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## Measuring household inflation perceptions and expectations: The effect of guided vs non-guided inflation questions

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# **Measuring Household Inflation Perceptions and Expectations: The Effect of Guided vs Non-Guided Inflation Questions**

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# Measuring Household Inflation Perceptions and Expectations: The Effect of Guided vs Non-Guided Inflation Questions

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**Abstract:** An experiment using a representative survey of the German population shows that letting respondents report a number rather than asking them to choose from a list of predefined ranges lowers the response rate for both perceived past and expected inflation and decreases (increases) reported past (expected) inflation. Income, education, gender, objective and subjective knowledge about monetary policy, and political affiliation affect the effect's size but not its sign. East and West German respondents who were 15 or older when the Berlin Wall fell have reactions different from those who were younger at that time, which supports the 'impressionable years' hypothesis based on different inflation experiences.

**Keywords:** Inflation perception, inflation expectation, survey question design, Germany, household survey, impressionable years hypothesis.

**JEL classification:** E52, E58, Z1.

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## 1. Introduction

The inflation perceptions and expectations of financial market participants, firms, and laypersons may have wide-ranging economic and political consequences and thus have been scrutinised extensively using survey data. Focusing on household surveys, reviews of the literature by Wärneryd<sup>°</sup>(1986), Ranyard et al.<sup>°</sup>(2008), and Bruine de Bruin et al.<sup>°</sup>(2017) document the increasing depth and scope of research in this area. Households' reported perceptions of inflation have been found informative by social scientists in regard to aspects of household behaviour. For instance, such perceptions appear to affect individual consumption decisions (Armentier et al.,<sup>°</sup>2015), have been used to test the rationality hypothesis (Jonung and Laidler,<sup>°</sup>1988), and correlate with the popularity of governments (Sanders,<sup>°</sup>2000).

In terms of economic policy, central bankers also recognise the importance of survey-based measures of inflation expectations (see, e.g., Bernanke,<sup>°</sup>2007). Many central banks, for instance, the Bank of England, the European Central Bank, the Bank of Australia, the Bank of Japan, the Sveriges Riksbank, and the Reserve Bank of India, collect direct measures of expectations based on surveys asking respondents to report their expectations, (Armantier et al.,<sup>°</sup>2015).

However, measuring inflation via surveys raises methodological problems and the reliability of the resulting estimates is questionable. For example, researchers report that beliefs about both future and past inflation vary across different groups of economic actors, for example, between firms and households (Jonung, °1981; Coibion et al., °2020). There can be substantial differences between official inflation rates and perceived inflation rates, for example, after the introduction of the euro (Aucremanne et al., °2007; Brachinger, °2008). Differences have been reported in estimates of the perceived rate of inflation between surveys conducted in the same country at the same point in time (Bruine de Bruin et al., °2017).

Last, but not least, answers to questions about inflation, like those to any other survey question, may be subject to wording effects (Bruine de Bruin, °2011). Survey responses can be sensitive to question design. Armantier et al. (2013) and Bruine de Bruin et al. (2017) observe that responses can be markedly different depending on whether the question referred to ‘prices in general’, ‘inflation’, or ‘prices you pay’.

The design of response options may also affect answers. As Bruine de Bruin et al. (2011) point out, the way response options are presented is part of the question and therefore may affect answers to it. Coibion et al. (2020) report that the number of intervals from which respondents can choose when stating their expected inflation affects the measured uncertainty of respondents. However, the question of how the type of response option affects reported perceived or expected inflation has received no specific attention.

Another blind spot in the literature on surveys of subjective inflation measurement is how questions affect non-responses. Laypersons’ limited knowledge about monetary affairs (Hayo and Neuenkirch, 2018) can lead to a notable number of non-responses. Moreover, Coibion et al. (2020) observe that even among major economic players, for example, price-setters, over 60% of US firms selected the ‘I don’t know’ option to a question asking them about the Federal Reserve’s target inflation rate. Bruine de Bruin et al. (2017) report that the wording of the question about inflation affects the response rate and that respondents are more likely to respond to a question on ‘inflation’ than to one on ‘prices in general’.

To the best of our knowledge, how response options to questions about perceived and expected inflation affect the rate of non-responses has not been studied. Hence, we know neither whether the design of answer categories influences the propensity to answer nor whether it has an impact on the distribution of reported inflation figures.

This issue matters. As Bruine de Bruin et al. (2017) point out, answers to questions about perceived and expected inflation could be subject to a social desirability bias. Respondents

likely want to avoid reporting answers that the interviewer may consider foolish or unrealistic. Thus, providing them with a selection of intervals from which to choose instead of asking them to simply volunteer a number might increase the response rate. This raises the question of whether the additional responses prompted by suggesting intervals really add useful information to the sample. If respondents are more concerned about not being able to answer than about reporting their true attitudes, then these additional observations are noisy. In the extreme, if respondents randomly selected an interval, extra responses would result in pure noise. Put differently, the share of ‘non-attitudes’, as defined by Campbell et al. (1960), in overall answers is likely higher in the case of pre-formulated answer categories.

The design of answer categories may also bias the estimates of expected inflation. This could occur if providing answer intervals caused anchoring, as defined by Tversky and Kahneman (1974). Alternatively, respondents may pick the middle category if they are unsure about what answer they should give (see, e.g., Oppenheim,<sup>o</sup>1992). In either case, both the mean and the dispersion of answers would be affected by the way in which respondents are asked to formulate their answers.

The purpose of our research is to assess the impact of two different response options on the outcome of questions about perceived past inflation and expected future inflation in a representative population survey. In this paper, we use a randomised survey experiment to study how the way in which respondents can give responses to questions about their perception of past inflation and their expectations affects the distribution of answers. Using a representative survey of about 2,000 German residents, we contrast a question where respondents are asked to report a number, without further indication, with a question where respondents are provided with a list of intervals from which to choose. Half of the respondents were randomly assigned to the first type of question, the other half to the other. We investigate how the specification of the response options affects both the response rate to the question and the reported inflation rate. As the two groups were randomly selected, we can identify the causal effects of different response options.

Our results show that letting respondents choose a number without giving them any guidance decreases the response rate compared to asking them to choose from a predefined range of answers. This finding holds for both perceived inflation and expected inflation. Moreover, we discover that the actual inflation rate stated by respondents differs significantly between the two response options. Letting respondents choose a number without giving them any guidance prompted them to report a relatively lower past inflation and a relatively higher expected

inflation rate than did asking them to choose from a list of predefined intervals. Thus, not only does the choice of a specific response option affect reported past and future inflation rates, it also does so in opposite directions.

We condition the effect of the type of response option on income, education, gender, objective and subjective knowledge about monetary policy, and political affiliation. These variables moderate the size of the ‘type-of-response’ effects, but generally do not change their signs. However, we observe systematic differences in the type-of-response effect between East and West German respondents who were 15 or older when the Berlin Wall fell, but not for younger respondents. This finding is in line with the ‘impressionable years’ hypothesis and likely reflects different personal inflation experiences.

The rest of the paper is organised as follows. The next section describes the survey and the data. Section 3 reports our baseline results and Section 4 robustness and extensions. Section 5 concludes.

## **2. Survey and Data**

The inflation questions were included on our behalf in an Omnibus survey conducted from 6 February to 2 March 2018 by Gesellschaft für Konsumforschung (GfK), a large private research company specialising in market research and public opinion surveys. The survey covers various topics and a broad range of socio-demographic and psychological indicators, many of which are not automatically collected by GfK. The sample is based on face-to-face interviews conducted by professional interviewers equipped with pen-pads and is representative of the German population (for more details, see Hayo et al., 2018).

First, we focus on the specification of the response options for a question about the inflation rate that people perceived in the past year. The survey features two variants of the same question. Respondents were randomly divided into two groups. Half of the respondents were asked to state the past inflation rate without any further guidance in terms of answer options:

Q1a: ‘Do you remember, roughly, what Germany’s rate of inflation was in 2017? Please write the percentage here: ...’

Respondents could either state a number or declare that they did not know the answer.

The other half of the respondents were asked a variant of the question that presented them with a series of intervals:

Q1b: ‘Do you remember, roughly, what Germany’s rate of inflation was in 2017? Which of the following options describes best how prices have changed? (a) Decreased; (b) Unchanged; (c) Increased by 1% or less; (d) Increased by more than 1% but less than 2%; (e) Increased by more than 2% but less than 3%; (f) Increased by more than 3% but less than 4%; (g) Increased by 4% or more; (h) Don’t know.

We then investigate the influence of response options on results in a question asking respondents to state the inflation rate they expect for the following year. As for past inflation, the survey features two variants of the same question, randomly asked by the interviewer:

Question Q2a: ‘What do you expect the inflation rate will be next year, i.e., 2018? Please write the percentage here: ...’

Respondents could either state a number, declare that they had no opinion on the future inflation rate, or say that they did not know the answer.

In the other variant of the question, respondents were invited to choose from a series of intervals.

Question Q2b: ‘What do you expect the inflation rate will be next year, i.e., 2018? Which of the following options describes best how prices will change? (a) Decrease; (b) No change; (c) Increase by 1% or less; (d) Increase by more than 1% but less than 2%; (e) Increase by more than 2% but less than 3%; (f) Increase by more than 3% but less than 4%; (g) Increase by 4% or more; (h) I do not form opinions about what might be the rate of inflation in the future; (i) Don’t know.

Note that we allowed respondents to state that they have no opinion as to inflation expectations in addition to the ‘don’t know’ option because there is a conceptual difference between a person who generally does not have inflation expectations and a person who cannot provide a specific number for a given time period.

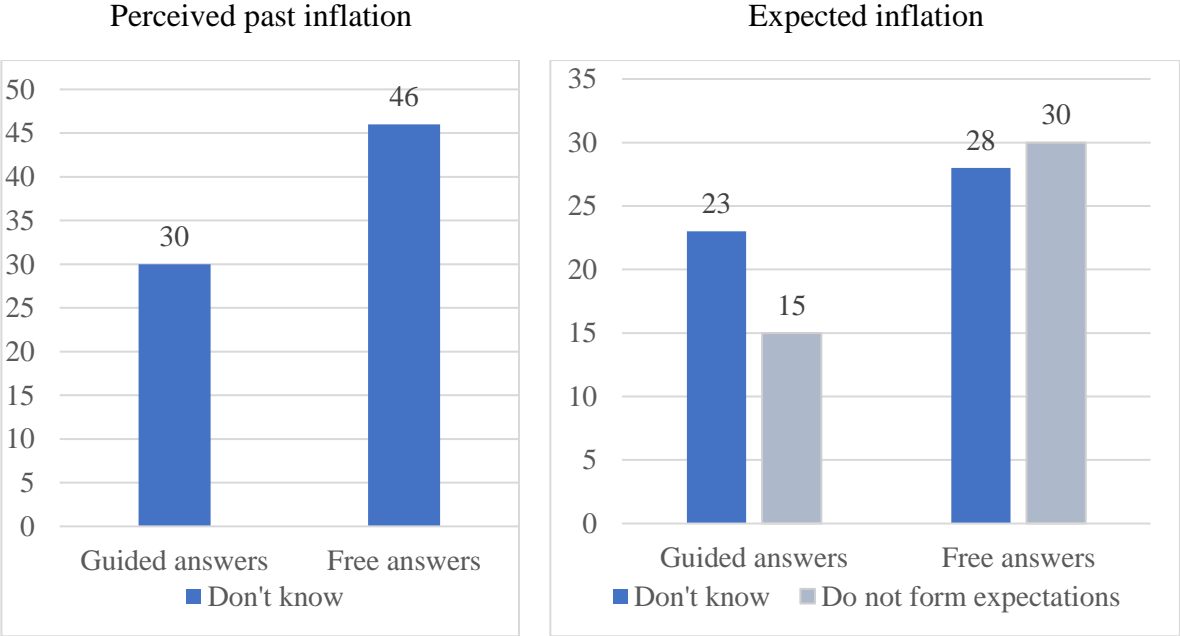
To determine whether and, if so, how the two response options affect people’s stated perceived and expected inflation rates, we need to make answers comparable. First, for a sense of the way the design of response options affects mean answers, we need to translate the intervals of the



guided answers into numerical values. We thus take the midpoint of the interval for the middle categories and  $-0.5$  and  $+4.5$  as lower and upper bounds, respectively. As those bounds are arbitrary, we also look at other codings in the analyses referring to means. Specifically, we consider a lower bound of  $-1$  and an upper bound of  $+10$ , a range that is derived from computing the average of the non-guided answers over the range of inflation values greater than 4%. Second, we assign non-guided answers to the intervals provided in guided answers.

Figure 1 reports the distribution of missing answers for the two versions of the inflation questions.<sup>1</sup> In both treatments, we find a substantial share of people who do not answer.

Figure 1: Distribution of missing values for perceived and expected inflation by type of question (in %)



The left panel of Figure 1 compares the shares of missing values for perceived past inflation. The share of ‘don’t know’ answers is substantially higher in the non-guided version (46%) than in the guided version (30%). The right panel of the figure displays the respective shares of missing answers to the expected inflation rate questions. While the difference is not as big as in the case of perceived inflation (non-guided form: 28%, guided form: 23%), the qualitative result is the same. Given our random treatment, we conclude that providing multiple-choice

<sup>1</sup> Note that due to the high quality of the survey, there are no missing answers other than those specified here.

answer categories induces some respondents to report an inflation value when they would not have done so if faced non-guided answers.

It is not obvious whether this phenomenon is an advantage or a disadvantage. The advantage of reducing the number of ‘don’t know’ answers is a larger sample size with which to work. The disadvantage is that by making it easier to answer the question, some respondents who have no clear attitude towards the issue will provide an answer. Put differently, we may add noise in the form of ‘non-attitudes’ to our dataset rather than informative answers (see Campbell et al.,<sup>o</sup>1960; Zaller,<sup>o</sup>1992).

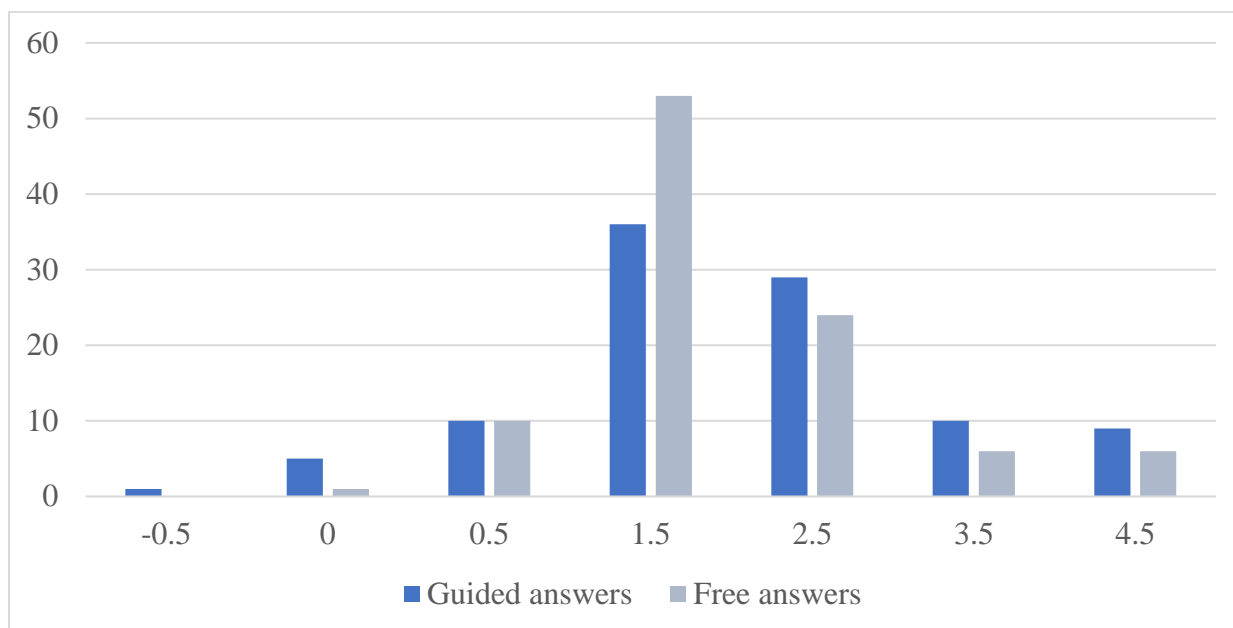
One way of addressing that question is to determine whether people responding ‘don’t know’ to the perceived past inflation question also do so in the case of the one on expected inflation and whether their share depends on the type of response option provided. Analysing the non-guided answers, 41% of those who chose ‘don’t know’ in the past inflation question made the same choice in the case of expected inflation. Turning to the guided format, we find that only 25% behaved similarly. Thus, the linkage between answering ‘don’t know’ across the two formats is much stronger in the case of the non-guided format. We interpret this finding as an indication that the non-guided version of the question is relatively superior with regard to identifying those respondents whose answers are based on ‘non-attitudes’.

Consistent with this interpretation are the findings for those who state that they do not form inflation expectations. We discover that the share of people stating no expectation formation is twice as high in the case of the non-guided version (non-guided: 30%; guided: 15%). Relying on questions with guided response options may lead to an impression of a much higher degree of perception and expectation formation than is warranted. Put differently, while studies using guided questions likely have lower shares of both ‘don’t know’ answers and ‘do not form expectation’ statements, they may just be including more respondents with non-attitudes in the dataset, that is, more noise.

In the next step, we analyse the differences our treatment makes with regard to the distribution of inflation rate answers. Figure 2 compares the difference between the two response option treatments in shares of answers about perceived past inflation.

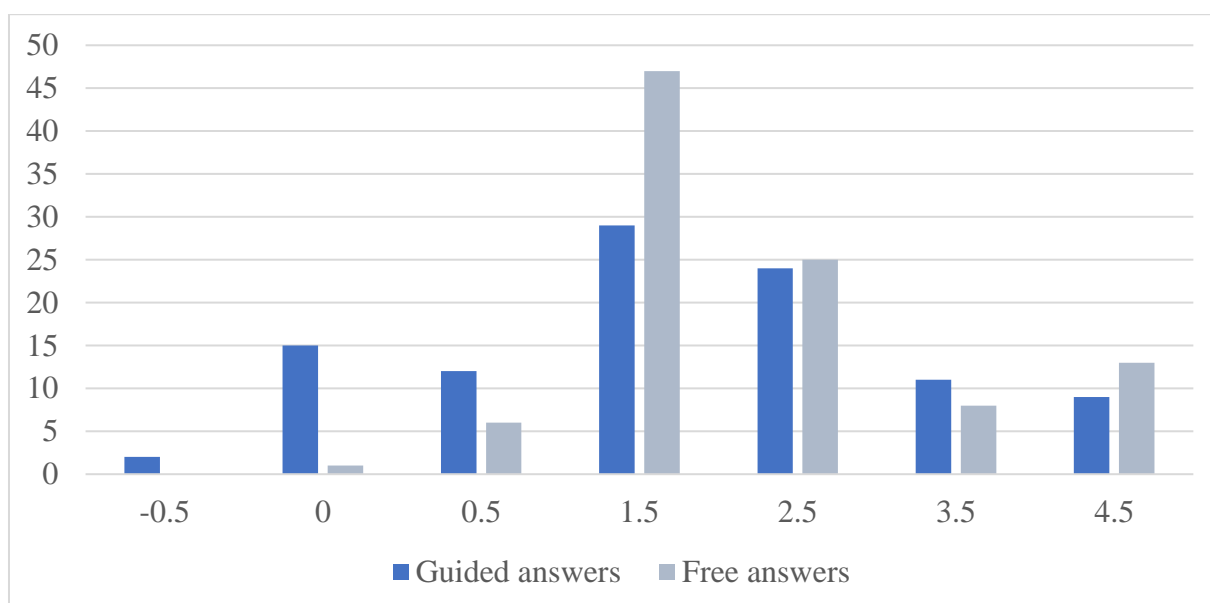
Extreme answers are more frequent when answering the guided question than when answering the free question. For example, no respondent reported a negative inflation rate in the non-guided response option, whereas nearly 1% did in the guided one. Likewise, 3% of respondents reported an inflation rate larger than 4% in the non-guided case, whereas nearly 6% did in the guided one.

Figure 2: Distribution of perceived *past* inflation by type of response option (in %)



Notes: Based on coding inflation rates at the midpoint of the guided response options. Lower and upper bounds were set at -0.5 (decrease) and 4.5 (> 4%), respectively.

Figure 3: Distribution of *expected* inflation by type of response option (in %)



Notes: Based on coding inflation rates at the midpoint of the guided response options. Lower and upper bounds were set at -0.5 (decrease) and 4.5 (> 4%), respectively.

In the case of expected inflation, findings are similar with regard to the ‘decrease’ category (see Figure 3). However, we observe a larger share of people with higher inflation expectations in the non-guided treatment.

Do these differences in the distribution have an impact on the estimated mean and standard deviation of the inflation rate? To answer this question, Table 1 compares these statistics across the two treatments for perceived past inflation. As indicated above, in the case of guided answers, we provide results for two different assumptions about the lower and upper bounds.

Table 1: Past inflation: Comparing mean inflation and standard deviation across treatments

	Free answers			Guided answers	
	(1)	(2)	(3)	(4)	(5)
	Raw data	Coding [-0.5;4.5]	Coding [-1;10]	Coding [-0.5;4.5]	Coding [-1;10]
Mean	2.6	1.9	2.3	2.1	2.5
St. dev.	4.1	1.0	2.1	1.2	2.5
No of obs.	543			707	
Mean difference	(1) – (4): 0.53	(1) – (5): 0.1	(2) – (4): -0.15	(3) – (5): -0.3	
t-test:	***		**	**	
St. dev. difference	(1) – (4): 2.9	(1) – (5): 1.6	(2) – (4): -0.2	(3) – (5): -0.4	
Var. ratio test	***	***		***	

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

In 2017, the official annual CPI inflation rate in Germany was 1.8%. We find that the mean answer is 2.6 when using the non-guided answers in their raw form. This number decreases to 1.9 and 2.3, respectively, when transforming the values into the guided answer coding. For guided answers, we find values of 2.1 and 2.5, respectively. Equality across treatments can be rejected for all cases except coding [-0.5; 4.5] for both variables. Although the perceived inflation rate is highest when using the raw non-guided answers, means for transformed variables are higher in the case of guided answers. Thus, the inflation rate as perceived by our respondents is systematically higher than the official inflation rate. Less surprisingly, we discover that the standard deviation of the raw non-guided answers is much higher than that of the transformed variables. The variation of the two alternative guided answers tends to be higher than that of the transformed non-guided answers.

We interpret our findings as suggesting that when left to their own devices, on average, people overpredict their own inflation rate as compared to the official one. However, when raw non-guided answers are transformed into ranges, this conclusion no longer holds: now we find that answers were noisier in the guided treatment. We interpret this result as suggesting that some respondents in the guided version who did not know the inflation rate just picked an answer.

Pre-formulated answers make this easy to do without losing face, which could easily happen if one answered the free version of the question with a value far away from the true one.

Moreover, the additional noise created by adding answers from respondents who have a ‘non-attitude’ on that question is not neutral with regard to the average inflation rate. Since the multiple-choice answers include more choices of inflation values above the officially measured inflation rate, these options are relatively more often selected and our measurement of the average inflation rate is upwardly biased. By the same token, we observe that the relative frequency with which the correct range is chosen is higher in the non-guided version than in the guided one. Again, this finding is in line with the hypothesis that providing guided answer categories creates additional noise.

Table 2 sets out the results for the case of expected inflation.

Table 2: Expected inflation: Comparing mean inflation and standard deviation across treatments

	Free answers			Guided answers	
	(1)	(2)	(3)	(4)	(5)
	Raw data	Coding [-0.5;4.5]	Coding [-1;10]	Coding [-0.5;4.5]	Coding [-1;10]
Mean	3.2	2.2	2.9	1.8	2.3
St. dev.	4.9	1.1	2.8	1.4	2.6
No of obs.		411		639	
Mean difference	(1) – (4): 1.4	(1) – (5): 0.9	(2) – (4): 0.4	(3) – (5): 0.6	
t-test:	***	***	***	***	
St. dev. difference	(1) – (4): 3.6	(1) – (5): 2.3	(2) – (4): -0.2	(3) – (5): 0.2	
Var. ratio test	***	***	***	*	

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

We find significant differences between the various treatments and codings. At over 3%, the non-guided specification yields the highest expected inflation rate, whereas the guided version with the low extreme value coding results in a 1.8% expected inflation rate. In terms of standard deviations, the results are not clear except for the high variability of the raw non-guided answers. How accurate are these expectations when compared to the official inflation rate of 1.9% in 2018? Similar to our findings on past inflation, the guided answers with low extreme value coding perform best here, whereas the raw non-guided average is the worst. Thus, in the case of expected inflation, the results are similar to the ones for past inflation when comparing raw non-guided answers with guided answers, but go the other way around when comparing the transformed non-guided answers with guided answers.

### 3. Baseline Estimations

First, we estimate logit models where the dependent variable is a dummy variable set to 1 when respondents answered the questions about perceived or expected inflation. For expected inflation, we set the dummy equal to 0 when respondents answered either ‘I don’t know’ or ‘I don’t form expectations’. We regress that dummy variable on another dummy variable taking the value 1 when the respondent was asked the non-guided variant of the question. In principle, a binary model linking outcome and treatment provides unbiased coefficients, since the treatment was randomly assigned to respondents. However, the zero correlation between control treatments and variables is strictly valid only in infinitely large samples. Moreover, the inclusion of control variables potentially reduces the idiosyncratic estimation error, thereby improving the efficiency with which the treatment effect is estimated. In a second specification, we therefore add socio-demographic variables to the binary estimation.

We control for the respondent’s age (in years), gender (a dummy variable set to 1 when the respondent is a woman), level of education (dummy variables coding whether he or she did an apprenticeship, went to secondary school, holds the German equivalent of A-levels/high school diploma, the Abitur, or went to university; the baseline category is primary education), and household income (in 1,000 euros).<sup>2</sup> Note that we adopt a 5% level of significance for our hypothesis tests, except where stated otherwise.

Columns (1) and (2) of Table 3 report the results of the regressions pertaining to the propensity to answer the question on past inflation; Columns (3) and (4) report regressions pertaining to the propensity to answer the question on expected inflation.

The main finding appears in the first row of Table 3, which reports the coefficient of the dummy coding the non-guided response option. In all regressions, the coefficient of that variable is negative and statistically significant at the 1% level. Therefore, respondents were less likely to provide an answer to a question when in the non-guided treatment compared to those in the the guided one.

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<sup>2</sup> Table A1 in the Appendix reports the summary statistics for the control variables.

Table 3: Dependent variable: Propensity to report past and expected inflation.

	(1)	(2)	(3)	(4)
	Reports past inflation		Reports expected inflation	
Free answers	-0.71 (-7.62)***	-0.81 (-8.19)***	-0.87 (-9.51)***	-0.92 (-9.80)***
Female		-0.52 (-5.18)***		-0.29 (-3.11)***
Age respondent		0.01 (4.04)***		0.01 (2.77)***
Apprenticeship		1.03 (4.801)***		0.59 (2.84)***
Secondary school		1.42 (6.75)***		0.99 (4.86)***
Abitur		1.72 (6.99)***		0.89 (3.81)***
University		2.01 (7.46)***		1.64 (6.48)***
Household income		0.49 (5.15)***		0.21 (2.54)**
Observations	2,015	2,015	2,015	2,015

Estimator: logit. Constant included but not reported. z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

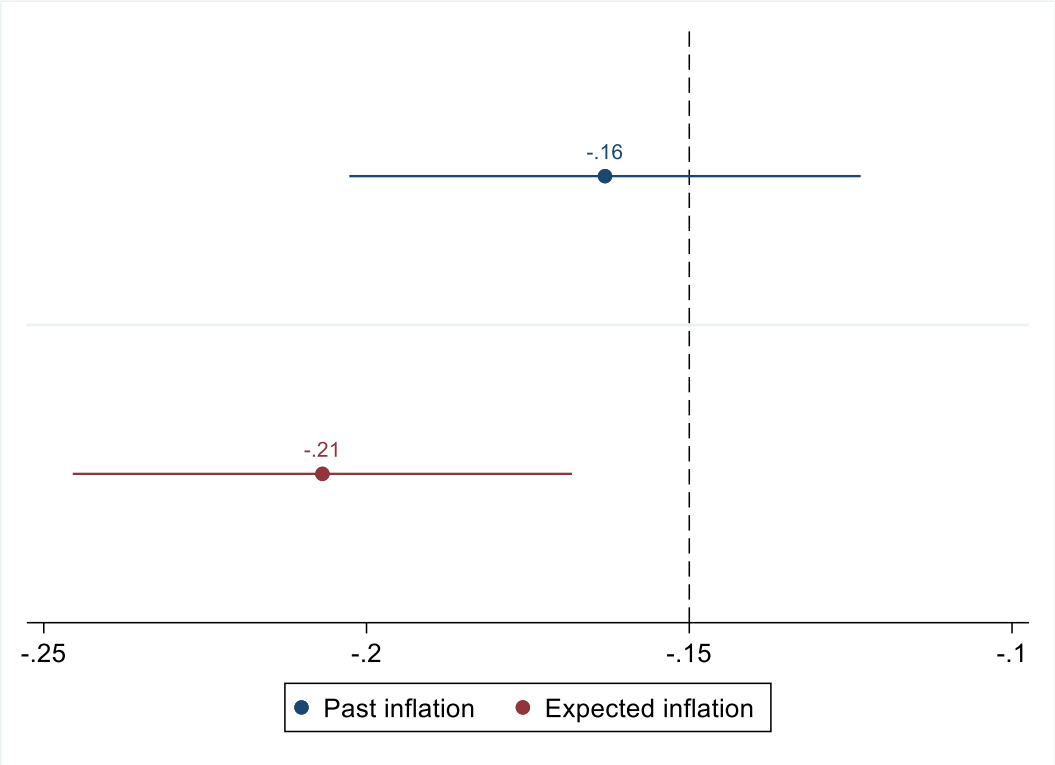
Our control variables show consistent signs across the two regressions. Specifically, the female dummy exhibits a negative sign, which implies that female respondents were less likely than male respondents to answer the two questions. Age bears a positive coefficient, implying that older respondents were more likely to answer the question. The apprenticeship, secondary school, Abitur, and university dummies all exhibit a positive coefficient, implying that respondents with more than primary education are more likely to answer the question. Finally, household income correlates positively with the propensity to answer both questions. These results are consistent with stylised facts on laypersons' interest in and knowledge about monetary policy in Germany (Hayo and Neuenkirch, 2018).

Based on Regressions 1 and 3 of Table 3, Figure 4 reports the marginal effects of being asked the non-guided response option for both past and expected inflation. The non-guided variant reduces the answer probability by 16 percentage points (pp) for past inflation and by 21pp for expected inflation. However, the two marginal effects are statistically indistinguishable, as the confidence intervals overlap.

In Table A2 in the Appendix, we distinguish between 'I don't know' and 'I don't form expectations' answers to the expected inflation question and estimate a multinomial logit model. The result show that the non-guided response option significantly decreases the probability of giving an answer and increases the probability of choosing one of the two ways not to answer. The main additional information stemming from the multinomial logit model is

that the marginal effect of the non-guided question on the probability to reply ‘I don’t form expectations’ is three times as large as on the probability to reply ‘I don’t know’.

Figure 4: Average marginal effect of the non-guided response option on the propensity to answer



Notes: Estimates obtained from Regressions 1 and 3 of Table 3. 95% confidence intervals.

We interpret this finding as revealing the relative social desirability of the two answers. Replying that one does not form expectations is likely less embarrassing than replying that one does not know. As a result, non-guided respondents concerned about giving a foolish reply will be more likely to reply that they do not form expectations than that they just do not know.

Second, to compare the quantitative inflation answers across the two response options, we estimate models where the dependent variable is the answer reported by respondents about perceived or expected inflation, respectively (see Table 4). For perceived inflation, the dependent variable is obtained by merging Questions 1a and 1b. For expected inflation, the dependent variable is obtained by merging Questions 4a and 4b.

For a proper comparison, the answers to the two questions need to be expressed on the same scale. We therefore convert continuous answers into intervals. We regress the stated past inflation level on a dummy variable taking the value 1 when the respondent was asked Question 1a and 0 otherwise. As the dependent variable now follows a natural ordering, the model is



estimated as an ordered logit model. We first estimate a bivariate model and then add control variables: demographics (age and gender), a series of dummies capturing education level, and a series of dummies coding income.

Table 4 shows that most control variables are statistically insignificant. In the regression taking past inflation as its dependent variable, the Abitur and university variables exhibit a negative sign that is statistically significant at the 10% level only (Column (2)). Thus, respondents who have completed secondary education or hold a university degree seem to perceive less inflation. In the same regression, household income correlates negatively with past inflation, as the coefficient of household income is negative and statistically significant. This finding on perceived past inflation is in line with that found by Jaravel (2019) for the US and that found by Gürer and Weichenrieder (2020) for the EU, who observe that measured consumer price inflation decreases with income. For expected inflation, none of the control variables is statistically significant (Column (4)).

Columns (1) and (2) of Table 4 show that the coefficient of the dummy variable coding the non-guided response option is always negative and statistically significant. Accordingly, respondents who replied to the non-guided variant, on average reported lower levels of perceived past inflation than those who answered the guided one.

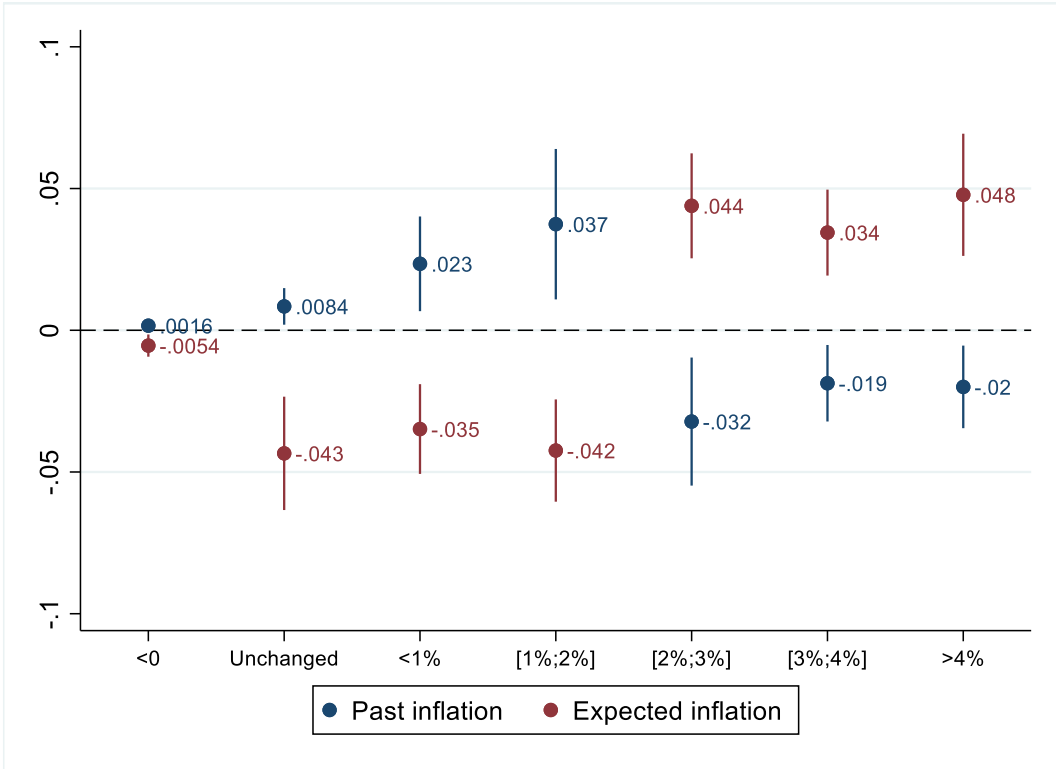
Table 4: Dependent variable: Reported past and expected inflation.

	(1)	(2)	(3)	(4)
	Past inflation		Expected inflation	
Free answers	-0.29 (-2.78)***	-0.25 (-2.40)**	0.52 (4.63)***	0.52 (4.64)***
Female		0.10 (0.95)		-0.07 (-0.59)
Age respondent		-0.001 (-0.37)		0.002 (0.44)
Apprenticeship		-0.28 (-0.88)		0.004 (0.01)
Secondary school		-0.38 (-1.19)		-0.03 (-0.10)
Abitur		-0.66 (-1.93)*		-0.20 (-0.596)
University		-0.56 (-1.65)*		-0.03 (-0.10)
Household income		-0.17 (-2.01)**		-0.14 (-1.50)
Observations	1,250	1,250	1,050	1,050

Estimator: logit. Constant included but not reported. z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Figure 5 reports the average marginal effect of the non-guided response option, which allows assessing its magnitude and observing which inflation brackets are affected.

Figure 5: Average marginal effect of the free variant of the question on reported past and expected inflation



Notes: Estimates obtained from Regressions 1 and 3 of Table 4. 95% confidence intervals.

The negative average effect noted above is not uniformly observed for all stated inflation rates. In the case of past inflation, the non-guided variant has little impact on the probability of reporting that inflation decreased or remained unchanged. This raises, by 2pp and 4pp, respectively, the probability that respondents report an increase of less than 1% or between 1% and 2%. For higher stated past inflation values, the impact of the free question switches sign and reduces, by about 2pp, the likelihood of choosing any value higher than 2%. Thus, the average negative effect noted above is driven by reported past inflation rates above 2%.

Columns (3) and (4) of Table 4 show that the effect of the non-guided variant on expected inflation is, on average, positive and statistically significant. Accordingly, and in notable contrast to its effect on past inflation, the non-guided response option prompted respondents to report higher expected inflation.

Reflecting their opposite qualitative effects, the quantitative assessment in Figure 5 illustrates that, again, the average effect, in this case positive, can be misleading. The magnitude of the response option effect on expected inflation mirrors its impact on past inflation. The non-guided version reduces the probability that expected inflation is lower than 1% or between 1% and 2%

but increases, by up to 5pp, the probability that it will be reported as any value above 2%. The main quantitative differences in absolute terms between the effects of the non-guided response option on past and expected inflation are that the likelihood of reporting unchanged prices is five times larger and that of reporting a rate greater than 4% is two times smaller in the case of the former compared to the latter.

#### **4. Robustness Checks and Extensions**

In this section, we study whether the effect of the treatment is heterogenous with regard to respondent characteristics. Specifically, we condition the effect on being socialised in the former German Democratic Republic, socio-demographic variables such as income, education, and gender, objective and subjective knowledge about monetary policy, and political affiliation. Generally, we find that conditioning on these variables does not result in significant switches in the sign of the response option effect. However, when considering the magnitude of the response option effect, we discover a number of cases where there is a notable degree of heterogeneity across the various categories of a variable, which we summarise below (only reporting significant effects).

**Conditioning on Inflation Experience in East and West Germany:** Until 1990, Germany was divided into the Federal Republic of Germany (FRG) and the German Democratic Republic (GDR), which might have caused differences in attitude between the inhabitants of the two regions (Alesina and Fuchs-Schündeln, 2007). West Germans had always lived in a market economy; East Germans experienced a transition from a planned to a market economy in the early 1990s. East Germans had to adjust to a new economic system based on generally flexible prices. These differences in experience may prompt (formerly) East Germans to react differently from (formerly) West Germans to the two response options of the inflation questions.

We thus distinguish respondents based on their area of residence and estimate our models separately for residents of former East and West Germany. The results are reported in the Appendix in Tables Table A3a and Table A4a; Tables Table A3b and Table A4b report marginal effects.

Table A3a shows a significantly lower influence of the response option effect for East Germans compared to West Germans, but the magnitude of the difference is small. A striking finding appears in Table A3b, which reports results pertaining to the stated inflation rate. We find that the response option type influences only the answers of West Germans, whereas it has no

statistically significant effect on East Germans. Specifically, West Germans report a significantly lower past inflation rate and a significantly higher expected inflation rate when faced with the non-guided response option.

Having to adjust to a new economic system may have made East Germans more mindful of inflation and less likely to be affected by a simple variation in the response options. A testable implication of this explanation is that the East German reaction should be driven by respondents who lived in the GDR before its collapse in 1989. We therefore further distinguish respondents based on how old they were when the Berlin Wall fell, which is in line with the ‘impressionable years’ hypothesis. This hypothesis refers to the phase of primary socialisation, which is extensively discussed in sociology (e.g., Berger and Luckmann,<sup>o</sup>1966; Mead,<sup>o</sup>1967) and psychology (e.g., Krosnick and Alwyn,<sup>o</sup>1989; Giuliano and Spilimbergo,<sup>o</sup>2014), and posits that values, attitudes, and dispositions are all formed before a certain age. Accordingly, we distinguish respondents who were younger or older than 15 in 1989. The results by age group are reported in Columns (3) to (6) of Tables Table A3a, A3b, Table A4a, and A4b. All groups are less likely to answer when faced with the non-guided version, but among respondents who were 15 or older in 1989, West Germans react significantly more strongly to the two response options than do East Germans. By contrast, the regional difference is statistically insignificant for respondents who were younger than 15 in 1989.

The response option effect on the reported inflation rate is reported in Tables Table A4a and Table A4b. The results reveal that the significant difference between East and West Germans is again essentially driven by those who were 15 or older in 1989. Our results therefore support the ‘impressionable years’ hypothesis: Germans who lived long enough in the GDR do not, on average, react to the variation in the response options. One interpretation is that older East Germans had to adapt to a market economy with free prices. As a result, they became more mindful of price changes than West Germans, who never had to adjust to a new system, or younger East Germans, who grew up in the new system.<sup>3</sup>

**Conditioning on Income:** Respondents with different incomes purchase different bundles of goods and services and, hence, might be affected differently by inflation. For instance,

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<sup>3</sup> As we do not know whether respondents were born where they live, we cannot rule out the possibility that some respondents who were interviewed in one part of the country moved there after growing up in the other part. However, such migration would likely dampen the estimated difference between the two parts of the country because some Western respondents were socialised in the Eastern part before moving the West and vice-versa.

Jaravel<sup>o</sup>(2019) and Gürer and Weichenrieder<sup>o</sup>(2020) show that the price of poor households' consumption basket increased more than that of rich households. Households with different levels of income may also be affected by different types of shocks or have different degrees of optimism (Souleles,<sup>o</sup>2004). As a result, their reactions to the specific form of the response options to the inflation question may vary too. To test this possibility, we estimate our model separately for each income quartile (see Tables Table A5a, A5b, Table A6a, and A6b in the Appendix). In the case of past inflation, respondents in the bottom and top income quartiles react significantly less to free answers than do middle-income respondents. The magnitude of the difference in marginal effects is notable: for instance, the reaction of respondents from the third income quartile is twice as large as that of those from the fourth quartile. Interestingly, this ordering of answer probabilities is reversed when asking about inflation expectations: people from the low and high end of the income distribution show the highest sensitivity to the type of question. Among these two groups, the latter react significantly more strongly than the former to the non-guided variant.

**Conditioning on Education:** The effect of survey question design on people's answers may depend on their education level. In the context of the 'forbid-allow anomaly', Rugg<sup>o</sup>(1941) reports a greater effect of variations in the phrasing of the question on better-educated respondents, which can be interpreted as education increasing people's sensitivity to variations in language. However, Hippler and Schwarz<sup>o</sup>(1988) report the opposite. They argue that educated people tend to have stronger opinions that are less likely to be influenced by the concrete specification of the question. In the context of inflation expectations, Coibion et al. (2020) recall that household surveys document systematic differences between respondents with different levels of formal education. To test the possible influence of education, we ran specific regressions by level of education; the results are reported in Tables Table A7a, A7b, Table A8a, and A8b. For past inflation, free answers reduce the probability of answering and the effect generally declines with level of education, as the coefficient of the dummy variable is negative and statistically significant, thus generally supporting Hippler and Schwarz's<sup>o</sup>(1988) argument. At up to a factor of three, the differences in marginal effects for past inflation can be sizable.

**Conditioning on Gender:** Men and women have been found to have different perceptions and expectations of inflation that may be driven by household gender roles (Coibion et al.<sup>o</sup>2020; D'acunto et al.,<sup>o</sup>2020). There is also empirical evidence that women have relatively lower objective and subjective knowledge about monetary policy affairs (Hayo and

Neuenkirch,°2018). We therefore estimated each regression separately for each gender (see Tables Table A9a, A9b, Table A10a, and A10b). We find little evidence that the response option effect is different for men and women.

**Conditioning on Objective and Subjective Monetary Policy Knowledge:** For the most part, the public is ill-informed about monetary policy and central banking (van der Cruijssen et al.,°2015; Hayo and Neuenkirch,°2018; Coibion et al.,° 2020), which may affect not only their propensity to answer questions about inflation but also how they react to cues provided by intervals. To test that possibility, we successively conditioned the effect of the type of question on respondents' objective and subjective knowledge about monetary policy. We constructed an index of objective knowledge based on four questions pertaining to monetary policy and the European Central Bank.<sup>4</sup> We added one point to the index for each correct answer, resulting in an index ranging from 0 when the respondent did not answer any of the four questions correctly, to 4 when he/she answered all of them correctly. We also conditioned the response option effect on respondents' subjective knowledge, assessed directly by asking them to indicate it on a scale from 1 to 5.

Tables Table A11a and Table A11b show that those who were unable to answer even one question correctly are relatively more sensitive to the specific response options. Their likelihood of answering the non-guided version decreases by 20pp more than that of respondents with very high knowledge. We find a similar result for expected inflation. The non-guided version tends to significantly reduce (increase) reported past (expected) inflation for respondents with the lowest objective knowledge score.

Moving on to subjective knowledge, in Tables Table A13a and Table A13b, we discover that the response option effects on past inflation across subjective knowledge levels are generally insignificantly different from each other. Tables Table A14a and Table A14b set out the response option effect for subjective knowledge on the stated inflation rates. Similar to the case of objective knowledge, the non-guided version reduces (increases) the past (expected) inflation value given by respondents who think they know very little about the ECB and monetary policy issues.

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<sup>4</sup> The four questions pertained to the ECB's objective, to its independence from governments, to the value of the repo rate at the time of the interview, which was zero, and to the relationship between policy rates and inflation (see Hayo and Neuenkirch,°2014).

**Conditioning on Political Affiliation:** There is empirical evidence suggesting that both the perception of past performance (Evan and Andersen,°2006) and expectations of future economic performance (Gerber and Huber,°2010; Bachmann et al.,°2021) are subject to partisan biases. We therefore condition the ‘type-of-question’ effect on political affiliation.

As Tables Table A15a and Table A15b show, we generally find relatively small differences across party preferences. In the case of inflation expectations, FDP supporters stand out because their likelihood of answering the question is not subject to a response option effect. Thus, the self-claimed competence of the FDP in economic matters seems to be reflected in its supporters’ willingness to provide an inflation expectation even in the case of non-guided responses. For instance, compared to FDP voters, left party supporters have a 20pp greater probability of not answering when faced with the non-guided variant.

Tables Table A16a and Table A16b study whether the choice between guided form and non-guided form leads to significant differences with regard to the stated values for past and future inflation. For past inflation, we find no notable differences, whereas for expected inflation, we find that the expected inflation rates provided by FDP supporters are not affected by different response options.

## **5. Conclusion**

Conducting a survey experiment within a representative survey of the German population, we test how the way in which respondents are asked to state their perceived past inflation rate and their expected inflation rate affects their propensity to answer and the reported magnitude of their answers. The first main finding is that letting respondents report a number without giving them any guidance results in a lower response rate than does asking them to choose from a list of ranges. The result holds when respondents are asked to state their perceived past inflation rate and when they are asked about their expected inflation rate.

There are several possible interpretations of this result. A pragmatic approach would suggest using predefined response options, as this reduces the number of missings. However, inasmuch as multiple-choice answers induce respondents to provide an answer even though they do not have clearly defined inflation views (i.e., non-attitudes), they increase the amount of noise in responses.

Interestingly, we also find a strong response option effect when considering the share of people stating that they do not form inflation expectations. Thus, it seems likely that the provision of predefined response options prompts respondents to select a number as an inflation expectation

even though they would not have done so if they had faced a free-form answer. We consider this as suggesting that the answers to the standard guided question on inflation expectations contain a noticeable number of people who do not actually form such expectations (in our sample: 30% plus 15% choosing ‘don’t know’).

The second main finding is that the type of response option also affects the average reported inflation rate. The effect, however, bears an opposite sign for past and expected inflation. Specifically, letting respondents state a number without giving them any guidance resulted, on average, in a lower reported past inflation rate but a higher reported expected inflation rate. This has worrying implications. If it is the case that we induce respondents to provide answers on inflation by offering predefined answer choices even though they do not have clearly defined views, we may actually create an undesirable bias in the answers. This suggests that the pragmatic view, namely, that predefined answers reduce the number of missings, may actually be problematic when drawing inferences about laypersons’ inflation perceptions and expectations.

A third set of results was obtained by conditioning the response option effect on a variety of respondent characteristics: income, education, gender, objective and subjective knowledge about monetary policy, and political affiliation. The working of the effect remains qualitatively unchanged, but different categories of these variables can have a notable effect on the quantitative importance of the ‘response option effect’.

In particular, we found a meaningful difference in the effect of the type of question between East and West German respondents if they were 15 or older when the Berlin Wall fell, whereas we found no such difference for younger respondents. This finding is in line with the ‘impressionable years’ hypothesis and likely reflects different inflation experiences in the two parts of Germany.

We believe our findings are relevant for researchers conducting or using surveys that intend to measure perceived past or expected future inflation and demonstrate that response options can have a meaningful impact on the outcome. Generalising this result beyond the field of subjective inflation measurement suggests that the way answers are phrased is an integral part of question design. Not only does it affect the propensity of respondents to answer the questions, but it also affects their average answers. In addition, the magnitude of the response option effect varies over categories of socio-demographic and knowledge variables. Thus, the design of response options can affect the outcome of surveys along various dimensions and researchers should be aware of this.



The finding that non-guided answers reduce the propensity to answer is the same for past and expected inflation; however, we observe opposite results for the stated value of past and expected inflation rates. This leads to the question of when and why a specific type of answer affects non-response and biases answers upwards or downwards, a question that warrants further research. Part of the explanation may rest on respondents' previous inflation experiences, as our results for East and West Germany show. Hence, how respondents react to a specific type of answer may be a function of their early life experience. Clearly, the connection between respondents' economic experience and sensitivity to response options deserves more scrutiny.

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# Measuring Household Inflation Perceptions and Expectations: The Effect of Guided vs Non-Guided Inflation Questions

## *Appendix*

### A.1. Summary Statistics

Table A1: Summary statistics

	Mean	Std. dev. (when relevant)
Free answers (Q1a)	0.516	
Free answers (Q4a)	0.496	
Age respondent	50.89	18.54
Female	0.54	
No completed training	0.043	
Apprenticeship	0.288	
Secondary school	0.408	
Abitur	0.123	
University	0.108	
Net household income per capita	1.207	0.60
Objective monetary policy knowledge	1.343	1.26
Subjective monetary policy knowledge	2.247	0.98
Do you trust the ECB?	2.582	1.01
Vote for Linkspartei/PDS	0.076	
Vote for SPD	0.15	
Vote for Die Grünen	0.097	
Vote for FDP	0.064	
Vote for CDU/CSU	0.227	
Vote for AfD	0.095	
Vote for other Party	0.071	
East Germany	0.212	
West German	0.788	
15 or older in 1989	0.659	

## A.2. Distinguishing Between ‘I don’t know’ and ‘I don’t form expectations’

Table A2: Distinguishing ‘I don’t know’ from ‘I don’t form expectations’

	(1) Reports expected inflation	(2) Doesn’t form expectations	(3) Doesn’t know
Free answers (Q4a) (raw coefficient)	-	1.15 (9.70)***	0.64 (5.85)***
Average marginal effect	-0.21 (-10.48)***	0.15 (8.66)***	0.05 (2.80)***
Observations	2,015	2,015	2,015

Multinomial logit estimate. z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### A.3. Robustness Checks and Extensions

#### A.3.1. Effect Conditional on Early Life in East or West Germany

Table A3a: Dependent variable: Propensity to report past and expected inflation. East vs. West Germany: Raw coefficients

	(1) East	(2) West	(3) ≥15 in the GDR	(4) ≥15 in the FRG	(5) <15 in the GDR	(6) <15 in the FRG
<i>Past inflation</i>						
Free answers (Q1a)	-0.626 (-3.26)***	-0.742 (-6.91)***	-0.568 (-2.43)**	-0.764 (-5.54)***	-0.827 (-2.42)**	-0.750 (-4.31)***
Observations	482	1,533	336	979	146	554
<i>Expected inflation</i>						
Free answers (Q4a)	-0.873 (-4.61)***	-0.867 (-8.29)***	-0.864 (-3.81)***	-0.889 (-6.77)***	-0.903 (-2.62)***	-0.811 (-4.64)***
Observations	482	1,533	336	979	146	554

z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table A3b: Average marginal effects: Dependent variable: Propensity to report past and expected inflation. East vs. West Germany

	(1) East	(2) West	(3) >15 in the GDR	(4) >15 in the FRG	(5) <15 in the GDR	(6) <15 in the FRG
<i>Past inflation</i>						
Free answers (Q1a)	-0.144 (-3.40)***	-0.169 (-7.36)***	-0.128 (-2.51)**	-0.167 (-5.88)***	-0.194 (-2.63)***	-0.179 (-4.62)***
Observations	482	1,533	336	979	146	554
<i>Expected inflation</i>						
Free answers (Q4a)	-0.202 (-5.06)***	-0.207 (-9.13)***	-0.200 (-4.17)***	-0.211 (-7.49)***	-0.209 (-2.90)***	-0.192 (-5.04)***
Observations	482	1,533	336	979	146	554

z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table A4a: Dependent variable: Reported past and expected inflation. Effect conditioned on income: Raw coefficients

	(1) East	(2) West	(3) >15 in the GDR	(4) >15 in the FRG	(5) <15 in the GDR	(6) <15 in the FRG
<i>Past inflation</i>						
Free answers (Q1a)	-0.263 (-1.24)	-0.326 (-2.7)***	-0.196 (-0.78)	-0.328 (-2.23)**	-0.341 (-0.82)	-0.321 (-1.51)
Observations	299	951	215	643	84	308
<i>Expected inflation</i>						
Free answers (Q4a)	0.308 (1.43)	0.601 (4.50)***	0.113 (0.44)	0.478 (2.96)***	0.738 (1.83)*	0.856 (3.61)***
Observations	282	768	197	524	85	244

z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table A4b: Average marginal effects: Dependent variable: Reported past and expected inflation. East vs. West Germany

	(1) East	(2) West	(3) >15 in the GDR	(4) >15 in the FRG	(5) <15 in the GDR	(6) <15 in the FRG
<i>Past inflation</i>						
< 0	0.00175 (0.93)	0.00170 (1.72)*	0.000909 (0.62)	0.00253 (1.58)	0.00400 (0.64)	0.0148 (1.42)
Unchanged	0.00172 (0.93)	0.0116 (2.49)**	0.000899 (0.62)	0.0101 (2.03)**	0.00390 (0.64)	0.0304 (1.51)
< 1%	0.0151 (1.20)	0.0282 (2.68)***	0.0117 (0.77)	0.0270 (2.21)**	0.0181 (0.78)	0.0316 (1.47)
[1%; 2%]	0.0461 (1.25)	0.0356 (2.64)***	0.0353 (0.78)	0.0375 (2.18)**	0.0539 (0.83)	-0.0355 (-1.52)
[2%; 3%]	-0.0264 (-1.24)	-0.0351 (-2.71)***	-0.0208 (-0.78)	-0.0348 (-2.24)**	-0.0278 (-0.8)	-0.0210 (-1.47)
[3%; 4%]	-0.0153 (-1.21)	-0.0216 (-2.62)***	-0.0107 (-0.77)	-0.0219 (-2.16)**	-0.0230 (-0.81)	-0.0203 (-1.45)
> 4%	-0.0230 (-1.21)	-0.0204 (-2.57)**	-0.0173 (-0.77)	-0.0204 (-2.12)**	-0.0292 (-0.80)	
Observations	299	951	215	643	84	308
<i>Expected inflation</i>						
< 0	-0.00217 (-1.01)	-0.00696 (-2.51)**	-0.00114 (-0.42)	-0.00542 (-1.89)*	-0.0632 (-1.58)	-0.0104 (-1.57)
Unchanged	-0.0182 (-1.36)	-0.0550 (-4.11)***	-0.00534 (-0.44)	-0.0383 (-2.75)***	-0.0440 (-1.58)	-0.0974 (-3.24)***
< 1%	-0.0166 (-1.37)	-0.0421 (-4.2)***	-0.00565 (-0.44)	-0.0361 (-2.82)***	-0.0660 (-1.86)*	-0.0501 (-3.17)***
[1%; 2%]	-0.0339 (-1.44)	-0.0319 (-3.71)***	-0.0133 (-0.44)	-0.0297 (-2.73)***	0.0251 (1.08)	-0.0297 (-1.88)*
[2%; 3%]	0.00575 (0.87)	0.0561 (4.64)***	0.00110 (0.31)	0.0487 (3.03)***	0.0727 (1.87)*	0.0646 (3.70)***
[3%; 4%]	0.0278 (1.44)	0.0316 (4.07)***	0.00975 (0.44)	0.0256 (2.76)***	0.0755 (1.67)*	0.0428 (3.03)***
> 4%	0.0373 (1.42)	0.0482 (4.07)***	0.0146 (0.44)	0.0352 (2.74)***		0.0802 (3.13)***
Observations	282	768	197	524	85	244

z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### A.3.2. Effect Conditional on Income

Table A5a: Dependent variable: Propensity to report past and expected inflation. Effect conditioned on income

	(1) 1st quartile	(2) 2nd quartile	(3) 3rd quartile	(4) 4th quartile
<i>Past inflation</i>				
Free answers	-0.616 (-3.483)***	-0.862 (-4.632)***	-0.991 (-5.216)***	-0.467 (-2.157)**
Observations	524	503	542	446
<i>Expected inflation</i>				
Free answers	-0.837 (-4.626)***	-0.766 (-4.213)***	-0.718 (-4.077)***	-1.319 (-6.463)***
Observations	524	503	542	446

Estimator: logit. Constant included but not reported. z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table A5b: Average marginal effects: Dependent variable: Propensity to report past and expected inflation. Effect conditioned on income

	(1) 1st quartile	(2) 2nd quartile	(3) 3rd quartile	(4) 4th quartile
<i>Past inflation</i>				
Free answers (Q1a)	-0.15 (-3.66)***	-0.20 (-5.06)***	-0.21 (-5.74)***	-0.09 (-2.19)**
Observations	524	503	542	446
<i>Expected inflation</i>				
Free answers (Q4a)	-0.20 (-5.04)***	-0.18 (-4.54)***	-0.17 (-4.34)***	-0.29 (-8.03)***
Observations	524	503	542	446

z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table A6a: Dependent variable: Reported past and expected inflation. Effect conditioned on income

	(1) 1st quartile	(2) 2nd quartile	(3) 3rd quartile	(4) 4th quartile
<i>Past inflation</i>				
Free answers	-0.369 (-1.625)	-0.228 (-1.059)	-0.175 (-0.900)	-0.388 (-1.878)*
Observations	263	301	362	324
<i>Expected inflation</i>				
Free answers	0.187 (0.777)	0.647 (2.810)***	0.702 (3.354)***	0.551 (2.398)**
Observations	231	251	308	260

Estimator: ordered logit. Constant included but not reported. z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1



Table A6b: Average marginal effects: Dependent variable: Reported past and expected inflation. Effect conditioned on income

	(1) 1st quartile	(2) 2nd quartile	(3) 3rd quartile	(4) 4th quartile
<i>Past inflation</i>				
< 0	0.00 (0.85)	0.00 (0.85)	0.00 (0.82)	0.01 (1.50)
Unchanged	0.01 (1.43)	0.01 (1.02)	0.01 (0.88)	0.04 (1.85)*
< 1%	0.02 (1.53)	0.02 (1.05)	0.01 (0.90)	0.05 (1.85)*
[1%; 2%]	0.06 (1.65)*	0.03 (1.05)	0.02 (0.89)	-0.04 (-1.90)*
[2%; 3%]	-0.03 (-1.61)	-0.03 (-1.06)	-0.02 (-0.90)	-0.02 (-1.80)*
[3%; 4%]	-0.03 (-1.59)	-0.01 (-1.04)	-0.01 (-0.89)	-0.02 (-1.75)*
> 4%	-0.03 (-1.57)	-0.02 (-1.04)	-0.01 (-0.88)	
Observations	263	301	362	324
<i>Expected inflation</i>				
< 0	-0.00 (-0.71)	-0.01 (-1.27)	-0.00 (-1.31)	-0.01 (-1.55)
Unchanged	-0.02 (-0.76)	-0.06 (-2.53)**	-0.07 (-3.01)***	-0.03 (-2.10)**
< 1%	-0.01 (-0.76)	-0.04 (-2.52)**	-0.04 (-3.00)***	-0.05 (-2.27)**
[1%; 2%]	-0.02 (-0.79)	-0.05 (-2.73)***	-0.05 (-3.19)***	-0.04 (-2.28)**
[2%; 3%]	0.01 (0.77)	0.06 (2.86)***	0.07 (3.42)***	0.05 (2.44)**
[3%; 4%]	0.01 (0.78)	0.04 (2.63)***	0.03 (2.93)***	0.05 (2.32)**
> 4%	0.02 (0.77)	0.05 (2.50)**	0.07 (3.04)***	0.04 (2.14)**
Observations	231	251	308	260

z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### A.3.3. Effect Conditional on Education

Table A7a: Dependent variable: Propensity to report past and expected inflation. Effect conditioned on education

	(1) Education 1	(2) Education 2	(3) Education 3	(4) Education 4	(5) Education 5
<i>Past inflation</i>					
Free answers	-1.44 (-3.08)***	-1.09 (-6.31)***	-0.45 (-3.04)***	-0.61 (-2.22)**	-0.75 (-2.07)**
Observations	107	597	823	255	199
<i>Expected inflation</i>					
Free answers	-0.70 (-1.66)*	-1.02 (-6.04)***	-0.78 (-5.43)***	-1.15 (-4.41)***	-0.63 (-1.98)**
Observations	107	597	823	255	199

Estimator: logit. Constant included but not reported. z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table A7b: Average marginal effects: Dependent variable: Propensity to report past and expected inflation. Effect conditioned on education

	(1) Education 1	(2) Education 2	(3) Education 3	(4) Education 4	(5) Education 5
<i>Past inflation</i>					
Free answers (Q1a)	-0.29 (-3.67)***	-0.25 (-7.30)***	-0.10 (-3.10)***	-0.13 (-2.30)**	-0.12 (-2.11)**
Observations	107	597	823	255	199
<i>Expected inflation</i>					
Free answers (Q4a)	-0.16 (-1.74)*	-0.24 (-6.92)***	-0.18 (-5.86)***	-0.27 (-5.25)***	-0.13 (-2.04)**
Observations	107	597	823	255	199

z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table A8a: Dependent variable: Reported past and expected inflation. Effect conditioned on education

	(1) Education 1	(2) Education 2	(3) Education 3	(4) Education 4	(5) Education 5
<i>Past inflation</i>					
Free answers	-0.60 (-0.85)	-0.16 (-0.80)	-0.28 (-1.74)*	-0.28 (-0.99)	-0.44 (-1.47)
Observations	35	350	526	175	159
<i>Expected inflation</i>					
Free answers	0.30 (0.51)	0.25 (1.12)	0.70 (4.06)***	0.020 (0.063)	0.96 (3.06)***
Observations	41	282	453	129	142

Estimator: ordered logit. Constant included but not reported. z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table A8b: Average marginal effects: Dependent variable: Reported past and expected inflation. Effect conditioned on education

	(1) Education 1	(2) Education 2	(3) Education 3	(4) Education 4	(5) Education 5
<i>Past inflation</i>					
< 0	0.03 (0.75)	0.00 (0.73)	0.00 (1.10)	0.00 (0.81)	0.01 (1.03)
Unchanged	0.01 (0.67)	0.01 (0.79)	0.01 (1.59)	0.01 (0.92)	0.04 (1.45)
< 1%	0.10 (0.87)	0.01 (0.80)	0.02 (1.72)*	0.03 (0.99)	0.05 (1.42)
[1%; 2%]	-0.02 (-0.60)	0.02 (0.80)	0.04 (1.74)*	0.03 (0.97)	-0.05 (-1.49)
[2%; 3%]	-0.02 (-0.79)	-0.02 (-0.80)	-0.03 (-1.75)*	-0.03 (-1.00)	-0.03 (-1.40)
[3%; 4%]	-0.11 (-0.84)	-0.01 (-0.80)	-0.02 (-1.70)*	-0.02 (-0.96)	-0.02 (-1.30)
> 4%		-0.01 (-0.80)	-0.02 (-1.69)*	-0.01 (-0.95)	
Observations	35	350	526	175	159
<i>Expected inflation</i>					
< 0	-0.01 (-0.46)	-0.00 (-0.88)	-0.01 (-2.11)**	-0.00 (-0.06)	-0.01 (-1.30)
Unchanged	-0.03 (-0.50)	-0.02 (-1.09)	-0.06 (-3.56)***	-0.00 (-0.06)	-0.06 (-2.24)**
< 1%	-0.02 (-0.50)	-0.01 (-1.09)	-0.05 (-3.71)***	-0.00 (-0.06)	-0.07 (-2.64)***
[1%; 2%]	-0.02 (-0.52)	-0.02 (-1.13)	-0.05 (-3.88)***	0.00 (0.06)	-0.08 (-2.85)***
[2%; 3%]	0.02 (0.50)	0.02 (1.12)	0.05 (4.01)***	0.00 (0.06)	0.07 (3.06)***
[3%; 4%]	0.01 (0.51)	0.01 (1.11)	0.05 (3.85)***	0.00 (0.06)	0.06 (2.76)***
> 4%	0.04 (0.51)	0.02 (1.10)	0.06 (3.64)***		0.08 (2.55)**
Observations	41	282	453	129	142

z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### A.3.4. Effect Conditional on Gender

Table A9a: Dependent variable: Propensity to report past and expected inflation. Effect conditioned on gender

	(1) Male	(2) Female
<i>Past inflation</i>		
Free answers	-0.74 (-5.16)***	-0.70 (-5.56)***
Observations	944	1,071
<i>Expected inflation</i>		
Free answers	-0.80 (-5.99)***	-0.93 (-7.43)***
Observations	944	1,071

Estimator: logit. Constant included but not reported. z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table A9b: Average marginal effects: Dependent variable: Propensity to report past and expected inflation. Effect conditioned on gender

	(1) Male	(2) Female
<i>Past inflation</i>		
Free answers (Q1a)	-0.15 (-5.42)***	-0.17 (-5.90)***
Observations	944	1,071
<i>Expected inflation</i>		
Free answers (Q4a)	-0.19 (-6.49)***	-0.22 (-8.32)***
Observations	944	1,071

z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table A10a: Dependent variable: Reported past and expected inflation. Effect conditioned on gender

	(1) Male	(2) Female
<i>Past inflation</i>		
Free answers	-0.30 (-2.03)**	-0.29 (-1.90)*
Observations	651	599
<i>Expected inflation</i>		
Free answers	0.56 (3.51)***	0.49 (3.04)***
Observations	532	518

Estimator: logit. Constant included but not reported. z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table A10b: Average marginal effects: Dependent variable: Reported past and expected inflation. Effect conditioned on gender

	(1) Male	(2) Female
<i>Past inflation</i>		
< 0	0.00 (1.43)	0.00 (1.28)
Unchanged	0.01 (1.87)*	0.01 (1.74)*
< 1%	0.02 (2.01)**	0.02 (1.88)*
[1%; 2%]	0.04 (2.01)**	0.04 (1.90)*
[2%; 3%]	-0.03 (-2.04)**	-0.03 (-1.91)*
[3%; 4%]	-0.02 (-1.99)**	-0.02 (-1.84)*
> 4%	-0.02 (-1.95)*	-0.02 (-1.85)*
Observations	651	599
<i>Expected inflation</i>		
< 0	-0.01 (-1.89)*	-0.01 (-1.92)*
Unchanged	-0.05 (-3.19)***	-0.04 (-2.83)***
< 1%	-0.03 (-3.18)***	-0.04 (-2.89)***
[1%; 2%]	-0.05 (-3.53)***	-0.03 (-2.99)***
[2%; 3%]	0.05 (3.52)***	0.04 (3.05)***
[3%; 4%]	0.03 (3.34)***	0.03 (2.96)***
> 4%	0.05 (3.27)***	0.04 (2.87)***
Observations	532	518

z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### A.3.5. Effect Conditional on Objective and Subjective Knowledge

#### *Objective Knowledge*

Table A11a: Dependent variable: Propensity to report past and expected inflation. Effect conditioned on objective knowledge

	(1)	(2)	(3)	(4)	(5)
Objective knowledge	Very bad				Very good
<i>Past inflation</i>					
Free answers (Q1a)	-0.98 (-5.77)***	-0.71 (-4.22)***	-0.83 (-3.51)***	-0.53 (-1.43)	-0.19 (-0.28)
Observations	615	608	444	201	147
<i>Expected inflation</i>					
Free answers (Q4a)	-0.95 (-5.16)***	-0.92 (-5.55)***	-1.14 (-5.36)***	-1.35 (-4.03)***	-0.35 (-0.74)
Observations	615	608	444	201	147

Estimator: logit. Constant included but not reported. z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table A11b: Average marginal effects: Dependent variable: Propensity to report past and expected inflation. Effect conditioned on objective knowledge

	(1)	(2)	(3)	(4)	(5)
	Very bad				Very good
<i>Past inflation</i>					
Free answers (Q1a)	-0.22 (-6.46)***	-0.17 (-4.48)***	-0.14 (-3.63)***	-0.08 (-1.44)	-0.01 (-0.28)
Observations	615	608	444	201	147
<i>Expected inflation</i>					
Free answers (Q4a)	-0.19 (-5.56)***	-0.22 (-6.20)***	-0.23 (-6.08)***	-0.26 (-4.68)***	-0.05 (-0.74)
Observations	615	608	444	201	147

z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table A12a: Dependent variable: Reported past and expected inflation. Effect conditioned on objective knowledge

	(1)	(2)	(3)	(4)	(5)
Objective knowledge	Very bad				Very good
<i>Past inflation</i>					
Free answers (Q1a)	-0.50 (-2.11)**	-0.22 (-1.12)	-0.26 (-1.28)	-0.57 (-1.89)*	0.46 (1.38)
Observations	244	358	346	165	137
<i>Expected inflation</i>					
Free answers (Q4a)	0.61 (2.22)**	0.65 (3.10)***	0.61 (2.90)***	0.25 (0.80)	0.01 (0.03)
Observations	183	300	302	141	124

Estimator: ordered logit. Constant included but not reported. z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table A12b: Average marginal effects: Dependent variable: Reported past and expected inflation. Effect conditioned on objective knowledge

	(1)	(2)	(3)	(4)	(5)
	Very bad				Very good
<i>Past inflation</i>					
< 0	0.002 (0.91)	0.002 (0.94)	0.001 (0.79)	0.003 (0.89)	-0.003 (-0.81)
Unchanged	0.017 (1.76)*	0.009 (1.09)	0.004 (1.14)	0.013 (1.40)	-0.010 (-1.08)
< 1%	0.041 (2.04)**	0.019 (1.12)	0.021 (1.27)	0.037 (1.77)*	-0.034 (-1.31)
[1%; 2%]	0.063 (2.10)**	0.024 (1.11)	0.036 (1.28)	0.078 (1.87)*	-0.053 (-1.36)
[2%; 3%]	-0.026 (-2.04)**	-0.022 (-1.12)	-0.033 (-1.29)	-0.080 (-1.93)*	0.081 (1.40)
[3%; 4%]	-0.032 (-2.03)**	-0.019 (-1.11)	-0.014 (-1.25)	-0.026 (-1.64)	0.013 (1.14)
> 4%	-0.066 (-2.04)**	-0.013 (-1.10)	-0.015 (-1.24)	-0.026 (-1.60)	0.007 (0.99)
Observations	244	358	346	165	137
<i>Expected inflation</i>					
< 0	-0.007 (-1.20)	-0.006 (-1.52)	-0.008 (-1.66)*	-0.002 (-0.63)	-0.000 (-0.03)
Unchanged	-0.070 (-2.08)**	-0.056 (-2.76)***	-0.055 (-2.63)***	-0.016 (-0.78)	-0.000 (-0.03)
< 1%	-0.036 (-2.04)**	-0.050 (-2.87)***	-0.046 (-2.72)***	-0.014 (-0.78)	-0.000 (-0.03)
[1%; 2%]	-0.030 (-1.91)*	-0.045 (-2.98)***	-0.036 (-2.62)***	-0.030 (-0.81)	-0.002 (-0.03)
[2%; 3%]	0.037 (2.17)**	0.048 (3.04)***	0.057 (2.96)***	0.030 (0.81)	0.001 (0.03)
[3%; 4%]	0.029 (2.08)**	0.038 (2.92)***	0.039 (2.70)***	0.015 (0.79)	0.001 (0.03)
> 4%	0.077 (2.15)**	0.071 (2.90)***	0.050 (2.61)***	0.016 (0.78)	0.000 (0.03)
Observations	244	358	346	165	137

z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## Subjective Knowledge

Table A13a: Dependent variable: Propensity to report past and expected inflation. Effect conditioned on subjective knowledge

	(1) Very bad	(2)	(3)	(4)	(5) Very good
<i>Past inflation</i>					
Free answers	-0.73 (-4.23)***	-0.72 (-4.13)***	-0.83 (-4.83)***	-1.41 (-2.68)***	-
Observations	565	585	676	168	9
<i>Expected inflation</i>					
Free answers	-0.91 (-4.96)***	-1.03 (-6.03)***	-0.90 (-5.59)***	-1.45 (-3.15)***	-0.69 (-0.53)
Observations	565	585	676	168	21

Estimator: logit. Constant included but not reported. z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table A13b: Average marginal effects: Dependent variable: Propensity to report past and expected inflation. Effect conditioned on subjective knowledge

	(1) Very bad	(2)	(3)	(4)	(5) Very good
<i>Past inflation</i>					
Free answers (Q1a)	-0.17 (-4.52)***	-0.16 (-4.37)***	-0.17 (-5.12)***	-0.18 (-2.70)***	
Observations	565	585	676	168	9
<i>Expected inflation</i>					
Free answers (Q4a)	-0.20 (-5.39)***	-0.24 (-6.93)***	-0.21 (-6.17)***	-0.21 (-3.32)***	-0.08 (-0.53)
Observations	565	585	676	168	21

Estimator: ordered logit. Constant included but not reported. z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table A14a: Dependent variable: Reported past and expected inflation. Effect conditioned on subjective knowledge

	(1) Very bad	(2)	(3)	(4)	(5) Very good
<i>Past inflation</i>					
Free answers	-0.63 (-2.66)***	-0.39 (-2.03)**	-0.047 (-0.27)	-0.04 (-0.13)	-
Observations	247	369	472	142	20
<i>Expected inflation</i>					
Free answers	0.70 (2.63)***	0.43 (2.06)**	0.57 (3.06)***	0.59 (1.87)*	0.31 (0.32)
Observations	193	313	391	135	18

Estimator: ordered logit. Constant included but not reported. z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1



Table A14b: Average marginal effects: Dependent variable: Reported past and expected inflation. Effect conditioned on subjective knowledge

	(1) Very bad	(2)	(3)	(4)	(5) Very good
<i>Past inflation</i>					
< 0	0.024 (2.08)**	0.002 (1.16)	0.000 (0.27)	0.000 (0.12)	0.000 (0.00)
Unchanged	0.041 (2.43)**	0.015 (1.83)*	0.001 (0.27)	0.001 (0.13)	0.000 (0.00)
< 1%	0.088 (2.72)**	0.034 (2.01)**	0.003 (0.27)	0.004 (0.13)	0.000 (0.00)
[1%; 2%]	-0.037 (-2.48)**	0.043 (2.00)**	0.007 (0.27)	0.004 (0.13)	-0.000 (-0.00)
[2%; 3%]	-0.044 (-2.55)**	-0.040 (-2.06)**	-0.006 (-0.27)	-0.007 (-0.13)	-0.000 (-0.00)
[3%; 4%]	-0.072 (-2.50)**	-0.030 (-1.96)**	-0.003 (-0.27)	-0.001 (-0.13)	
> 4%		-0.024 (-1.90)*	-0.003 (-0.27)	-0.001 (-0.13)	
Observations	247	369	472	142	20
<i>Expected inflation</i>					
< 0	-0.007 (-1.25)	-0.001 (-0.90)	-0.010 (-2.01)**	-0.004 (-0.89)	-0.043 (-0.31)
Unchanged	-0.09 (-2.45)**	-0.03 (-1.93)*	-0.04 (-2.70)**	-0.06 (-1.72)*	-0.01 (-0.25)
< 1%	-0.04 (-2.41)**	-0.03 (-1.98)**	-0.03 (-2.73)**	-0.04 (-1.76)*	0.05 (0.32)
[1%; 2%]	-0.03 (-2.27)**	-0.04 (-2.09)**	-0.06 (-3.10)**	-0.03 (-1.58)	
[2%; 3%]	0.04 (2.51)**	0.04 (2.06)**	0.05 (3.09)**	0.04 (1.88)*	
[3%; 4%]	0.04 (2.46)**	0.02 (1.99)**	0.04 (2.93)**	0.06 (1.86)*	
> 4%	0.09 (2.50)**	0.04 (1.99)**	0.04 (2.78)**	0.04 (1.63)	
Observations	193	313	391	135	18

z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### A.3.6. Effect Conditional on Political Affiliation

Table A15a: Dependent variable: Propensity to report past and expected inflation. Effect conditioned on political affiliation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Linkspartei	SPD	Grüne	FDP	CDU/CSU	AfD	Other Party
<i>Past inflation</i>							
Free answers (Q1a)	-0.74	-0.91	-0.83	-0.80	-0.55	-0.66	-0.92
	(-2.09)**	(-3.91)***	(-2.66)***	(-2.04)**	(-2.75)***	(-2.28)**	(-2.38)**
Constant	1.24	1.03	1.27	1.28	1.12	0.91	0.85
	(4.52)***	(6.08)***	(5.24)***	(4.39)***	(7.50)***	(4.28)***	(3.01)***
Observations	161	339	207	132	480	213	118
<i>Expected inflation</i>							
Free answers (Q4a)	-1.33	-0.89	-1.11	-0.30	-0.93	-1.02	-0.91
	(-3.81)***	(-4.01)***	(-3.80)***	(-0.83)	(-4.90)***	(-3.56)***	(-2.40)**
Constant	1.28	0.56	0.80	0.38	0.78	0.76	0.30
	(4.91)***	(3.57)***	(3.74)***	(1.42)	(5.58)***	(3.72)***	(1.15)
Observations	161	339	207	132	480	213	118

z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table A15b: Average marginal effects: Dependent variable: Propensity to report past and expected inflation. Effect conditioned on political affiliation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Linkspartei	SPD	Grüne	FDP	CDU-CSU	AfD	OtherParty
<i>Past inflation</i>							
Free answers (Q1a)	-0.15	-0.20	-0.17	-0.16	-0.12	-0.15	-0.21
	(-2.18)**	(-4.27)***	(-2.82)***	(-2.15)**	(-2.82)***	(-2.39)**	(-2.63)***
Observations	161	339	207	132	480	213	118
<i>Expected inflation</i>							
Free answers (Q4a)	-0.28	-0.21	-0.25	-0.07	-0.22	-0.23	-0.22
	(-4.65)***	(-4.44)***	(-4.45)***	(-0.84)	(-5.45)***	(-4.06)***	(-2.67)***
Observations	161	339	207	132	480	213	118

z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table A16a: Dependent variable: Reported past and expected inflation. Effect conditioned on political affiliation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Linkspartei	SPD	Grüne	FDP	CDU/CSU	AfD	Other Party
<i>Past inflation</i>							
Free answers (Q1a)	0.25	0.64	0.51	0.67	0.20	0.32	0.64
	(0.89)	(3.21)***	(2.03)**	(2.09)**	(1.20)	(1.29)	(1.87)*
Observations	161	339	207	132	480	213	118
<i>Expected inflation</i>							
Free answers (Q4a)	1.02	0.71	0.94	0.46	0.76	0.89	0.73
	(3.54)***	(3.63)***	(3.69)***	(1.45)	(4.62)***	(3.59)***	(2.19)**
Observations	161	339	207	132	480	213	118

z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table A16b: Average marginal effects Dependent variable: Reported past and expected inflation. Effect conditioned on political affiliation

	(1) Linkspartei	(2) SPD	(3) Grüne	(4) FDP	(5) CDU–CSU	(6) AfD	(7) OtherParty
<i>Past inflation</i>							
< 0	0.005 (0.83)	0.001 (0.37)	0.002 (0.38)	-0.009 (-0.65)	0.001 (0.89)	0.003 (0.82)	0.004 (0.52)
Unchanged	0.004 (0.83)	0.004 (0.38)	0.002 (0.38)	-0.016 (-0.67)	0.016 (1.75)*	0.024 (1.28)	0.029 (0.60)
< 1%	0.053 (1.44)	0.010 (0.38)	0.010 (0.39)	-0.040 (-0.71)	0.029 (1.88)*	0.083 (1.44)	0.033 (0.60)
[1%; 2%]	0.065 (1.48)	0.007 (0.37)	0.014 (0.39)	0.036 (0.71)	0.047 (1.89)*	-0.016 (-1.19)	-0.023 (-0.60)
[2%; 3%]	-0.067 (-1.52)	-0.013 (-0.38)	-0.016 (-0.39)	0.020 (0.69)	-0.051 (-1.94)*	-0.039 (-1.41)	-0.013 (-0.59)
[3%; 4%]	-0.030 (-1.34)	-0.006 (-0.38)	-0.006 (-0.39)	0.009 (0.65)	-0.024 (-1.82)*	-0.056 (-1.38)	-0.030 (-0.60)
> 4%	-0.030 (-1.31)	-0.004 (-0.38)	-0.006 (-0.39)		-0.019 (-1.75)*		
Observations	112	217	143	93	334	136	70
<i>Expected inflation</i>							
< 0	-0.004 (-0.75)	-0.004 (-0.93)	-0.010 (-1.07)	-0.021 (-1.11)	-0.006 (-1.35)	-0.009 (-0.56)	-0.088 (-1.41)
Unchanged	-0.032 (-1.06)	-0.067 (-2.22)**	-0.043 (-1.46)	-0.038 (-1.34)	-0.032 (-1.73)*	-0.009 (-0.56)	-0.039 (-1.30)
< 1%	-0.031 (-1.08)	-0.047 (-2.27)**	-0.040 (-1.51)	-0.033 (-1.36)	-0.031 (-1.76)*	-0.027 (-0.57)	-0.057 (-1.44)
[1%; 2%]	-0.034 (-1.15)	-0.040 (-2.09)**	-0.036 (-1.48)	-0.088 (-1.80)*	-0.024 (-1.73)*	0.001 (0.28)	0.039 (1.50)
[2%; 3%]	0.040 (1.10)	0.074 (2.58)***	0.085 (1.68)*	0.066 (1.76)*	0.042 (1.86)*	0.013 (0.57)	0.048 (1.50)
[3%; 4%]	0.031 (1.11)	0.044 (2.20)**	0.017 (1.29)	0.041 (1.57)	0.024 (1.75)*	0.031 (0.57)	0.097 (1.46)
> 4%	0.029 (1.06)	0.039 (2.02)**	0.028 (1.37)	0.073 (1.56)	0.027 (1.72)*		
Observations	104	180	115	73	275	120	55

z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1