Determinants of Inflation Perceptions and Expectations: an Empirical Analysis for Austria

This study uses micro data from a survey among 2,000 Austrian households conducted in 2013 to investigate the socioeconomic determinants of inflation perceptions and expectations. In our econometric analysis, we find that socioeconomically disadvantaged respondents (less income, lower educational attainment) and older interviewees tend to have higher inflation perceptions. In contrast, respondents living in larger households or in agglomerations with more than 5,000 inhabitants have lower inflation perceptions. As to inflation expectations, we find that older and less educated people tend to report higher inflation expectations. Additionally, we document that women tend to have higher inflation expectations than men and that knowledge of the Eurosystem's definition of price stability dampens inflation expectations. Moreover, respondents who are skeptical about the reliability of the official inflation indicators state higher inflation expectations. As largely correct and realistic inflation perceptions and expectations are important for the credibility of monetary policy, these results suggest that financial education strategies should be focused on population groups with lower educational attainment, less income and on younger people.

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Most central banks operate under an explicit or implicit target for price stability. In such a regime, effective monetary policy requires inflation expectations to be well anchored to or near the target. Thus, it is of vital importance for central banks to understand the formation process of inflation perceptions and inflation expectations. While inflation expectations are forward looking, inflation perceptions are backward looking as they reflect people's views about past or current inflation rates.[2] Individuals' perceptions and expectations of inflation may, indeed, affect actual inflation and other economy-wide outcomes (Ireland, 2000). If the public expects higher inflation rates, realized inflation will be higher, as, for example, wage demands will be adjusted upward. Inflation perceptions which differ persistently and over an extended period from official inflation rates could be detrimental to the credibility of the central bank's price stability objective. Moreover, wrong perceptions and expectation errors might affect people's financial decisions about spending, saving and borrowing, which, in the aggregate, can lead to adverse effects on the macroeconomy and on the effectiveness of monetary policy. Therefore, possible misperceptions and expectation errors should be brought in line with actual developments, a process which a central bank can influence by appropriate communication. Achieving this goal is easier if the socioeconomic characteristics which determine inflation perceptions and expectations are known, so that central banks' communication and education efforts can be better targeted to the needs of specific groups.

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However, with the information at hand it is hard to discern whether individual inflation perceptions and expectations differ from average actual inflation rates because people's individual perceptions and expectations simply reflect the different actual inflation rates they experience, or because people's perceptions and expectations are indeed biased. This assessment has important policy implications because only in the latter case – i.e. if differences between socioeconomic groups are based on misperceptions and errors rather than on actual experiences – we can expect adverse effects on allocation and macroeconomic outcomes. Since we do not observe individuals' actual inflation rates, we focus on the determinants of the magnitude of inflation perceptions and expectations rather than on the deviations from actual values in this study.

Our empirical analysis, in which we attempt to uncover the socioeconomic determinants of inflation perceptions and expectations in Austria, is based on a survey among 2,000 Austrian households conducted during the second quarter of 2013 (IFES, 2013). Our main findings reveal that people with higher income, higher educational attainment, those living in larger households or in urban areas and younger people tend to have lower inflation perceptions. Furthermore, we find that females, older and less educated people tend to have higher short-run and long-run inflation expectations. The respondents' knowledge of the ECB's definition of price stability (our proxy for economic literacy) has a dampening impact on inflation expectations and skeptics about the reliability of the official inflation indicators have more elevated inflation expectations.

Several studies have investigated the determinants of inflation perceptions and inflation expectations based on survey data. As a robust finding, this literature reveals that people with a disadvantaged socioeconomic background (e. g. low income, less educational attainment) have biased inflation expectations/perceptions. Menz and Poppitz (2013) report this feature for Germany, Blanchflower and Mac Coille (2009) for the U.K. and Pfajfar and Santoro (2008) for the U.S.A. To date, only few attempts have been made to investigate this issue for Austria. Fluch and Stix (2005) examined inflation perceptions among Austrians during the euro cash changeover. They found that perceived inflation diverged considerably from actual inflation for a prolonged period around the time of the euro cash changeover in early 2002. In another study, Fluch et al. (2013) conducted a broad descriptive analysis of inflation perceptions and expectations for Austria. Neither of these two Austria-related studies attempted a rigorous econometric analysis of the determinants of inflation perceptions and expectations.

The remainder of this paper is structured as follows: Section 1 discusses the data used in the analysis, provides some descriptive statistics and explains the estimation strategy employed. Section 2 presents and discusses the empirical evidence for the socioeconomic determinants of inflation perceptions and expectations. In section 3, we draw some conclusions and suggest avenues for further research.

1 Data and Estimation Strategy

We use a survey which the Institute for Empirical Social Studies (IFES) conducted on behalf of the Oesterrei-

chische Nationalbank (OeNB) from May to July 2013[3] (OeNB-Barometer), in which 2,000 people above the age of 15 were interviewed. The questionnaire comprised about 30 questions on general aspects of inflation, of which only one part was devoted to inflation perceptions and expectations (IFES, 2013). IFES applied a so-called stratified multistage clustered random sampling strategy to ensure that the respondents were representative – with respect to a number of socioeconomic characteristics – of the general Austrian population.[4]

1.1 Data

The people responding to the survey provided qualitative, quantitative and point estimates for their perceptions and expectations of inflation. In other words, they had to estimate or guess some measure of inflation during past and present (in case of perceptions) or future (in case of expectations) episodes.

The survey additionally contains information on a range of socioeconomic characteristics of the respondents, including education, income, place of residence (in terms of the number of inhabitants in the residential municipality), type of accommodation (rented, own property or other), household size (number of persons in the household), employment status, age and gender. Some of the variables, originally available for a larger number of categories, were consolidated to fewer categories (see the annex for definitions of the variables). For instance, the variable educational attainment in the survey

contained 11 different categories ranging from primary school to, at most, university education. We subsumed the 11 different categories under low, medium and high education. Furthermore, we experimented with a variety of possible categorizations for these variables.

Table 1 presents general statistics about important variables used in our analysis.[5] More than 70% of the respondents had completed compulsory

Table 1

Socioeconomic Characteristics

	%	Cumulative %
Income		
Low (less than EUR 1,050)	22.3	22.3
Medium (EUR 1,050 to EUR 2,099)	38.2	60.5
High (more than EUR 2,100)	9.6	70.1
Not specified	24.8	94.9
No own income	5.1	100.0
Education		
Lower secondary	71.5	71.5
Higher secondary	15.4	86.9
Tertiary	13.1	100.0
Unemployed		
No	95.7	95.7
Yes	4.3	100.0
Number of people in the household		
1	27.9	27.9
2	38.7	66.6
3 to 4	27.5	94.0
More than 4	6.0	100.0
Housing		
Rent	55.2	55.2
Own property	39.1	94.3
Other	5.7	100.0
Place of residence		
Less than 5,000 inhabitants	39.1	39.1
More than 5,000 inhabitants	60.9	100.0
Gender		
Male	51.6	51.6
Female	48.4	100.0

Source: OeNB-Barometer survey conducted by IFES in the second quarter of 2013.

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[3] At that time, Austrian HICP inflation hovered between 2.1% and 2.4%, i.e. somewhat above its long-run mean since 1999 of 1.9%.

[4] See Fluch et al. (2013) for more details on the sampling of the survey; this paper also presents the major results of the survey at the descriptive level.

[5] Descriptive statistics along with graphical representations of the distribution of our dependent variables (inflation perceptions and expectations) can be found in Fluch et al. (2013).

schooling, an apprenticeship or vocational training (lower secondary), broadly 15% had graduated from high school (higher secondary) and 13% had finished tertiary education (university or college). Concerning income, most respondents were in the medium income range (with a monthly net income between EUR 1,050 and EUR 2,100). However, about one-quarter of the interviewees did not indicate their income. Around 4% of the respondents reported to be unemployed. Furthermore, most interviewees' household size was small, with two-thirds of the respondents living in a one- or two-person household. 55% of the respondents lived in rented accommodation and 61% in municipalities with more than 5,000 inhabitants.

1.2 Estimation Strategy

The survey questions relevant for our analysis were designed such that respondents had to report their inflation perceptions and expectations (our dependent variables) in terms of predefined intervals. Consequently, the precise value of their perceptions/expectations remained unobserved. Furthermore, the data were also censored in the sense that the upper-end interval was open (above 5%). An estimation method which can deal with censored interval data is the generalized tobit model – also called interval regression – where the parameters are estimated by means of maximum likelihood (Maddala, 1983, for a general discussion of censored models and Stewart, 1983, for a comparison of estimation methods in the specific case of our application).[6]

We use our survey data to estimate equations of the general form:

$$y = f(age, age^2, gender, education, income, \\ agglomeration, housing, household \\ size, employment\ status, economic \\ literacy, inflation\ skepticism), \quad (1)$$

where y is the inflation perception or expectation of a given respondent, which, as described above, falls into a specific interval without being precisely known. The explanatory variables included in our econometric specifications are: age, gender, education, income, agglomeration, type of accommodation in which the respondent lives (rented or other types), number of people living in the same household as the respondent, employment status of the respondent and dummies for economic literacy and inflation skepticism.[7]

The inclusion of the variables age, gender, income, education and employment status is motivated by the findings in the related literature: Existing studies on the heterogeneity of inflation perceptions and expectations across demographic groups, such as Pfajfar and Santoro (2008), Blanchflower and Mac Coille (2009), Menz and Poppitz (2013) and Bruine de Bruin et al. (2010), generally find for different countries and different time horizons that older, economically disadvantaged (unemployed, low income) and/or less educated people tend to have comparatively higher inflation perceptions/expectations. In some studies, gender plays a role as well, with women usually showing higher inflation perceptions/expectations than men. Bruine de Bruin et al. (2010) particularly emphasize the role

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[6] In our application, OLS could in principle be applied if the estimates are appropriately adjusted as shown in Stewart (1983). We use a ready-to-use ML estimation method implemented in STATA.

[7] See the annex for definitions of these variables.

of economic/financial literacy in the expectations formation process, which we also test in this paper. The characteristics household size, type of accommodation and place of residence are not common in the literature on the determinants of inflation perceptions and inflation expectations. However, Fessler and Fritzer (2013) found that these variables have an impact on actual household-specific inflation rates. For that reason, we want to investigate whether household size, type of accommodation and agglomeration are relevant variables in our context.

After having estimated the determinants of inflation perceptions, we take a closer look at those respondents whose perceptions were correct and those who did not respond to questions about their inflation perceptions. In particular, we would like to know which socioeconomic features characterize these groups of interviewees. To this end, we run a logistic regression[8] that explains the probability of being among the above-mentioned groups of respondents. We calculate the marginal effects of the socioeconomic characteristics on this probability. For instance, it would be interesting to know if interviewees who abstain from answering questions about their inflation perceptions tend to have a lower educational attainment. After that, we investigate the socioeconomic determinants of short- and long-run inflation expectations also by means of interval regressions.

2 Empirical Results

We first discuss the results for inflation perceptions and then for inflation expectations.

2.1 Respondents' Inflation Perceptions Are Determined Mainly by Age, Educational Attainment, Income, Household Size and Place of Residence

In the OeNB-Barometer survey (IFES, 2013, question 13), people were asked to estimate or guess the annual rate of inflation for different periods of the past. More specifically, they were given the opportunity to choose from ranges of inflation rates in 1 percentage point intervals, from 0% to 5% (i.e. 0% to 1%, 1% to 2%, 2% to 3%, 4% to 5%) and above 5%. The respondents also had the option of a "don't know" answer. They were asked to estimate annual inflation for the following periods: (1) since the introduction of euro cash in 2002, (2) since the beginning of the financial and economic crisis in mid-2008, (3) the year 2012 and (4) the current month (depending on the time of the interview: March, April or May 2013).

The interval regressions are based on the following specification:

$$
\begin{aligned}
inf\ per = \ &\alpha + \beta_1 age + \beta_2 age^2 + \beta_3 income + \\
&+ \beta_4 education + \beta_5 gender + \\
&+ \beta_6 agglomeration + \beta_7 housing + \\
&+ \beta_8 household\ size + \\
&+ \beta_9 emp\ status + \beta_{10} econ\ lit + \\
&+ \beta_{11} inf\ skept + \varepsilon
\end{aligned} \quad (2)
$$

The estimation results are shown in table 2. Note that the coefficients of an interval regression (in contrast to the marginal effects presented in tables A1 and A2 in the annex) can be interpreted like OLS coefficients. They reveal that the respondent's age played a role in the choice of an inflation interval. The older the respondents were, the more

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[8] The alternative of probit regressions usually yields quite similar results because the cumulative distribution functions of the normal and logistic distribution are very similar.

Table 2

Intervall Regressions
Dependent Variable: Inflation Perception in Different Periods

Variables	(1)	(2)	(3)	(4)
Age	0.0265*	0.0321***	0.0120	0.0153
	(0.0142)	(0.0117)	(0.0109)	(0.0133)
Age squared	−0.000212	−0.000257**	−0.000126	−0.000174
	(0.000140)	(0.000113)	(0.000104)	(0.000131)
Income	0.0484	−0.0383	−0.0970	−0.190**
3 groups	(0.0931)	(0.0725)	(0.0594)	(0.0755)
Education	−0.0316	−0.0753	−0.163***	−0.129***
3 groups	(0.0655)	(0.0512)	(0.0393)	(0.0500)
Gender	−0.0755	−0.00173	0.0251	0.0388
Dummy for male	(0.0995)	(0.0790)	(0.0690)	(0.0871)
Agglomeration (reference: below 5,000 inhabitants)	−0.0498	−0.195**	−0.284***	−0.137
above 5,000 inhabitants	(0.107)	(0.0813)	(0.0712)	(0.0883)
Housing	−0.151	0.179**	−0.0125	0.0598
Dummy for rented accommodation	(0.107)	(0.0816)	(0.0701)	(0.0886)
Household size (number of people)	0.00116	−0.0422	−0.0784**	−0.124***
	(0.0468)	(0.0344)	(0.0310)	(0.0370)
Employment status	0.0508	−0.187	0.106	0.260
Dummy for unemployed	(0.273)	(0.220)	(0.213)	(0.260)
Economic literacy	−0.164	−0.173**	−0.113*	−0.0971
Dummy for knowledge of price stability target	(0.101)	(0.0772)	(0.0656)	(0.0829)
Inflation skepticism	0.565***	0.248**	0.0583	−0.00222
Dummy if inflation (indicator) is deemed Unreliable	(0.140)	(0.0970)	(0.0836)	(0.0942)
Constant	2.322***	2.764***	3.557***	3.367***
	(0.375)	(0.300)	(0.287)	(0.359)
Observations	1,114	1,137	1,184	1,126

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

Source: Authors' calculations.

Note: Robust standard errors in parentheses.

(1) Since the introduction of euro cash in 2002.
(2) Since the beginning of the financial and economic crisis in mid-2008.
(3) In the year 2012.
(4) The most recent month (March, April or May 2013, depending on the date of the interview).

likely they were to opt for a higher inflation interval. It follows that older people tend to have higher inflation perceptions (evidence for this was also found in Hobijn and Lagakos, 2005, for U.S. households). Inflation perceptions increase by about 0.03 percentage points with every year of age. This feature is nonlinear and diminishes over time as captured by the negative coefficient on the term age squared. The nonlinear effect might be due to changing consumption patterns over the life cycle. More specifically, older people might consume more goods and services which record an above-average inflation rate during the respective periods (e.g. medical goods and services, restaurant services and fuels). As consumption patterns tend to consolidate with age, the described link of age with inflation perceptions is likely to diminish with age. However, the described effects were only significant for the period since the beginning of the financial and economic crisis and the period since the introduction of euro cash (in the latter case the nonlinear effect was not significant). Furthermore, people with higher income tend to have lower

inflation perceptions. Moving up one income group dampens inflation perceptions by 0.19 percentage points. Again, this feature did not apply to all periods considered, but only to the most recent month at the time of the interview. The link between education and inflation perceptions is robust for the most recent month and the year 2012: the higher the interviewees' educational attainment was, the lower were their inflation perceptions. The results for income and education are also likely to be largely ascribable to the specific consumption baskets of people with different income and educational attainment. In particular, as was shown in Fessler and Fritzer (2013) for Austrian households, higher-income groups and people with higher educational attainment tend to face lower actual inflation rates. Hence, differences in perceptions by and large seem to be congruent with actual inflation experiences.

In addition, people living in agglomerations differ in their inflation perceptions from people living in rural areas. People living in places with more than 5,000 inhabitants perceive inflation to be lower by 0.20 to 0.28 percentage points compared with those living in smaller residential areas. This characteristic was significant for the period since the introduction of euro cash and the year 2012. Inflation perceptions are not only influenced by actual price developments, but can also be affected by variables related to consumers' economic situation, e.g. disposable income or wages (see ECB, 2007). Hence, the inflation perceptions of people living in agglomerations could be dominated by higher-income groups.

The link between housing (rented accommodation or other types of accommodation) and perceptions of inflation is significant only for the period since the introduction of euro cash. More specifically, people living in rented accommodation tend to have relatively higher inflation perceptions than people owning their homes. This does not come as a surprise given that rent inflation had been higher than headline inflation for several years. Furthermore, compared with expenses for owner-occupied housing, rents are closer to frequent out-of-pocket expenditures, which are supposed to have a strong impact on inflation perceptions. However, the results are not significant for all periods. This broadly coincides with results found in Döhring and Mordonu (2007).

Besides the socioeconomic background investigated so far, household size also had an effect on the formation of perceptions. The larger the household was, the lower were inflation perceptions. This feature was significant for the year 2012 and the most recent month. A similar result was found by Fessler and Fritzer (2013) in the case of the link between actual inflation and household size: The larger the household is, the lower is the household-specific inflation rate. Household composition evidently has an influence on the household's consumption basket. More specifically, larger households (usually households with children) are more likely to be budget-constrained and therefore consume relatively more goods and services with below average inflation rates (e.g. clothing and footwear, recreation services and transportation) or are more prepared to substitute expensive products for cheaper ones when relative prices change. Furthermore, larger households more often live in self-owned accommodations (Statistics Austria, 2014), which might also dampen their inflation perceptions given that rents, which recently increased more than average inflation,

are not part of their monthly expenditures.

Economic literacy – here proxied by the respondents' knowledge of the quantitative definition of the Eurosystem's price stability target – affected inflation perceptions significantly for two periods considered (since the financial and economic crisis and for the year 2012). People who were informed about the price stability target had inflation perceptions that were, on average, lower by 0.11 to 0.17 percentage points. The indicator for inflation skepticism likewise influenced interviewees' inflation perceptions. The less convinced the respondents were about the reliability of the official inflation rates, the higher were their inflation perceptions. Inflation skeptics' perceptions were, on average, by 0.25 to 0.57 percentage points higher than those of non-skeptics. The considerable size of the impact might also have been partly driven by Austrian media. For instance, when the inflation rate of the basket of frequently bought products is higher than the overall measure of inflation, newspapers report about it. The opposite development does not usually make the headlines, though. Gender and employment status proved to be insignificant determinants of inflation perceptions for all periods considered.

Overall, a considerable share of the respondents did not provide an estimate or a guess of the inflation rate for different periods. Apparently this did not depend on any specific period about which respondents were asked. The lowest share of people responding "don't know" was recorded for the inflation rate in the year 2012 (24.5%), while for all other periods about 30% of the respondents were not able or willing to give an answer.

2.2 The Higher the Educational Attainment and the Better Informed Respondents Are about Economic Matters, the More Likely Perceptions Match the Actual Inflation Rate

Between one-fifth (for the period from 2002) and one-third (for the year 2012) of the people interviewed picked the correct interval, i.e. the range which contained the actual inflation rate during the respective period. Overall, respondents with a higher educational attainment are more likely to be well informed about the inflation rate in different periods (see table A1 in the annex). The marginal effects of educational attainment as well as of economic literacy on the probability to choose the correct interval were significant for all periods except the most recent month and the period since the introduction of euro cash. Put differently, people with higher educational attainment and those with knowledge about the quantitative price stability objective of the Eurosystem were more likely to choose the proper inflation interval. Other socioeconomic characteristics did not have a similar robust influence. In other words, the marginal effects were either insignificant, significant for fewer periods investigated or changed signs: Interviewees with higher income and males were more likely to pick the correct interval for the most recent month and for the period since the introduction of euro cash, respectively. In contrast, the marginal effects of inflation skepticism were ambiguous. For the period since the euro cash changeover, people who believed that the official inflation measure was not reliable were less likely to choose the correct inflation interval. Just the opposite was true for the most recent month.

2.3 How is Repsonse Abstention Distributed across Socioeconomic Groups?

The share of interviewees replying "don't know" when asked about the level of inflation, ranged from about one-fourth (for the year 2012) to almost one-third (for the period from 2002 and the most recent month). In particular, the younger the respondents were, the lower the income and the lower the educational attainment were, the more likely it was for respondents to refrain from stating an inflation rate for the different periods (see table A2 in the annex[9]). Furthermore, people with knowledge about the Eurosystem's price stability objective were more likely to answer the questions on inflation perceptions compared with those without this knowledge. Interestingly, also inflation skeptics were more likely to state their opinion on the inflation rate compared with non-skeptics. Finally, also females were more likely to be in the group of non-respondents compared with males.

2.4 Inflation Expectations Are Determined Mainly by Age, Gender, Education and Economic Literacy

Like perceptions of inflation, inflation expectations were also given in intervals in our dataset. Respondents were asked which inflation rate they expected to prevail in 12 months and 5 to 10 years ahead. They had to choose among 1 percentage point-wide intervals between −5% and +5%. In addition, two open intervals of below −5%

and above +5% as well as the point interval of constant prices (0%) were also possible responses. Although the response structure of inflation expectations was slightly more complicated than that of inflation perceptions, the empirical strategy of estimating a generalized tobit model with maximum likelihood (interval regression) is still suitable. Thus, we estimate a model for short-term (1 year) and long-term (5 to 10 years) inflation expectations, where age, gender, income, education, a measure of economic literacy and a measure of the respondent's attitude toward the reliability of the official inflation indicator are the explanatory variables:[10]

$$inf\ exp = \alpha + \beta_1 age + \beta_2 age^2 + \beta_3 gender + \\ + \beta_4 income + \beta_5 education + \\ + \beta_6 econ\ lit + \beta_7 inf\ skept + \varepsilon \quad (3)$$

In the related literature (e.g. Bruine de Bruin et al., 2010), economic literacy was shown to significantly affect consumers' inflation expectations. Our proxy for economic literacy is the respondents' knowledge of the Eurosystem's quantitative definition of price stability, which is covered in a different question in the survey. About one-third (32.4%) of the respondents picked the correct answer of "below, but close to, 2%".[11] We use a dummy variable for the correct answer as a proxy for respondents' literacy in the field of inflation. As another dummy we include the declaration of respondents who find the Consumer Price Index (CPI) or the Harmonised Index of Consumer Prices

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[9] Note that the number of observations in table A2 is higher than in table 2 and table A1. The reason is that in the regressions reported in table 2 and table A1 the respondents that were not able or willing to decide on an inflation range were excluded, while the group of nonrespondents was included in the regressions of table A2.

[10] We tried out all the variables mentioned in equation (1), but included only those variables which proved to be significant in at least one of the two regressions in the final specification reported in this section.

[11] See Fluch et al. (2013) for a descriptive analysis of this and more results of the survey.

(HICP) a "rather" or "fully unreliable inflation indicator". 14% of all respondents had this attitude toward the two official inflation indicators, which we interpret as inflation skepticism. We want to test the hypothesis whether being a skeptic with respect to the reliability of the official inflation indicator affects inflation expectations in a quantitative way.

The estimation results are shown in table 3. They indicate that – like in the case of inflation perceptions – both short-term and long-term inflation expectations are significantly affected by the respondents' age. Older respondents had significantly higher inflation expectations, with short-term expectations increasing by an average 0.03 percentage points and long-term expectations by 0.05 percentage points per year of age. This result is in line with the findings in the literature (e.g. Blanchflower and Mac Coille, 2009; Pfajfar and Santoro, 2008). Higher inflation expectations of older people are sometimes explained with their greater pessimism in general or their longer horizon of experience that also includes historical periods of elevated inflation, which could still affect their inflation expectations today. Like for inflation perceptions, we also find a nonlinear effect of the respondents' age on inflation expectations implying that the increase diminishes with higher age.

As in other studies, we find that women had higher inflation expectations than men. The gender effect is clearly significant for long-term expectations, but only borderline significant (with a p-value of slightly above 0.1) for short-term inflation expectations. Pfajfar and Santoro (2008) as well as Bruine de Bruin et al. (2010) explain gender differences in inflation expectations with women's stronger focus on day-to-day shopping. As prices of food and beverage items have been rising faster than the overall CPI in recent years, it is conceivable that primary shoppers of such items have higher inflation expectations.

Table 3

Intervall Regressions
Dependent Variable: Short- and Long-Term Inflation Expectations

Explanatory variables	1 year expectations	5 to 10 years expectations
Age	0.0345***	0.0472***
	(0.0115)	(0.0128)
Age squared	−0.0003**	−0.0004***
	(0.0001)	(0.0001)
Gender	−0.1232	−0.1698*
Dummy for male	(0.0773)	(0.0927)
Income	0.1242*	0.1414*
3 groups	(0.0635)	(0.0763)
Education	−0.0814*	−0.1731***
3 groups	(0.0495)	(0.0583)
Economic Literacy	−0.2128***	−0.2286**
Dummy for knowledge of price stability target	(0.0776)	(0.0938)
Inflation Skepticism	0.3276***	0.4094***
Dummy if inflation (indicator) is deemed unreliable	(0.0990)	(0.1220)
Constant	1.1585***	1.5030***
	(0.2686)	(0.3014)
Observations	1,261	1,186

Source: Authors' calculations.

*Note: *** p-value<0.01, ** p-value<0.05, * p-value<0.1; robust standard errors in parentheses.*

The finding that inflation expectations increase with respondents' personal income is somewhat at odds with the related literature.[12] Most studies, such as Menz and Poppitz (2013) and Bruine de Bruin et al. (2010), find significantly lower, rather than higher, inflation expectations for high-income groups. They explain this with group-specific inflation rates, where low-income groups are exposed to higher inflation rates due the higher proportion of food and energy items in their personal consumption basket. For Austria, Fessler and Fritzer (2013) have shown that income and group-specific inflation rates are negatively related, but differences across groups are numerically small. As a result, the effect of income on inflation expectations found for other countries could be muted in Austria.

For education, however, we do find the expected negative effect on inflation expectations: respondents with higher educational attainment (lower secondary, higher secondary, college/university) have significantly lower short- and long-run inflation expectations. Pfajfar and Santoro (2008) argue that agents with higher education are generally more interested in economic reports and specific information on inflation and other macroeconomic variables, which results in more realistic inflation expectations. They also note that income and educational groups are usually highly correlated in demographic studies, which explains the same sign of these two variables in regressions of inflation expectations. In

our dataset, however, the correlation of income and educational groups is relatively small at 0.2, which could be another reason for the different effects of these two variables on expectations.[13]

According to Bruine de Bruin et al. (2010), financial literacy is the single most important factor explaining demographic heterogeneity in inflation expectations. They constructed a summary indicator from 16 questions on economic/financial literacy and found that people with a lower degree of financial literacy had significantly higher inflation expectations. Although our measure of economic literacy – a dummy for respondents' knowledge of the Eurosystem's definition of price stability – is much cruder than their measure, we also find a negative and strongly significant impact of economic literacy on inflation expectations.

Finally, our results also suggest that people who are skeptic about the reliability of the official inflation indicators have significantly higher short- and long-term inflation expectations than non-skeptics. The size of the coefficient indicates a very strong effect of this variable: inflation expectations of inflation skeptics are on average 0.3 percentage points higher in the short run than those of the rest of the population (0.4 percentage points in the long run). Interestingly, being an inflation skeptic is not correlated in any significant way with either educational attainment or economic literacy, but it nevertheless exerts a strong influence on the formation of inflation expectations.

[12] The result in table 3 is based on a categorical income variable consisting of three income groups (with a monthly net income below EUR 1,050, between EUR 1,050 and EUR 2,100, and above EUR 2,100). Alternative estimations with a more finely defined income variable consisting of five groups deliver qualitatively equivalent results.

[13] This is not to say that education has no effect on people's income in Austria. Regular income reports of Statistics Austria document the positive effect of educational attainment on personal income. In that sense, our dataset might not be representative enough to capture the link between education and income in the population.

To check the robustness of these results we also investigated the determinants of the qualitative inflation expectations available in our dataset. In addition to stating inflation expectations in quantitative intervals, respondents also had to indicate whether they expected prices (over the next 12 months and the next 5 to 10 years) to "increase strongly", "increase slightly", "remain constant", "decrease slightly" or "decrease strongly". We estimate an ordered probit model in which the resulting qualitative responses are regressed on the same explanatory variables as before. The ordered probit model is the equivalent to the interval regression when responses are given in ordered categories. The estimation results are presented in table A3 in the annex. Qualitatively, these results confirm our previous findings, yet significance is not always as strong as in the interval regressions: Age is only significant for short-run inflation expectations. Income as well as economic literacy are only significant for long-run expectations in the ordered probit models, but all other results are the same as before. Thus, qualitative and quantitative inflation expectations appear to be broadly consistent in our dataset. One advantage of the estimations with qualitative data is that they are based on more observations because fewer respondents drop out when asked about their qualitative inflation expectations compared with their quantitative expectations.

3 Summary and Conclusions

In this paper, we perform interval regressions to investigate the determinants of inflation perceptions and expectations in Austria. The analysis is based on data taken from a survey among 2,000 Austrian households, which was conducted in the second quarter of 2013. We find that people with a disadvantaged socioeconomic background perceive higher inflation rates. While the above-mentioned data source did not allow us to answer whether their perceptions are congruent with their own actual inflation experience, other studies argue that this is indeed the case. Furthermore, people with lower educational attainment, lower income and younger people are more likely to be unable to state perceptions of the development of inflation. It goes without saying that realistic perceptions of the general public about the actual inflation rate is an important factor for the credibility of a central bank. Hence, these results suggest that financial education strategies should be focused on population groups with less educational attainment and lower income as well as younger people.

We also find that older people, females and people with lower educational attainment have significantly higher short- as well as long-run inflation expectations. These results are in line with the existing literature. Furthermore, our simple measures of economic literacy and inflation skepticism also show a significant impact on inflation expectations: People who are better informed about economic matters tend to have lower and at the same time more realistic inflation expectations. A comparatively small share of inflation skeptics, i.e. people who do not regard the official CPI/HICP as a reliable inflation indicator, have considerably higher short- and long-run inflation expectations. This implies that economic and financial literacy initiatives by public organizations – like central banks and other institutions – will help improve the alignment of inflation expectations with actual developments. Intensifying such initiatives would therefore be a step toward supporting the effectiveness of monetary policy.

With time moving on, we will be able to evaluate the accuracy of the inflation expectations obtained from this survey. It will be interesting to investigate the factors explaining expectation errors or the probability that people have correct inflation expectations ex post. If inflation expectations and perceptions are biased upward, these might well be the same factors that determine the magnitude of expectations and perceptions in the first place. We leave this question for future research.

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Annex

Table A1

Logistic Regression of the Probability that Respondents Choose the Correct Inflation Interval

Variables	(1)	(2)	(3)	(4)
Age	−0.00124	−0.00613	0.00431	0.00380
	(0.00495)	(0.00499)	(0.00523)	(0.00538)
Age squared	0.00002	0.00008	−0.00002	−0.00002
	(0.00005)	(0.00005)	(0.00005)	(0.00005)
Income	−0.00765	−0.0376	−0.00526	0.0802***
3 groups	(0.0256)	(0.0270)	(0.0278)	(0.0290)
Education	0.0270	0.0630***	0.0684***	0.000978
3 groups	(0.0192)	(0.0196)	(0.0205)	(0.0215)
Gender	0.0650**	0.0172	−0.00139	−0.0587*
Dummy for male	(0.0309)	(0.0317)	(0.0327)	(0.0332)
Employment status	−0.0318	−0.0545	−0.0541	−0.125
Dummy for unemployed	(0.0789)	(0.0790)	(0.0757)	(0.0810)
Economic literacy	−0.0108	0.0586*	0.0875***	0.0369
Dummy for knowledge of price stability target	(0.0310)	(0.0313)	(0.0325)	(0.0336)
Inflation skepticism	−0.0884**	−0.0549	0.00203	0.115***
Dummy if inflation (indicator) is deemed unreliable	(0.0417)	(0.0424)	(0.0430)	(0.0441)
Observations	1,114	1,137	1,184	1,126

Source: Authors' calculations.

*Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$. The table reports marginal effects at the means. Standard errors in parentheses.*

(1) Since the introduction of euro cash in 2002.
(2) Since the beginning of the financial and economic crisis in mid-2008.
(3) In the year 2012.
(4) In the most recent month (March, April or May 2013, depending on the date of the interview).

Table A2

Logistic Regression of the Probability that Respondents Opt for the „Don't Know" Answer

Variables	(1)	(2)	(3)	(4)
Age	−0.00975***	−0.00791**	−0.00698**	−0.00356
	(0.00316)	(0.00311)	(0.00282)	(0.00348)
Age squared	0.00009***	0.00008**	0.00007**	0.00005
	(0.00003)	(0.00003)	(0.00003)	(0.00003)
Income	−0.0697***	−0.0643***	−0.0450**	−0.0371*
3 groups	(0.0207)	(0.0204)	(0.0182)	(0.0213)
Education	−0.0550***	−0.0460***	−0.0482***	−0.0302*
3 groups	(0.0166)	(0.0165)	(0.0149)	(0.0173)
Gender	−0.0634***	−0.0596***	−0.0576***	−0.0526**
Dummy for male	(0.0227)	(0.0222)	(0.0199)	(0.0239)
Employment status	0.0686	0.0578	−0.0374	−0.00582
Dummy for unemployed	(0.0458)	(0.0444)	(0.0446)	(0.0517)
Economic literacy	−0.175***	−0.162***	−0.174***	−0.187***
dummy for knowledge of price stability target	(0.0274)	(0.0268)	(0.0253)	(0.0279)
Inflation skepticism	−0.185***	−0.134***	−0.135***	−0.0874**
Dummy if inflation (indicator) is deemed unreliable	(0.0409)	(0.0390)	(0.0361)	(0.0361)
Observations	1,464	1,464	1,464	1,464

Source: Authors' calculations.

Note: *** p<0.01, ** p<0.05, * p<0.1. The table reports marginal effects at the means. Standard errors in parentheses.

(1) Since the introduction of euro cash in 2002.
(2) Since the beginning of the financial and economic crisis in mid-2008.
(3) In the year 2012.
(4) In the most recent month (March, April or May 2013 depending on the date of the interview).

Table A3

Ordered Probit on Qualitative Inflation Expectations
Dependent Variable: Short- and Long-Term Inflation Expectations

Exlpanatory variables	1 year expectations	5 to 10 years expectations
Age	0.0189*	0.0091
	(0.0099)	(0.0110)
Age squared	−0.0002*	−0.0001
	(0.0001)	(0.0001)
Gender	−0.2015***	−0.1618**
Dummy for male	(0.0683)	(0.0696)
Income	0.0109	0.1020*
3 groups	(0.0536)	(0.0580)
Education	−0.0987**	−0.1615***
3 groups	(0.0403)	(0.0446)
Economic literacy	−0.0923	−0.1208*
Dummy for knowledge of price stability target	(0.0692)	(0.0698)
Inflation skepticism	0.3011***	0.2456**
Dummy if inflation (indicator) is deemed unreliable	(0.0932)	(0.0999)
Observations	1,424	1,364

Source: Authors' calculations.

Note: *** p-value<0.01, ** p-value<0.05, * p-value<0.1; robust standard errors in parentheses. Dependent variables consist of 5 categories: [prices will…] increase strongly, increase slightly, remain constant, decrease slightly or decrease strongly.

Definition of Variables

Below are the definitions of variables which are not self-explanatory.

Income:

Personal monthly net income
- low (below EUR 1,050),
- medium (EUR 1,050 to EUR 2,099),
- high (including and above EUR 2,100)

Education:

Highest level of successfully completed education
- lower secondary (compulsory school, apprenticeship, vocational school)
- higher secondary (high school)
- tertiary (university or college degree)

Agglomeration:
- below 5,000 inhabitants
- above 5,000 inhabitants

Housing:

Dummy with the value 1 for rented accommodation (including municipal and cooperative housing) and 0 for all other types of accommodation, e.g. owner-occupied housing and rent-free housing arrangements

Economic literacy:

Dummy to indicate respondents who correctly stated the Eurosystem's quantitative definition of price stability (below, but close to, 2%)

Inflation skepticism:

Dummy to indicate respondents who think that the official CPI or HICP are unreliable inflation indicators