prices: A study of the causes regulating the value of Money*. Macmillan, London.