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

26 February 2021

Bernd Hayo
Philipps-Universität Marburg
School of Business & Economics
Universitätsstraße 24
D-35037 Marburg, Germany
hayo@wiwi.uni-marburg.de

Pierre-Guillaume Méon
Université libre de Bruxelles (U.L.B.)
Solvay Brussels School of Economics and Management
Centre Emile Bernheim, CP-114/03
avenue F.D. Roosevelt, 50
1050 Bruxelles, Belgium
pgmeon@ulb.ac.be

Inflation perception and framing

Abstract: 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. One randomly chosen half of respondents were asked to report a concrete number without any further guidance. The other half was provided with a list of ranges to choose from. This setup allows identifying the causal effect of question design.

We find that letting respondents report a number without guidance results in a lower response rate than asking them to choose from a list of ranges. The result holds both for perceived past inflation and expected inflation. It also resulted in a lower (higher) reported past (expected) inflation rate.

We condition the effect of the type of questions on income, education, gender, objective and subjective knowledge about monetary policy, trust in the ECB, and political affiliation. Although those variables can moderate the size of the effect of the type of questions, the effect remains qualitatively similar. However, we observe systematic differences in the 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 inflation experiences.

1. Introduction

Inflation perceptions and expectations by financial market participants, firms, and laypeople have wide-ranging economic and political consequences. In light of that, they have been intensively scrutinised using survey data. Household surveys have found an increasing number of applications, as the reviews of the literature by Wärneryd (1986), Ranyard et al. (2008), and Bruine de Bruin et al. (2017), compiled at different points in time, demonstrate. Households' reported perceptions of inflation have been found to be informative for social scientists about various aspects of household behaviour. For instance, they appear to affect individual consumption decisions (Armentier et al., 2015), have been used to test the rationality hypothesis (Jonung and Laidler, 1988), and correlate with the popularity of governments (Sanders, 2000).

In terms of conducting economic policy, central bankers have recognised the importance of survey-based measurement of inflation expectations too (see e.g. Bernanke, 2007). Many central banks collect direct measures of expectations based on surveys asking respondents to

report their expectations, 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 (Armantier et al., 2015).

However, measuring inflation via surveys raises methodological problems and the reliability of the resulting estimates may be questioned. For example, researchers report, that beliefs over both future and past inflation differ across firms and households (Jonung, 1981, Coibion et al., 2020). Especially after the introduction of the euro, there is evidence of a gap between perceived and actual inflation in various countries (Aucremanne et al., 2007, Brachinger, 2008). Moreover, different estimates of the perceived rate of inflation based on different surveys conducted in the same country at the same point in time were reported (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 framing effects (Bruine de Bruin, 2011). In line with that presumption, survey respondents have been found to be sensitive to the framing of the question that they answer. Armantier et al. (2013) and Bruine de Bruin et al. (2012) thus observed that responses could be markedly different if the question referred to "prices in general", "inflation", or "prices you pay".

In addition to the framing of the question, the framing of the answer may affect reported answers. As Bruine de Bruin (2011) points out, the way in which response options are presented is part of the question and, therefore, may affect answers too. Coibion et al. (2020) report evidence that the number of intervals from which respondents can choose to report their expected inflation affects the measured uncertainty of respondents. However, the question of how the type of answers affect reported perceived or expected inflation has received no specific attention. This is our research question.

Another blind spot of the literature on surveys of expected inflation is how questions affect non-responses. As respondents' knowledge about monetary affairs is likely limited, a notable number of non-responses may occur. For instance, even in the case of potential price-setters, Coibion et al. (2020) observe that over 60 per cent of US firms selected the "I don't know" option to a question asking them about the target inflation rate of the Federal Reserve. Bruine de Bruin et al. (2017) report that the wording of the question about inflation affects the response rate and that respondents were more likely to respond to a question on 'inflation' than 'prices in general'. To the best of our knowledge, how possible answer 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 there this has an impact on the reported inflation distribution.

Yet the issue matters. As Bruine de Bruin et al. (2017) point out, similar to other survey topics, answers to questions about perceived and expected inflation may be affected by a social desirability bias. Respondents may want to avoid reporting answers that the enquirer may consider foolish or unrealistic. In that case, providing them with a selection of intervals from which to choose instead of asking them to freely report a number may 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, those extra responses are likely very 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.

Furthermore, the design of answer categories may also bias the estimates of expected inflation. For instance, this could be the case if the provision of 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, 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.

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 outcome affects the distribution of answers. Using a representative survey of about 2000 German residents, we contrast a question where respondents are asked to report a number, without further indication, and a question where respondents are provided with a list of intervals to choose from. One half of respondents was randomly assigned to the first type of question, the other half to the other. We investigate how the framing of the question affects both the response rate to the question as well as the inflation rate given as an answer. As the two groups were randomly selected, we can identify the causal effect of framing. We find that letting respondents choose a number without guidance decreased the response rate compared to asking them to choose from a range of answers. The result holds both for perceived inflation and expected inflation. Moreover, we discover that letting respondents choose a number without guidance prompted them to report a relatively lower past inflation and a relatively higher expected inflation than asking them to report a number.

We condition the effect of the type of questions on income, education, gender, objective and subjective knowledge about monetary policy, trust in the ECB, and political affiliation. Although those variables can moderate the size of the effect of the type of questions, the effect remains qualitatively similar. However, we observe systematic differences in the 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 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. Data

The survey was conducted on our behalf by Gesellschaft für Konsumforschung (GfK), a large private research company specialising in market research and public opinion surveys. The survey period ranged from 6 February to 2 March 2018. The survey covers various topics, including inflation and monetary policy and a broad range of sociodemographic and psychological indicators. The sample is representative of the German population. The survey is described in more detail in Hayo et al. (2018).

First, we focus on the framing of a question asking respondents to declare the inflation rate that they perceived in the past year. The survey features two variants of the same question and the respondents were randomly divided into two groups, so that interviewers knew which question to ask a particular respondent. About one half of respondents were asked to freely state the actual inflation rate without any further guidance:

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 second half of respondents was asked a variant of the question that presented them with them a series of options:

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 framing of a question asking respondents to declare the inflation rate that 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 did "not form opinions about what might be the rate of inflation in the future", or declare that they did not know the answer.

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

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) Unchanged; c) Increase by 1% or less; 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.

The two questions are similar to the two questions on past inflation. Beside the fact that they pertain to expected inflation instead of past inflation, the only difference is that they allow respondents to declare that they do not form expectations on inflation.

To determine whether and how the framing of the two questions affects the perceived and expected inflation, we need to make answers comparable.

First, to get a sense of the way in which framing affects mean answers, we need to translate the intervals of the second variant of each question into numerical values. To do so, we take the midpoint of the interval for the middle-categories and as lower and upper bounds -0.5 and +4.5, respectively. As those bounds are arbitrary , we also look at other codings in the

analyses referring to means. In particular, we consider a lower bound of -1 and an upper bound of +10, which is derived from computing the average of the free form answers over the range of inflation values greater than 4 percent.

Second, we also transform the free form answers so as to correspond to the guided answers. Specifically, we assign free answers to the intervals provided in guided answers.

Commencing our analysis graphically, Figure 1 reports the distribution of 'don't know' answers for the two versions of the inflation questions. In both treatments, we find a substantial share of people who do not answer.

Figure 1: Distribution of 'don't know' answers for perceived and expected inflation as well as 'don't form expectations' by type of question (in %)
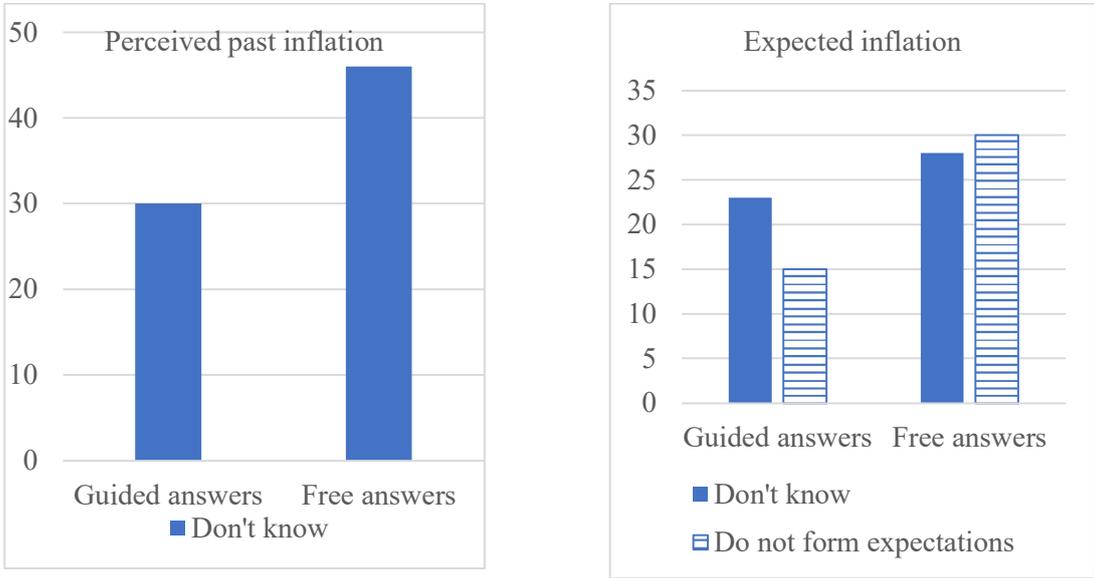

The left-hand side panel of Figure 1 compares the missing values for perceived past inflation. We can see that the share of 'don't know' answers is substantially higher in the case of the free form version (46%) versus the guided version (30%). The right-hand side panel displays the respective shares for the answers to the expected inflation rate questions. While the difference is not quite as big as in the case of perceived inflation (free form: 28%, guided form: 23%), the qualitative result is the same. Hence, given our random treatment, we can conclude that providing multiple-choice answer categories induces some respondents to offer an inflation answer who would not have done so if they had faced an open format.

It is not obvious whether this is an advantage or a disadvantage. The advantage of getting only few 'don't know' answers is a larger sample size to work with when studying inflation perception and expectations of households. The disadvantage is that by making it easier to

answer the question, respondents who have no clear attitude on the question asked will provide an answer. Put differently, we may add noise in the form of 'non-attitude's to our dataset rather than additional answers by informed and rational individuals (see Campbell et al. 1960; Zaller 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 form of the question. Analysing the free format answers, 41 per cent 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 per cent behaved similarly. Thus, the linkage between answering 'don't know' across the two formats is much stronger in the case of the free format. We interpret this finding as an indication that the free version of the question is relatively superior with regards to identifying those respondents whose anwers are based on 'non-attitudes'.

Figure 2: Distribution of perceived inflation by type of question (in %)
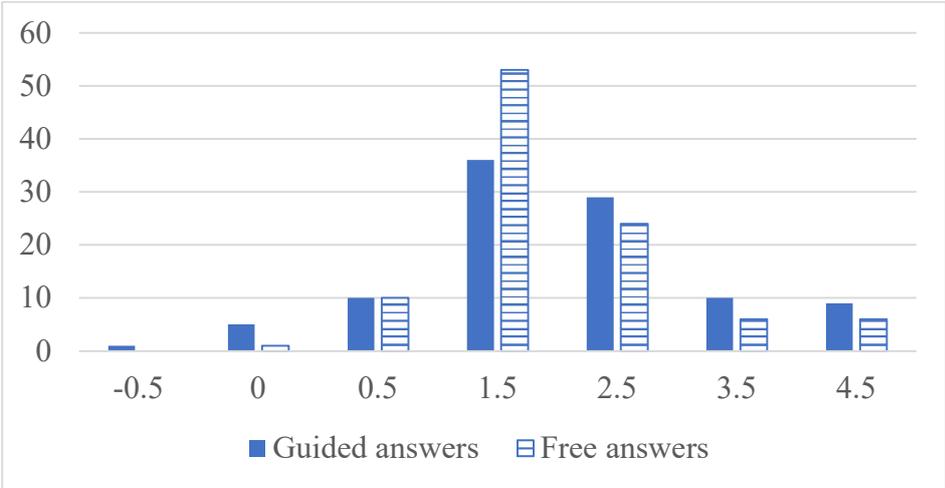
Notes: Based on coding inflation rates at the midpoint of the guided answer options. Lower and upper bounds were set at -0.5 (decrease) and 4.5 (> 4%).

Consistent with this interpretation are the findings on 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 free format (free: 30%; guided: 15%). Relying on guided questions may give the impression of a much higher degree of perception and expectation formation than seems to be warranted. Put differently, while studies using guided questions are likely going to find lower shares of 'don't know' answers as well as of 'do not

form expectation', this may just reflect including more respondents with non-attitudes in the dataset, i.e. more noise.

In the next step, we analyse the differences our treatment makes with regard to the distribution of inflation rate answers. Figure 2compares the shares of answers given across the treatment for perceived past inflation.

Extreme answers are more frequently found in the answers to the guided question than in those to the free question. For example, no respondent reports a negative inflation rate in the free-answer framing, whereas nearly 1 per cent did in the guided framing. Likewise, 3 per cent of respondents report an inflation rate larger than 4 per cent in the free-answer framing, whereas nearly 6 per cent do in the guided framing.

In the case of expected inflation, we get a similar finding with regard to the 'decrease' category (see Figure 3). However, we observe a larger share of people with higher inflation expectations in the free treatment.

Figure 3: Distribution of *expected* inflation by type of question
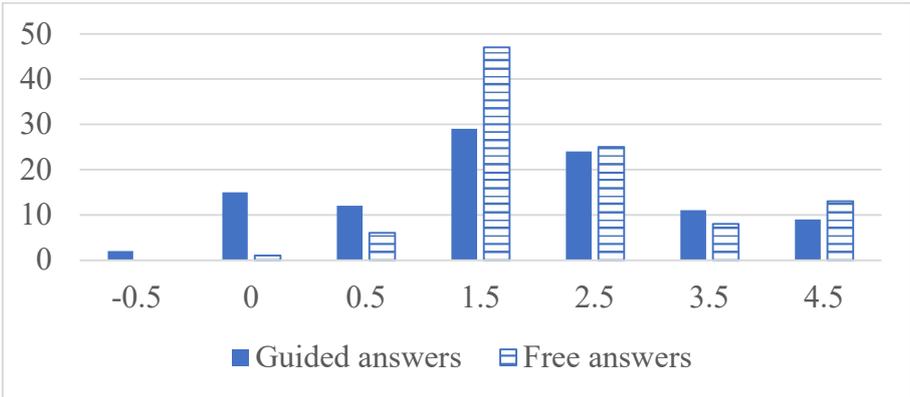
Notes: Based on coding inflation rates at the midpoint of the guided answer options. Lower and upper bounds were set at -0.5 (decrease) and 4.5 (> 4%).

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, we provide results for two different types of assumptions about the lower and upper bound in the case of the guided answers.

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	***	***		***	

Notes: *** p<0.01, ** p<0.05, * p<0.1.

The official annual CPI inflation rate in Germany in 2017 was 1.8 per cent. We find that the mean is 2.6 when using the free answers in their raw form. The number goes down 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. Testing for equality across treatments, we find that it can be rejected for all cases except coding [-0.5;4.5] for both variables. While the perceived inflation rate is highest when using the raw free 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 free 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 free answers.

We interpret our findings as suggesting that when left to their own devices, at least on average, people significantly overpredict their own inflation rate when compared to the official one. When transforming raw answers into ranges, this conclusion no longer holds. Now we find that answers were noisier in the guided treatment. We interpret that result as suggesting that some respondents who did not know the inflation rate just picked an answer. Pre-formulated answers make it easy to do so without losing face, which could easily happen by naming a far-off value in the free version of the question. Moreover, the additional noise created through 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 options

reflecting inflation values above the officially-measured inflation rate, they are relatively more often selected and we get an upward bias in our measurement of the average inflation rate. By the same token, we observe that the in the open question, the correct range is much more often chosen when comparing it to the other answer categories than in the case of the multiple-choice question. Again, this finding is in line with the hypothesis that the provision of pre-formulated answer categories creates additional noise.

Are these patterns also to be found in the case of expected inflation? Table 2 provides the relevant results.

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	***	***	***	*	

Notes: *** p<0.01, ** p<0.05, * p<0.1

We find significant difference between the various treatments and codings. With over 3 per cent, the free specification yields the highest expected inflation rate, whereas the guided question with the low extreme value coding results in only 1.8 per cent. In terms of standard deviations, the results are not quite clear except for the high variability of the raw free answers. How good are these expectations when compared to the official inflation rate of 1.9 per cent in 2018? Similar to our findings on past inflation, the guided answers with low extreme value coding performs best here, whereas the raw free average is worst. Thus, in the case of expected inflation, the results are similar to the ones on past inflation when comparing raw free answers and guided answers, but go the other way around when comparing the transformed free answers.

3. Baseline estimations

Firstly, we estimate logit models where the dependent variable is a dummy variable set to one if respondents answered the question, about perceived or expected inflation respectively. We regress that dummy variable on a dummy variable taking the value one if the respondent was asked the free variant of the question.

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

	(1)	(2)	(3)	(4)
	Reports past inflation		Reports expected inflation	
Free answers	-0.713	-0.813	-0.868	-0.923
	(-7.623)***	(-8.193)***	(-9.512)***	(-9.799)***
Female		-0.516		-0.294
		(-5.177)***		(-3.106)***
Age respondent		0.012		0.008
		(4.041)***		(2.774)***
Apprenticeship		1.025		0.591
		(4.801)***		(2.841)***
Secondary school		1.418		0.989
		(6.750)***		(4.860)***
Abitur		1.721		0.891
		(6.989)***		(3.807)***
University		2.014		1.637
		(7.459)***		(6.483)***
Household income		0.000		0.000
		(5.153)***		(2.536)**
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

The left-hand side panel of the Table 3 reports the results of the regressions pertaining to the propensity to answer the question on perceived inflation, while the right-hand side panel reports regressions pertaining to the propensity to answer the question on expected inflation.

In all regressions, the coefficient of the dummy variable coding free answers is negative and statistically significant at the 1 per cent level. Therefore, respondents were more likely to provide an answer to a question if they were free to report an answer than if they were asked to choose from a list of ranges.

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

	(1)	(2)	(3)	(4)
	Past inflation		Expected inflation	
Free answers	-0.291	-0.253	0.522	0.524
	(-2.780)***	(-2.401)**	(4.631)***	(4.642)***
Female		0.099		-0.066
		(0.948)		(-0.588)
Age respondent		-0.001		0.002
		(-0.368)		(0.441)
Apprenticeship		-0.283		0.004
		(-0.882)		(0.014)
Secondary school		-0.375		-0.029
		(-1.188)		(-0.096)
Abitur		-0.658		-0.198
		(-1.934)*		(-0.596)
University		-0.560		-0.033
		(-1.646)*		(-0.100)
Household income		-0.000		-0.000
		(-2.008)**		(-1.496)
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

Secondly, to compare answers across the two types of questions, 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 results from merging Questions 1a and 1b. For expected inflation, the dependent variable results from merging Questions 4a and 4b.

For a proper comparison, we have to express the answers to the two questions in the same scale. We could thus translate the discrete answers into continuous answers, but this would require making assumptions to assign a single value to all the answers corresponding to each interval. Choosing that value would itself be a strong assumption. The assumption would be particularly strong when coding extreme intervals, which are unbounded, as Table 1 and Table 2 show. Conversely, no assumption is needed to convert continuous answers into intervals, which is therefore what we do. We regress the stated past inflation level on a dummy variable taking the value one if the respondent was asked Question 1a and zero otherwise. As the dependent variable now follows a natural ordering, the model is estimated as an ordered logit

model.[1] We first estimate a bivariate model and then add control variables: demographics (age and gender), a series of dummies capturing respondents' education level, and a series of dummies coding their income. The coefficient of the dummy variable coding the variant of Question 1 exhibits is always negative and statistically significant at the 5 per cent level and beyond. Accordingly, respondents who replied to the free variant of the question report lower levels of perceived inflation. Conversely, by offering multiple-choice options, the guided variant of Question 1 prompted respondents to report higher levels of perceived inflation.

4. Robustness checks and extensions

In this section, study whether the effect of the treatment is heterogenous with regard to the characteristics of our respondents. Conditioning the treatment effects on a number of variables suggests that the sign of the effect seldom changes, but its magnitude can vary substantially. Specifically, we condition the effect on experience with the former German Democratic Republic, sociodemographic variables such as income, education, and gender, knowledge about monetary policy, trust in the ECB, and political affiliation.

4.1. Effect conditional on early life in East and West Germany

Until 1990, Germany was divided into the Federal Republic of Germany (FRG), which was a market economy, and the German Democratic Republic (GDR), which was a planned economy. There is empirical evidence that this led to observable differences between the preferences of the inhabitants of the two regions (Alesina and Fuchs-Schündeln (2007). Similarly, different inflation experiences may prompt the inhabitants of the two parts of the country to react differently to the framing of questions. Whereas West Germans have always lived in a market economy, East Germany transitioned from a planned to a market economy in the early 1990s. East Germans therefore had to learn and adjust to a new system and experienced a transition.

To test that contention, we ran separate regressions for the two groups of respondents. They are reported in Tables **5**a and **5**b.

---

[1] The online appendix shows that estimating an ordered probit instead of an ordered logit does not change the results.

In Table 5a, we find significant differences with regard to the propensity to provide a response to the question on past inflation: East Germans react less than West Germans to the type of question. However, for expected inflation, the difference between these two groups in the effect of the type of question on the answer probability is statistically insignificant.

In Table 5b, we study how the type of question affects the stated inflation rate in the two regions. Here we find a striking difference between the two regions. Whereas the type of question affects neither the reported past inflation nor the reported expected inflation of East Germans, it affects the answers of West Germans. Specifically, West Germans report a significantly lower past inflation rate and a significantly higher expected inflation rate when faced with the free answer option. Thus, our previous findings were driven by West Germans.

Table 5a: 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
Past inflation						
Free answers (Q1a)	-0.626	-0.742	-0.568	-0.764	-0.827	-0.750
	(-3.262)***	(-6.914)***	(-2.427)**	(-5.545)***	(-2.419)**	(-4.310)***
Observations	482	1,533	336	979	146	554
Expected inflation						
Free answers (Q4a)	-0.873	-0.867	-0.864	-0.889	-0.903	-0.811
	(-4.614)***	(-8.287)***	(-3.807)***	(-6.769)***	(-2.624)***	(-4.641)***
Observations	482	1,533	336	979	146	554

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

Table 5b: Dependent variable: Reported past and expected inflation. Effect conditioned on income

	(1) East	(2) West	(3) >15 in the GDR	(4) >15 in the FRG	(5) <15 in the GDR	(6) <15 in the FRG
Past inflation						
Free answers (Q1a)	-0.263	-0.326	-0.196	-0.328	-0.341	-0.321
	(-1.238)	(-2.697)***	(-0.781)	(-2.228)**	(-0.824)	(-1.512)
Observations	299	951	215	643	84	308
Expected *inflation*						
Free answers (Q4a)	0.308	0.601	0.113	0.478	0.738	0.856
	(1.434)	(4.503)***	(0.442)	(2.957)***	(1.830)*	(3.609)***
Observations	282	768	197	524	85	244

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

One explanation is that the observed difference between the two groups is due to different inflation experiences before and during the transition from a planned to a market

economy. Having to adjust to a new system may have made East Germans more mindful of inflation and less prone to be affected by the framing of questions asking them to report their past and expected inflation rates. A testable implication of that explanation is that the specificity of East German respondents should be driven by those who grew up and lived in the GDR before the fall of the Berlin wall in 1989.We therefore further distinguish respondents according to their age at the fall of the Berlin wall, 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, 1966, Mead, 1967) and psychology (e.g., Krosnick and Alwyn, 1989, Giuliano and Spilimbergo, 2014), and posits that values, attitudes, and dispositions are formed until 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 5a and 5b.

Table 5a sets out that all groups are less likely to answer when asked the free-form question. Among respondents who were 15 or older in 1989, those who live in West Germany react significantly more to the type of question than those living in East Germany. By contrast, the regional difference is statistically insignificant for respondents who were less than 15 in 1989.

In Table 5b, we turn to the effect of the type of question on the reported inflation rate. 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. For East Germans who were 15 or older in 1989, we observe no statistically significant effect of the type of question on the value provided for past or future inflation. By contrast, the free question decreases the reported past inflation rate and increases the expected inflation rate of West Germans of the same generation. Conversely, the effects of the question for younger East and West Germans are qualitatively similar and statistically indistinguishable.

Our results support the 'impressionable years' hypothesis. East Germans who grew up in the GDR and experienced the transition to a market economy behave differently from West Germans and from younger East Germans, whose experience with the GDR is limited. Specifically, Germans who lived long enough in the GDR do not, on average, react to the type of question. One interpretation is that 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. They are therefore less sensitive to the framing of the question.

15

4.2. Effect conditional on income

Respondents with different incomes purchase different bundles of goods and might be affected differently by inflation. For instance, Gürer and Weichenrieder (2020) show that the prices of the consumption basket of poor households increased by more than that of rich households. Households with different levels of income may also be affected by different types of shocks or display different degrees of optimism (Souleles, 2004). As a result, their reactions to the specific form of the inflation question may differ too. To test that possibility, we estimate our model separately for each income quartile (see Tables 6a and 6b).

Table 6a reports the results by income quartile for the propensity to answer the question. Both the top panel, reporting the results for past inflation, and the bottom panel, reporting the results for expected inflation, show that all income classes are less likely to give an answer when they must report a number than when they are asked to choose an interval, as the sign of the free answers dummy variable is negative and statistically significant. Our baseline finding is therefore not driven by any specific income quartile.

Table 6a: 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
Past inflation				
Free answers	-0.616	-0.862	-0.991	-0.467
	(-3.483)***	(-4.632)***	(-5.216)***	(-2.157)**
Observations	524	503	542	446
Expected inflation				
Free answers	-0.837	-0.766	-0.718	-1.319
	(-4.626)***	(-4.213)***	(-4.077)***	(-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

However, the table reveals quantitative differences between quartiles. In the case of past inflation, respondents at the bottom and top income quartiles react to free answers significantly less than middle-income people do. Interestingly, this ordering of answer probabilities is exactly the other way around when asking about inflation expectations, where people from the low and high end of the income distribution show the highest sensitivities to the type of question. Amongst these two groups, the latter react significantly stronger than the former when facing the free-form inflation question.

Table 6b: Dependent variable: Reported past and expected inflation. Effect conditioned on income

	(1) 1st quartile	(2) 2nd quartile	(3) 3rd quartile	(4) 4th quartile
Past inflation				
Free answers	-0.369	-0.228	-0.175	-0.388
	(-1.625)	(-1.059)	(-0.900)	(-1.878)*
Observations	263	301	362	324
Expected inflation				
Free answers	0.817	0.834	0.915	1.282
	(3.665)***	(3.993)***	(4.809)***	(6.174)***
Observations	263	301	362	324

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

Table 6b reports the results by income quartile for the level of past or expected inflation reported by respondents. Generally, free answers have no statistically significant impact on the value of reported past inflation in any income quartiles. This finding is likely due to a power issue resulting from splitting the sample in four sub-samples, as the point estimates remain fairly stable and negative but their standard deviation increases. Clearly, the baseline result is not driven by any particular income quartile.

In contrast, respondents from all income quartiles report higher expected inflation rates when asked the free form answer. Comparing the magnitudes of their reactions reveals that the effect of free-form answers on reported inflation expectations generally increase in the relative income level. The highest income quartile shows a significantly larger effect than all other groups.

4.3. Effect conditional 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 (1941) reports a greater effect of question changes for better-educated respondents, which can be interpreted as education increasing people's sensitivity to slight variations in language. However, Hippler and Schwarz (1988) report the opposite finding. They argue that educated people tend to have stronger opinions, which are less likely 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, which are reported in Tables 7a and 7b.

Table 7a: 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
Past inflation					
Free answers	-1.440	-1.088	-0.446	-0.614	-0.751
	(-3.081)***	(-6.305)***	(-3.040)***	(-2.223)**	(-2.065)**
Observations	107	597	823	255	199
Expected inflation					
Free answers	-0.700	-1.023	-0.775	-1.154	-0.634
	(-1.655)*	(-6.039)***	(-5.430)***	(-4.406)***	(-1.980)**
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

For past inflation, free answers reduce the probability to answer and the effect generally declines in the level of education, as the coefficient of the dummy variable is negative and statistically significant. However, the effect is not linear. We thus observe the smallest impact of the free-form question for the middle category of our formal education variable. This implies an asymmetric U-shape, with a steeper slope at the lower end of the education spectrum. Still, the reaction of the two lower education groups is significantly larger than that of the two highest groups, which generally supports Hippler and Schwarz's (1988) argument.

The bottom panel of Table 7a confirms the negative effect of free answers on the propensity to report expected inflation. In that case, the effect is similar to a sinus curve, with no clear pattern across educational categories.

In Table 7b, only for the third level of education do we find a statistically significant impact of the type of question on the value of the past inflation rate. In contrast, when studying expected inflation, we discover that the difference in the question format has no significant impact on the stated value for the two lower educational categories as well as for the second highest one. For the third and the highest category, we find significantly higher values, with the latter significantly higher than the former. Hence, for inflation expectations, people in the highest educational category do not have a higher probability of answering the free form question, but they state significantly higher values than all other educational groups.

Table 7b: 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
Past inflation					
Free answers	-0.604	-0.159	-0.281	-0.277	-0.444
	(-0.846)	(-0.802)	(-1.743)*	(-0.990)	(-1.473)
Observations	35	350	526	175	159
Expected inflation					
Free answers	0.301	0.245	0.696	0.0204	0.957
	(0.513)	(1.120)	(4.057)***	(0.0629)	(3.060)***
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

4.5. Effect conditional 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. 2020, D'acunto et al., 2020). There is also empirical evidence that women have relatively lower objective as well as subjective knowledge about monetary policy affairs (Hayo and Neuenkirch, 2018). We therefore estimated each regression separately for each gender. Those results are reported in Tables 8a and 8b.

Table 8a reports the results for the propensity to given an answer. It shows, that both male and female respondents are less likely to answer when faced with free-form answers. While the coefficients are statistically indistinguishable in the context of past inflation, they are different in the context of expected inflation. Specifically, men the answer probability decreases significantly more for men than for women.

Regarding the inflation rate reported by respondents (Table 8b), in the case of past inflation, there are again no significant differences between men and women. Both tend to report lower inflation values when answering the free-form question. When studying expected inflation rates, we discover that men react significantly more than women to free-form answers.

Table 8a: Dependent variable: Propensity to report past and expected inflation. Effect conditioned on gender

	(1) Male	(2) Female
Past inflation		
Free answers	-0.743	-0.696
	(-5.161)***	(-5.557)***
Observations	944	1,071
Expected inflation		
Free answers	-0.802	-0.934
	(-5.987)***	(-7.430)***
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 8b: Dependent variable: Reported past and expected inflation. Effect conditioned on gender

	(1) Male	(2) Female
Past inflation		
Free answers	-0.295	-0.286
	(-2.028)**	(-1.900)*
Observations	651	599
Expected inflation		
Free answers	0.556	0.488
	(3.508)***	(3.044)***
Observations	532	518

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

4.4. Effect conditional on objective and subjective knowledge

A large part of the public appears to be little informed about monetary policy and central banking (van der Cruijsen 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. To do so, we constructed an index of objective knowledge based on four questions pertaining to monetary

policy and the European Central Bank.[2] We added one point to the index for each correct answer, resulting in an index ranging from zero if the respondent correctly answered none of the four questions to five if he/she correctly replied to all of them. We also conditioned the effect of the type of question on respondents' subjective knowledge, assessed directly by asking them to indicate it on a scale from one to five. In Table 9a, we find that asking the free-form past inflation question reduces the propensity to answer for respondents with a knowledge score of 2 out of 4 or less. Equality tests show that those who were unable to answer even one question correctly have a significantly lower likelihood of answering the free-form question than all other respondents.

Table 9a: 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
Past inflation					
Free answers (Q1a)	-0.981	-0.709	-0.832	-0.529	-0.186
	(-5.768)***	(-4.223)***	(-3.509)***	(-1.426)	(-0.278)
Observations	615	608	444	201	147
Expected inflation					
Free answers (Q4a)	-0.948	-0.924	-1.138	-1.345	-0.345
	(-5.155)***	(-5.547)***	(-5.362)***	(-4.025)***	(-0.744)
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

For expected inflation, the free-form question reduces the propensity to answer of all the other respondents. Respondents with the highest knowledge score are unaffected by the type of question and react significantly different from everybody else.

---

[2] The four questions pertained to the objective pursued by the ECB, 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).

Table 9b: Dependent variable: Reported past and expected inflation. Effect conditioned on objective knowledge

Objective knowledge	(1) Very bad	(2)	(3)	(4)	(5) Very good
Past inflation					
Free answers (Q1a)	-0.499	-0.215	-0.259	-0.566	0.462
	(-2.108)**	(-1.122)	(-1.282)	(-1.887)*	(1.376)
Observations	244	358	346	165	137
Expected inflation					
Free answers (Q4a)	0.606	0.653	0.614	0.249	0.0100
	(2.216)**	(3.098)***	(2.899)***	(0.801)	(0.0298)
Observations	183	300	302	141	124

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

The free form question tends to significantly reduce reported past inflation for respondents with the lowest objective knowledge score. This effect is significantly different from all other knowledge levels except the second highest one. The findings for expected inflation provide a rather clear picture too. The free form question significantly increases expected inflation for respondents with scores of 0 to 2, the coefficients of which are not statistically different from each other. They are significantly higher than those estimated for larger objective knowledge index values, though.

Moving on to subjective knowledge, in Table 10a, we discover that the effect of the type of question on the probability of answering the question on past inflation generally declines in the level of subjective knowledge, but these differences are not statistically significant.

Table 10a: Dependent variable: Propensity to report past and expected inflation. Effect conditioned on subjective knowledge

Subjective knowledge	(1) Very bad	(2)	(3)	(4)	(5) Very good
Past inflation					
Free answers	-0.731	-0.723	-0.832	-1.407	-
	(-4.233)***	(-4.125)***	(-4.827)***	(-2.679)***	
Observations	565	585	676	168	9
Expected inflation					
Free answers	-0.914	-1.033	-0.896	-1.446	-0.693
	(-4.960)***	(-6.031)***	(-5.594)***	(-3.147)***	(-0.528)
Observations	565	585	676	168	21

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

In the case of inflation expectations, we do not obtain clear results. However, whereas the effect for the highest subjective knowledge category is imprecisely estimated, we find that the likelihood of not answering the free-form question is significantly higher for those with the second-to-highest subjective knowledge.

Table 10b sets out the effect of subjective knowledge on the stated inflation rates. For past inflation a free-form answer reduces the value given by respondents who think they know very little about the ECB and monetary policy issues significantly more than that given by other respondents. This effect is significantly more pronounced for the two groups with the lowest subjective knowledge.

Table 10b: Dependent variable: Reported past and expected inflation. Effect conditioned on subjective knowledge

	(1) Very bad	(2)	(3)	(4)	(5) Very good
Past inflation					
Free answers	-0.631	-0.387	-0.0466	-0.0395	-
	(-2.655)***	(-2.031)**	(-0.269)	(-0.126)	
Observations	247	369	472	142	20
Expected inflation					
Free answers	0.702	0.431	0.568	0.590	0.305
	(2.630)***	(2.063)**	(3.055)***	(1.873)*	(0.318)
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.

We find the opposite for expected inflation: when faced with free answers, all subjective knowledge groups tend to choose higher values than those who answered the multiple-choice questions. Those with the lowest subjective knowledge value are particularly strongly affected by the type of question. The effect of the type of question on the value they provide is significantly larger in statistical as well as economic terms than those stated by any other group. There is no significant difference between the coefficients estimated for the other categories.

4.6. Effect conditional on trust in the ECB

Christelis et al. (2020) observe that agents who trust the ECB, on average, expect a lower inflation rate. We therefore conditioned the effect of the type of question on the level of trust in

the ECB, gauged by the answers of respondents to a question asking them to assess on a one to five scale how much they trust the ECB.

The top panel of Table 11 11a illustrates that the degree of trust respondents have in the ECB does not affect the influence of the type of question on the probability of stating an answer to the question on past inflation to a notable degree. We cannot find significant differences between respondents with no trust and those with a lot of trust. For expected inflation, in contrast, those with a lot of ECB trust tend to have a significantly higher likelihood of not providing an answer when facing open answers than those with less trust, especially compared to those with no trust at all, as the bottom panel of Table 11a shows.

Table 11a: Dependent variable: Propensity to report past and expected inflation. Effect conditioned on trust in the ECB

	(1) No trust	(2)	(3)	(4)	(5) A lot of trust
Past inflation					
Free answers (Q1a)	-0.758	-0.598	-0.808	-0.577	-0.777
	(-3.493)***	(-2.840)***	(-6.050)***	(-1.806)*	(-1.017)
Observations	357	393	972	236	57
Expected inflation					
Free answers (Q4a)	-0.545	-0.852	-1.059	-0.896	-1.178
	(-2.540)**	(-4.106)***	(-7.952)***	(-3.082)***	(-1.897)*
Observations	357	393	972	236	57

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

Table 11b: Dependent variable: Reported past and expected inflation. Effect conditioned on trust in the ECB

	(1) No trust	(2)	(3)	(4)	(5) A lot of trust
Past inflation					
Free answers (Q1a)	-0.346	-0.708	-0.0995	-0.134	-0.167
	(-1.312)	(-2.968)***	(-0.643)	(-0.483)	(-0.312)
Observations	200	245	574	183	48
Expected inflation					
Free answers (Q4a)	0.271	0.359	0.718	0.875	-0.998
	(0.965)	(1.398)	(4.214)***	(2.904)***	(-1.603)
Observations	168	200	483	159	40

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

We do not find clear evidence of trust affecting the effect of the type of question on the reported value of past inflation in the top panel of Table 11b. The magnitude of the effect is, however, larger for respondents with the second-lowest level of trust. In the case of inflation expectations, we discover that for those who have more but not full ECB trust the free-form question significantly causes respondents to state higher inflation rates.

4.7. Effect conditional 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., forthcoming) are subject to partisan biases. We therefore condition the effect of answers on political affiliation. As Table 12a shows, the likelihood of answering the question on past inflation decreases for adherence of all political parties. The coefficients are statistically indistinguishable for most parties. However, we do find a significantly smaller effect on the answer probability of CDU/CSU supporters compared to all other voters (except AfD).

Table 12a: Dependent variable: Propensity to report past and expected inflation. Effect conditioned on political affiliation

	(1) Linkspartei	(2) SPD	(3) Grüne	(4) FDP	(5) CDU/CSU	(6) AfD	(7) Other Party
Past inflation							
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
Expected inflation							
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
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Regarding inflation expectations, it is interesting to note that for FDP supporters, the likelihood of answering the question is not significantly affected by confronting them with free answers. Moreover, the estimated coefficient is significantly lower than those obtained for other party affiliations. Thus, the propagated 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 free answers.

Table 12b studies whether the choice between free form and multiple choice questions creates significant differences with regard to the stated values for past and future inflation. For past inflation, we find no significant impact on answer probabilities for the supporters of the Left Party, the CDU/CSU, AfD, and other parties. SPD, Green, and FDP voters state significantly higher past inflation rates if they are faced with free answers.

Regarding expected inflation, we find a similar result to the likelihood of answering the question: expected inflation rates provided by FDP supporters are not affected by the way we ask the question. In contrast, supporters of all other parties state significantly higher values for expected inflation when encountering free answers.

Table 12b: 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) Other Party
Past inflation							
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
Expected inflation							
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
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

5. Conclusion

To be written.

References

Alesina, A. & Fuchs-Schündeln, N. (2007). Goodbye Lenin (or not?): The effect of Communism on people's preferences. *American Economic Review*, 97(4), 1507-1528.

Armantier, O., Bruine de Bruin, W., Potter, S., Topa, G., Van Der Klaauw, W. & Zafar, B. (2013). Measuring inflation expectations. *Annual Review of Economics*, 5(1), 273–301.

Armantier, O., Bruine de Bruin, W., Topa, G., Van der Klaauw, W., & Zafar, B. (2015). Inflation expectations and behavior: Do survey respondents act on their beliefs? *International Economic Review*, 56(2), 505–536.

Aucremanne, L., Collin, M., & Stragier, T. (2007). Assessing the gap between observed and perceived inflation in the euro area: Is the credibility of the HICP at stake? *NBB Working Paper* No. 112, April 2007.

Bachmann, O., Gründler, K., Potrafke, N. & Seiberlich, R., forthcoming. Partisan bias in inflation expectations. *Public Choice*.

Berger, P. L. & Luckmann, T. (1966). *The social construction of reality: A treatise in the sociology of knowledge*. New York: Anchor Books.

Bernanke, B. (2007). Inflation expectations and inflation forecasting (No. 306). Board of Governors of the Federal Reserve System (US).

Brachinger, H. W. (2008). A new index of perceived inflation: Assumptions, method, and application to Germany. *Journal of Economic Psychology*, 29(4), 433–457.

Bruine de Bruin, W.B., Baldassi, M., Figner, B., Fischhoff, B., Fleishman, L., Hardisty, D., Johnson, E., Keren, G., Konnikova, M., Levin, I. & Li, Y. (2011). Framing effects in surveys: How respondents make sense of the questions we ask. In *Perspectives on Framing*, edited by Gideon Keren, 303–325. New York, NY. Taylor and Francis Group, Psychology Press.

Campbell, A., Converse, P. E., Miller, W. E., & Stokes, D. E. (1960), *The American voter*. New York: John Wiley.

Coibion, O., Gorodnichenko, Y., Kumar, S. & Pedemonte, M. (2020). Inflation expectations as a policy tool? *Journal of International Economics*, 103–297.

Christelis, D., Georgarakos, D., Jappelli, T. & Van Rooij, M. (2020). Trust in the central bank and inflation expectation, ECB Working Paper No 2375.

D'Acunto, F., Malmendier, U., & Weber, M. (2020). Gender roles and the gender expectations gap, NBER Working Paper No. 26837.

de Bruin, W. B., van der Klaauw, W., van Rooij, M., Teppa, F., & de Vos, K. (2017). Measuring expectations of inflation: Effects of survey mode, wording, and opportunities to revise. *Journal of Economic Psychology*, 59, 45–58.

Evans, G. & Andersen, R. (2006). The political conditioning of economic perceptions. *Journal of Politics*, 68(1), 194-207.

Gerber, A.S. & Huber, G.A. (2010). Partisanship, political control, and economic assessments. *American Journal of Political Science*, 54(1), 153-173.

Giuliano, P. & Spilimbergo, A. (2014). Growing up in a recession. *Review of Economic Studies*, 81(2), 787-817.

Gürer, E. und A. Weichenrieder (2020). Pro-rich inflation in Europe: Implications for the measurement of inequality. *German Economic Review* 21, 107-138.

Hayo, B., García, I., Méon, P.-G., Neumeier, F., & Roth, D. (2018). German public attitudes towards asylum seekers, immigrants in the workplace, inflation, and local budgets: Evidence from a representative survey of the German population, *MAGKS Working Paper* No 2018-19, University of Marburg.

Hayo, B. & Neuenkirch, E. (2014). The German public and its trust in the ECB: The role of knowledge and information search, *Journal of International Money and Finance* 47, 286–303.

Hayo, B. & Neuenkirch, E. (2018). The influence of media use on layperson's monetary policy knowledge in Germany. *Scottish Journal of Political Economy,* 65, 1–26.

Hippler, H.-J. & Schwarz, N. (1988). Not forbidding isn't allowing: The cognitive basis of the forbid-allow anomaly. *Public Opinion Quarterly*, 50, 87–96.

Jonung, L. & Laidler, D. (1988). Are perceptions of inflation rational? Some evidence for Sweden. *American Economic Review*, 78(5), 1080–1087.

Jonung, L. (1981). Perceived and expected rates of inflation in Sweden. *American Economic Review*, 71(5), 961–968.

Krosnick, J.A. & Alwin, D.F. (1989). Aging and susceptibility to attitude change. *Journal of Personality and Social Psychology*, 57(3), 416–425.

Mead, G. H. (1967). *Mind, self and society*. Chicago: University of Chicago Press.

Oppenheim, A. N. (1992). *Questionnaire design, interviewing and attitude measurement*. London: Continuum.

Ranyard, R., Del Missier, F., Bonini, N., Duxbury, D. & Summers, B. (2008). Perceptions and expectations of price changes and inflation: A review and conceptual framework. *Journal of Economic Psychology*, 29, 378–400.

Rugg, D. (1941). Experiments in wording questions. *Public Opinion Quarterly*, 5, 91–92.

Sanders, D. (2000). The real economy and the perceived economy in popularity functions: how much do voters need to know?: A study of British data, 1974–97. *Electoral Studies*, 19(2-3), 275–294.

Souleles, N. S. (2004). Expectations, heterogeneous forecast errors, and consumption: Micro evidence from the Michigan consumer sentiment surveys. *Journal of Money, Credit and Banking*, 36, 39–72.

Tversky, A. & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science*, 185(4157), 1124–1131.

Wärneryd, K.-E. (1986). The psychology of inflation, *Journal of Economic Psychology,* 7, 259–268.

Zaller, J. (1992), *The Nature and Origins of Mass Opinion*. Cambridge: Cambridge University Press.