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Asymmetric Inflation Target Credibility

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Asymmetric Inflation Target Credibility

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This paper investigates the determinants of inflation target credibility (ITC) using a unique survey we designed to measure the credibility of the ECB's inflation target. Containing over 200,000 responses from German consumers collected between January 2019 and November 2024, our dataset enables us to estimate the effect of both positive and negative deviations of inflation from the 2% target on ITC. In contrast to the symmetry of the ECB's inflation target, we find that ITC is asymmetric, i.e. consumers respond significantly and plausibly signed to target deviations only when inflation is above target. When inflation is below target, however, the credibility of the inflation target cannot be improved by raising the inflation rate to close the gap.

Keywords: Credibility of Inflation Targets, Consumer Inflation Expectations, Expectation Formation

JEL classification: D84, E31, E52, E58

1 Introduction

For many central banks, including the Federal Reserve (Fed) and the European Central Bank (ECB), numerical inflation targets play a key role in the communication and the conduct of monetary policy. Monetary policy measures of the ECB, for example, have always been explained to the public with the ultimate goal of steering too-low or too-high inflation rates in the euro area back to the target level of around 2%. Inflation targets clarify the meaning of price stability and may even anchor longer-term inflation expectations. Yet, inflation targets can only be effective if their credibility is sufficiently high, i.e., if enough people expect that monetary policy will actually achieve the target. Therefore, understanding the determinants and the evolution of inflation target credibility (ITC) is a significant concern of monetary economists inside and outside central banks. The current paper sheds new light on ITC using a unique survey we designed to measure the credibility of the ECB's inflation target. Containing more than 200,000 responses from German consumers and covering the period from January 2019 to November 2024, our data set allows us to estimate the effect of positive as well as negative deviations of inflation from the ECB's 2% target on ITC.

Central banks put a lot of emphasis on the exact definition of their target. While the Fed has recently switched to an *average* inflation target, the ECB started in 1999 with an asymmetric target of *below 2%*, modified it to *below, but close to 2%* in 2003, and, eventually, adopted a fully symmetric target of *close to 2%* in July 2021. Those modest changes in the definition of the target were introduced as key components of relevant monetary policy strategy revisions.[1] Accordingly, our survey question shall account for the change in the definition of the ECB's target in 2021.

By contrast, the empirical literature typically uses qualitative or quantitative measures of inflation expectations from survey questions, which are only loosely connected to the central bank's inflation target. As a consequence, the information content of standard surveys on inflation expectations for ITC is not always apparent. For instance, in

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[1]For a comprehensive review of the evolution of the ECB's monetary policy strategy, see https://www.ecb.europa.eu/home/search/review/html/index.en.html.

the tradition of the Michigan Consumer Survey, the Business and Consumer Survey of the European Commission asks households how they expect prices to develop over the next 12 months. One of the answer categories is that prices will "stay about the same". On the one hand, this seems to be the perfect answer for a price stability-oriented central bank, indicating a high degree of inflation target credibility. On the other hand, Andrade et al. (2023) argue that inflation expectations are de-anchored when a large share of households expects prices to remain about the same because the expected inflation rate is about zero and, thus, clearly below the policy-intended level. Interpretation problems regarding the implied degree of ITC are not restricted to qualitative surveys. Two consumers reporting inflation expectations of, e.g., 3% in a quantitative survey may have very different views about whether future inflation will be *close to 2%* or not and, therefore, on the credibility of the inflation target. Our survey avoids these problems. Strictly following the official definition of the ECB's target, we ask "In what range do you think the annual inflation rate will be over the medium term?". This does not leave much room for misinterpreting the perceived credibility of the ECB's inflation target if survey responses fall into the categories "clearly above 2%" or "clearly below 2%" and not into the target category "(below but) close to 2%".

In previous work, we reported the evolution of the survey results until May 2022, both for the representative consumer and for various subgroups of the population corresponding to certain personal characteristics, including gender, age, education, and place of residence, see Coleman and Nautz (2023a,b). The current paper advances on these - mainly descriptive - studies in three important dimensions. Firstly, we do not restrict the analysis to averages and shares but estimate probability models using the individual survey data. This allows us to disentangle the effects of different personal characteristics on the perceived credibility of the inflation target. Personal characteristics alone, however, cannot explain why inflation target credibility changes over time. Following e.g. Hommes and Lustenhouwer (2019), we assume that the credibility of the inflation target depends on whether the central bank was able to achieve it in the past. Secondly, we therefore investigate to what extent the time-varying individual percep-

tions of ITC depend on the deviations of inflation from the 2% target. Thirdly, we are particularly interested in the role of asymmetries in the evolution of ITC.

The literature typically assumes that the effects of, e.g., demographics and observed inflation rates on inflation expectations and, thereby, on ITC are symmetric.[2] Nonetheless, consumers may assess inflation rates below and above the target quite differently. An early contribution considering asymmetric effects is Ehrmann (2015), who found that re-anchoring inflation expectations is particularly difficult when inflation has been persistently too low. Binder (2020) documents that consumers commonly tend to associate bad economic times with high inflation rates. Gorodnichenko and Sergeyev (2021) report that in the United States, in the euro area, and even in Japan, where inflation had been below target for decades, consumers virtually never expect deflation. Similarly, Baqaee (2020) shows that inflation expectations respond more to inflationary news than disinflationary news. He explains this asymmetry using ambiguity-averse households that underweight deflationary news since it increases their purchasing power. A further explanation for asymmetries in the effect of observed inflation on the perceived credibility of inflation targets is offered by models of rational inattention. Weber et al. (2023) and Korenok et al. (2023) provide cross-country evidence that households become more attentive to inflation in a high-inflation environment. According to Korenok et al. (2023), the inflation attention threshold for Germany is consistent with the threshold estimated for the U.S. For the inflation expectations of US consumers, Pfäuti (2024) estimates an attention threshold of 4%. Despite the symmetric inflation targets of the Fed and the ECB, all these contributions suggest that consumers may react differently to positive and negative deviations of inflation rates from the central bank's target.

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[2]Dräger et al. (2016) investigate to what extent inflation expectations of consumers are consistent with key economic concepts, including the Fisher Equation, the Taylor rule and the Phillips curve. D'Acunto et al. (2023) provide a comprehensive overview of the role of personal characteristics in the formation of individual inflation expectations. Typically, this literature uses RCTs to identify causal effects, for instance, by providing specific information treatments, an approach unavailable in our survey setting. A second strand of the literature considers inflation expectations from a more macro-oriented perspective. These studies investigate the (symmetric) effects of macro-news, realized inflation or inflation forecast errors to assess the anchoring of average or representative inflation expectations, see e.g. Beechey et al. (2011) and Bomfim and Rudebusch (2000) or Hachula and Nautz (2018) and Carvalho et al. (2023) for more recent contributions.

Inflation expectations have become a leading indicator of the credibility of a central bank's inflation target. This major interest in analyzing consumer expectations has led to the establishment of several new surveys, including the Fed's Survey of Consumer Expectations (SCE), the Bundesbank's Online Panel (BOP-HH), and the ECB's Household Finance and Consumption Survey (HFCS). Yet, to the best of our knowledge, no survey question explicitly adopts the wording and the definition of the central bank's inflation target. In the Bundesbank Online Panel, for example, survey participants were asked to state their "degree of trust in the ECB's ability to achieve price stability" on a scale from 0 (no trust) to 10 (full trust). Hoffmann et al. (2022) report that even in February 2021, when inflation was still very low, the average trust level did not exceed 5, and only very few respondents fully trusted the ECB. Christelis et al. (2020) employ survey data provided by the Dutch National Bank to explore the influence of trust in the ECB on inflation expectations. Dräger and Nghiem (2023) analyze the relationship between inflation literacy, inflation expectations and trust in the ECB. General trust in the central bank and inflation target credibility are similar but not identical concepts.[3] For example, Hayo and Méon (2024) showed that the persistently disappointing results of trust surveys are mainly stirred by general skepticism towards EU-wide institutions and anti-European attitudes and, to a far lesser extent, the ECB's actual inflation performance.

Our results indicate that the response of inflation target credibility perceived by consumers (ITC) to deviations from the target is asymmetric, i.e. ITC responds significantly and plausibly signed to target deviations only when inflation is above target. By contrast, when inflation is below target, the central bank cannot improve credibility by raising the inflation rate to close the gap. Note that this asymmetry cannot be explained by an inflation attention threshold. Specifically, we find a significant response of ITC to target deviations even if inflation is between 2% and 4%. Asymmetric responses are found for all types of consumers. In particular, the estimated degree of asymmetry does not depend on personal characteristics.

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[3] A detailed discussion of the various drivers of trust in central banks is provided by Ehrmann (2024).

The rest of the paper is structured as follows. Section 2 describes the survey design (2.1), provides an overview of the composition of the sample (2.2), and discusses the relevant inflation data (2.3). Section 3 introduces the symmetrical linear probability model, which we use as a starting point for estimating the inflation target credibility perceived by individual consumers. Section 4 estimates the asymmetric ITC model, where consumers' perceptions about ITC can respond differently to positive and negative deviations of inflation from the target. We account for a possible inflation attention threshold and explore to what extent the response of ITC to inflation depends on personal characteristics. Section 5 contains robustness analyses. In particular, we show that the asymmetric response of consumers to target deviations is not driven by sentiment (i.e. a *day-of-week* effect) or the recent change of the inflation rate pointing to a *being on the right track* effect. We also investigate how introducing the new, fully symmetric target in July 2021 affected consumers' perception of ITC. Finally, Section 6 offers some concluding remarks.

2 Data

2.1 The online survey: data collection, sample composition, and external validity

Our empirical analysis is based on a survey run by Civey, Germany's largest company for online surveys. Their surveys are spread across more than 25,000 partner websites, including major German online newspapers (Coleman and Nautz, 2023a). Civey's panel consists of approximately one million adult German citizens who signed up using their email address and created a user profile that provides further personal information, including the respondent's age, gender, and level of professional education. Moreover, we use the respondent's postcode to control for differences in the response behavior of East- and West-German consumers, see Goldfayn-Frank and Wohlfart (2020). From January 16, 2019, until November 28, 2024, about 140,000 survey participants submitted a total number of about 250,000 responses. Because not every user profile provides the full set of personal characteristics, the actual number of observations used

in our main regressions is 219,629.

Civey collects data through non-probability sampling, a survey technique that has become increasingly popular for market research, election polls, and also for economic research, see e.g. Binder (2020) and Coleman and Nautz (2023a). In these surveys, the attention is not restricted to a pre-selected, relatively small sample. Rather, each member of the large Civey panel is allowed to participate. Civey provides approximately 5,000 observations in consecutive 45-day windows using quota sampling. Representative results for each window are obtained using official socio-demographic data to weight survey responses accordingly. Without weighting, for example, male respondents aged above 50 would be clearly over-represented in our sample, see Table 1.[4]

Table 1   Personal characteristics of survey respondents

Demographic variable		Number	Share	Population
Gender	Male	99,642	69.9%	49.3%
	Female	42,990	30.1%	50.7%
Location	West	110,023	77.1%	85%
	East	32,609	22.9%	15%
Professional Education	NA	7,309	5.1%	
	College	67,574	47.4%	18.5%
	Else	67,749	47.5%	81.5%
Age	< 50	26,780	18.8%	55%
	≥ 50	115,852	81.2%	45%

NOTE. Total number of respondents: 142,632. Sample period: Jan 16, 2019 to November 28, 2024. Demographics from the day of latest response. In the following regressions, we include marital status, job position and employment status as additional controls. Population values are taken from the German Statistical Office.

While survey questions are proposed randomly, panel members still decide whether to participate or not. Therefore, our respondents are intrinsically motivated to answer the question and are interested in the topic. Typically, the motivation to participate in a survey is less intrinsic. Survey participants run by Amazon-Turk are paid for each

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[4]The regression weights used in our estimations are provided by Civey and are calculated for each of the 45-day data windows individually. For more technical details about the survey methodology, see Richter et al. (2023). Note that our main results can also be obtained using the unweighted data.

answer, and monetary incentives are also common for participants in standard consumer surveys. By contrast, the only benefit for participants in our survey is the access to aggregate results after they have responded. Thus, near-term second answers (i.e., during the next 45 days) are ruled out to avoid participants adjusting their answers in response to the published survey results.

Restricting repeat participants ameliorates "learning-through-survey" effects.[5] In our sample, the proportion of survey participants that answered the question more than once is 18.5% and only very few respondents answered more than five times during the five-year sample period, see Figure 1. In the following sections, multiple responses are included in our regressions. Nonetheless, it is important to emphasize that our main results do not depend on that choice, compare Table A1 in the appendix.

Figure 1 Number of responses per survey respondent
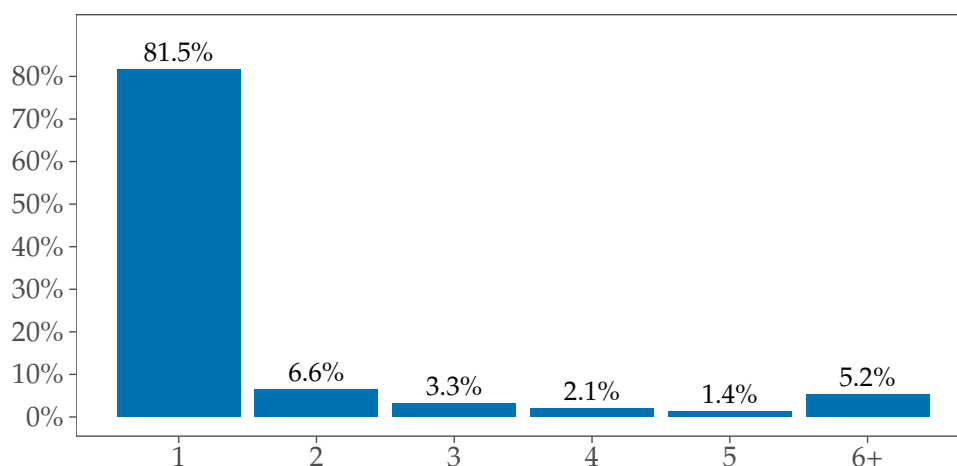
NOTE. The figure displays the frequency distribution of the number of responses per survey participant. While each user is allowed to participate once in a 45-day window, the share of high-frequent participants is very small. For more information see Table 1.

Coleman and Nautz (2023a) illustrate the external validity of the non-probability sampling approach by comparing survey results on short-term inflation expectations obtained by Civey with those taken from the well-established consumer survey of the Eu-

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[5]Following Kim and Binder (2023), these effects are large for household inflation expectations taken from the Fed's Survey of Consumer Expectations (SCE). They show that repeat survey participants generally have lower inflation expectations and uncertainty, particularly if their initial uncertainty was high.

ropean Commission (EC). We extend this exercise (from May 2021) to the more recent period. The expectations balance conveniently summarizes qualitative survey expectations as a weighted average of survey responses representing the inflation tendency, see Arioli et al. (2017). Figure 2 shows that Civey's balance is persistently above those from the EC survey, implying that participants in the Civey survey tend to expect higher inflation rates than those in the EC survey. Yet, the strong co-movement of the expectation balances indicates that the external validity of our survey results on the temporal variation of inflation target credibility remains high.

Figure 2   Expectations balances from Civey and the EC's consumer survey
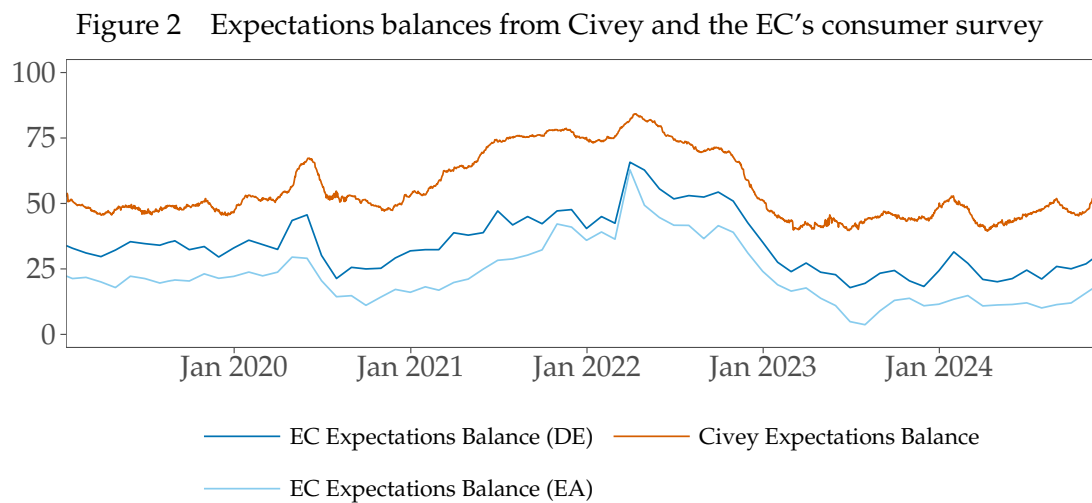
NOTE. The Figure shows the expectations balances for short-term inflation expectations of German consumers provided by Civey and expectation balances for Germany (DE) and the Euro area (EA) taken from the European Commission's Business and Consumer Survey, see Arioli et al. (2017). Sample period Jan 2019 to November 2024.

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2.2 Surveying inflation target credibility

Our study aims to explore how consumers perceive the credibility of the ECB's inflation target. To that aim, we implemented the survey question and the available answer categories as follows:

In what range do you think the annual inflation rate will be over the medium term? It will be...

(A)	...clearly above 2%	(D)	...clearly below 2%
(B)	...slightly above 2%	(N)	Do not know
(C)	...(below, but) close to 2%		

A distinguishing feature of our survey is that the survey question *and* the answer category (C) exactly follow the definition and wording of the ECB's target. In particular, in July 2021, we adjusted the answer category (C) from *below but close to 2%* to the new target *close to 2%*. Accordingly, (C) is the perfect answer from the central bank's perspective, implying that the inflation target is fully credible.

In line with the definition of the target and the general communication of the ECB, the survey does not determine the exact range of inflation rates that are *close* to 2%. This ambiguity would be a problem in a quantitative survey of inflation expectations because the researcher had to assume a plausible range of inflation rates viewed as compatible with the target. This decision becomes even more problematic if the credibility range varies over time or among consumers.[6] In our qualitative survey, this is not an issue because categories (A) and (D) are clearly incompatible with the ECB's inflation target irrespective of the individual consumer's interpretation of "close". Therefore, a high fraction of responses in the categories (A) and (D) unmistakably reveal that the perceived credibility of the inflation target is worryingly low.

In January 2019, we included (B) "slightly above 2%" as an answer category to account for the asymmetry in the inflation target and kept (B) in the survey in July 2021

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[6]Similarly, the ECB and, thus, the survey leaves it to the consumer what exactly "medium-term" means.

for comparability. Irrespective of the exact definition of the target, the answer (*B*) indicates a higher degree of credibility than (*A*). Therefore, in the spirit of expectations balances (compare Figure 2), Coleman and Nautz (2023a) propose the credibility indicator $CI = C + \frac{1}{2}B$ where C and B denote the shares of the corresponding answer. Of course, the weight of $\frac{1}{2}$ for the answer (*B*) is arbitrary and debatable, in particular since July 2021 when inflation expectations *slightly above 2%* may fall into the credibility range. In the following, we therefore consider both (*C*) and (*B*) as compatible with a credible inflation target and define the inflation target credibility indicator ITC as

$$ITC = C + B. \tag{1}$$

Figure 3 displays the share of C answers and the two credibility measures CI and ITC obtained for the representative consumer. The co-movement of all measures of inflation target credibility explains why the weight given to B answers does not affect our main results.

Figure 3   The credibility of the ECB's inflation target
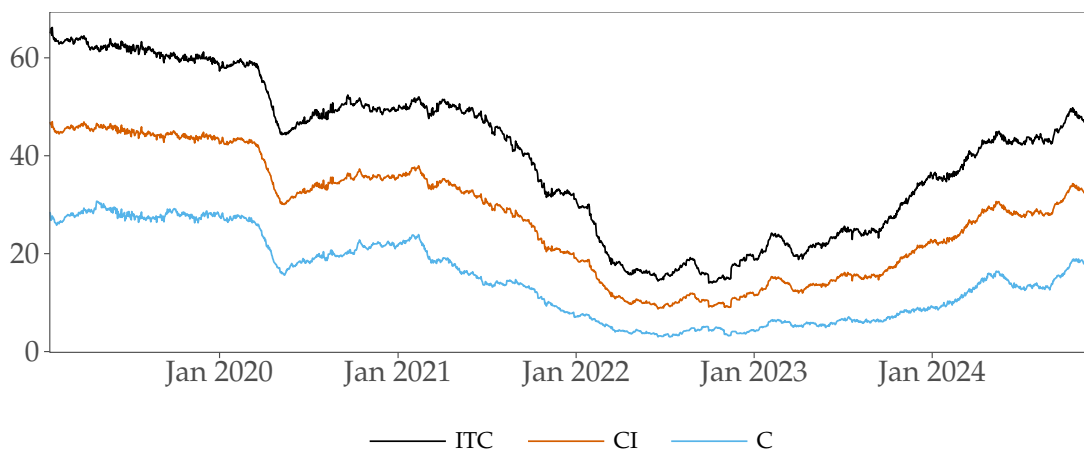
NOTE. The survey answers C and, to a lesser extent, B indicate the credibility of the inflation target. The Figure illustrates the co-movement of the representative share of C answers, the credibility index $CI = C + \frac{1}{2}B$ proposed by Coleman and Nautz (2023a) and $ITC = C + B$, the credibility measure used in the current paper. Sample period: Jan 2019 to November 2024.

The development of inflation certainly influences the evolution of average inflation target credibility, but the relationship is not trivial. Coleman and Nautz (2023a), for exam-

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ple, showed that during the COVID pandemic, inflation target credibility decreased because more consumers expected inflation to increase clearly above target, even though inflation rates were below target and the economy headed to a recession. To shed more light on the determinants of inflation target credibility, we shall explore how the individual response behavior in the survey depends on personal characteristics and the inflation environment.

2.3 Inflation measures

Personal characteristics may affect individual inflation expectations and, thereby, the perceived credibility of a medium-term-oriented inflation target. They cannot explain, however, why the credibility of an inflation target changes over time. A natural candidate for explaining time variation in inflation target credibility is the actual rate of inflation. Yet, which measure of inflation is relevant for consumers when they assess the credibility of the central bank's inflation target? From the ECB's perspective, it ought to be the HICP inflation, the harmonized and weighted average of the inflation rates of euro area member countries, the inflation measure the ECB's target refers to. However, consumers may be particularly attentive to regional price developments more relevant to their purchasing power. In our application, the heterogeneity of the Euro area is not an issue. The high weight of Germany in the calculation of the HICP implies that the difference between both inflation rates tends to be small. Figure 4 confirms the strong co-movement between yearly inflation rates in Germany (CPI) and the euro area (HICP).

Figure 4 displays additional inflation measures that could be relevant for ITC. In particular, the credibility of the inflation target may depend on the longer-term inflation record, see e.g. Hayo and Méon (2024). Thus, we also experiment with the average inflation rate over the last 12 months as a potential driver of ITC. Finally, we consider core inflation, defined as inflation excluding food and energy, as a promising candidate since it is less prone to short-run price fluctuations and can be seen as a proxy for the medium-term inflation trend.

Figure 4   Inflation measures
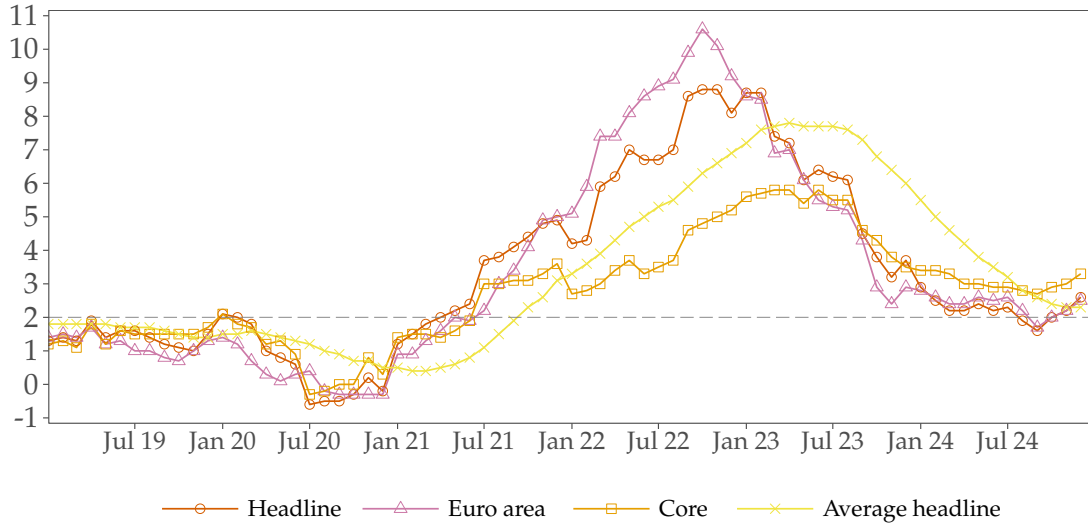
NOTE. The Figure shows the (yearly) headline CPI inflation rate for Germany, the HICP inflation rate for the euro area, core CPI inflation and the average CPI inflation rate over the past 12 months for Germany. The dashed line indicates the 2% inflation target. Sample period Jan 2019 to November 2024.

3 Symmetric inflation target credibility

3.1 The symmetric model of inflation target credibility

The starting point of our empirical analysis of inflation target credibility is the following linear probability model:

$$ITC_{it} = \alpha + \beta' X_i + \gamma |\pi_t - 2| + \varepsilon_{it} \tag{2}$$

where ITC_{it} equals one if consumer i answers C or B (and is zero in all other cases) and t denotes the day of the survey response. X_i contains the time-invariant control variables that include the personal characteristics of consumer i. π_t is a monthly measure of inflation observable in t. For convenience, we define π_t as the inflation rate in the month before t, the day of the survey response. The model assumes that the main time-varying determinant of inflation target credibility (ITC) is the deviation of inflation

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from the 2% target.[7] Since the treatment variable π_t is constant in a given month, we clustered the standard errors accordingly, see Abadie et al. (2023). In line with the ECB's new inflation target, the ITC equation (3) is symmetric as the impact of target deviations on ITC does not depend on the sign. In a symmetric ITC model, it does not matter if the inflation rate is, for example, 1% below or 1% above the target. Since deviations from the target should decrease its credibility, we expect γ to be negative.

3.2 Estimation results for the symmetric ITC model

To begin with, we estimate the symmetric model using the different inflation measures presented in the previous section. Table 2 summarizes the estimation results. Regardless of the underlying inflation measure, the response of inflation target credibility to target deviations is statistically significant and plausibly signed. Additionally, the response is economically relevant: If the deviation of German inflation from the target of 2% increases by one percentage point, for example, the predicted probability that a consumer perceives the ECB's inflation target as credible decreases by about 7 percentage points ($\gamma = -0.065$).

Table 2 further presents the results obtained for selected personal characteristics. For each inflation measure, we estimate that respondents with a college degree and those aged above 50 have a slightly higher probability of perceiving the target as credible. The estimated effects are stronger for females and East Germans, who seem to be particularly pessimistic about the credibility of the inflation target.

The similarity of the estimation results reflects the high correlation between the different measures of inflation. Yet, the specifications using average and core inflation are clearly outperformed by those using German CPI and the HICP. In the following, we focus on the German inflation rate as the relevant inflation measure for inflation target credibility perceived by German consumers but our main results do not depend on that choice, see Table A2 in the appendix.

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[7]More precisely, the target value of inflation was below, but close to 2% until July 2021. However, replacing 2% by 1.8% or 1.9% for responses submitted before July 2021 does not affect our results, see Table A4 in the appendix.

Table 2   Symmetric ITC model: results for different measures of inflation

	CPI	HICP	Average	Core
$ITC_{it} = \alpha + \beta X_{it} + \gamma|\pi_t - 2| + \varepsilon_{it}$				
$|\pi_t - 2|$	**−0.065**	**−0.056**	**−0.061**	**−0.097**
	(0.005)	(0.004)	(0.006)	(0.010)
Personal characteristics				
Female	**−0.085**	**−0.084**	**−0.082**	**−0.083**
	(0.005)	(0.005)	(0.005)	(0.005)
East	**−0.071**	**−0.071**	**−0.071**	**−0.072**
	(0.004)	(0.004)	(0.004)	(0.004)
College	**0.037**	**0.037**	**0.037**	**0.038**
	(0.004)	(0.004)	(0.004)	(0.003)
Age $\geq$ 50	**0.023**	**0.025**	**0.020**	**0.019**
	(0.006)	(0.006)	(0.007)	(0.007)
R^2	8.8	8.6	6.8	6.9
Obs.	219,629	219,629	219,629	219,629

NOTE. $ITC = 1$ if survey response is C or B. The various inflation measures used for π_t are the headline CPI inflation rate for Germany, the HICP inflation rate for the euro area, core CPI inflation and the average CPI inflation rate over the past 12 months for Germany, compare Figure 4. Additional controls include job position, employment status, and marital status. Standard errors clustered at the monthly level in parentheses. Bold font signifies significance at the 1% level. Sample period Jan 2019 - Nov 2024.

4 Asymmetric inflation target credibility

4.1 The asymmetric model of inflation target credibility

The probability models estimated in the previous section follow the logic of a symmetric inflation target, assuming that the impact of deviations from the target on its credibility does not depend on whether inflation is too high or too low. Yet, consumers may respond to inflation rates below and above the target differently. To allow for an asymmetric response of consumers' perception of inflation target credibility, we extend (2) to the following asymmetric ITC model:

$$ITC_{it} = \alpha + \beta X_i + \gamma^+ |\pi_t - 2|^+ + \gamma^- |\pi_t - 2|^- + \varepsilon_{it} \qquad (3)$$

where $|\pi_t - 2|^+$ ($|\pi_t - 2|^-$) captures the positive (negative) deviations of inflation from the target and is zero otherwise. Since $|\pi_t - 2| = |\pi_t - 2|^+ + |\pi_t - 2|^-$, the response of ITC to target deviations is symmetric if $\gamma^+ = \gamma^-$.

Table 3   Asymmetric inflation target credibility

	(1)	(2)	(3)	(4)
$|\pi_t - 2|^+$	**−0.062**	**−0.067**	**−0.098**	**−0.059**
	(0.005)	(0.005)	(0.017)	(0.005)
$|\pi_t - 2|^-$	0.013	0.007	0.007	0.058
	(0.010)	(0.009)	(0.011)	(0.031)
$\mathbb{1}(\pi_t > 4) \cdot |\pi_t - 2|$			0.034	−−
			(0.014)	
$\mathbb{1}(\pi_t < 0) \cdot |\pi_t - 2|$				−0.052
				(0.026)
Personal characteristics				
Female	**−0.085**	**−0.085**	**−0.085**	**−0.085**
	(0.005)	(0.004)	(0.005)	(0.005)
East	**−0.071**	**−0.071**	**−0.071**	**−0.070**
	(0.004)	(0.004)	(0.004)	(0.004)
College	**0.036**	**0.036**	**0.036**	**0.036**
	(0.004)	(0.003)	(0.004)	(0.004)
Age ≥ 50	**0.024**	**0.023**	**0.024**	**0.023**
	(0.006)	(0.006)	(0.006)	(0.006)
R^2	9.9	7.9*	10.0	10.0
Obs.	219,629			
Obs. (months) $\pi_t < 2$	94,911 (28)			
Obs. (months) $\pi_t > 2$	116,156 (40)			
Obs. (months) $\pi_t > 4$			73,651 (25)	
Obs. (months) $\pi_t < 0$				16,399 (5)

NOTE. The first column shows OLS estimation results for the asymmetric ITC model (3):

$$ITC_{it} = \alpha + \beta X_i + \gamma^+ |\pi_t - 2|^+ + \gamma^- |\pi_t - 2|^- + \varepsilon_{it}.$$

Column (2) reports the average marginal effects of the corresponding logit model and McFadden's pseudo R^2. The equation in column (3) allows for an additional (in)attention threshold of inflation rates 4% or higher, see Section 4.2. In column (4) an additional interaction variable for deflationary periods is included, see Section 4.3. For further information, see Table 2.

The estimation results for the asymmetric ITC equation based on German CPI inflation are summarized in the first column of Table 3. The data strongly reject the symmetric model ($\gamma^+ = \gamma^-$). Apparently, the plausibly signed response of ITC found in the symmetric specification is driven by inflation rates above the target ($\gamma^+ = -0.062$).

By contrast, for an inflation rate below the target, the corresponding coefficient is very close to zero and insignificant ($\gamma^- = 0.013$). Consequently, when inflation is below target, the central bank cannot improve the perceived credibility of its inflation target by increasing inflation to close the gap.

The asymmetric ITC model reveals that inflation target credibility is particularly low when inflation is above target. In this situation, the share of respondents expecting inflation to be "clearly above 2%" is particularly high - irrespective of personal characteristics, compare Figure A1 in the appendix. In line with stylized facts on inflation expectations (D'Acunto et al., 2023), the coefficients estimated for the demographics suggest that inflation target credibility is lower for females, East Germans, and respondents without a college degree.[8]

Since a linear probability model (LPM) can lead to predicted probabilities below zero or above one, we re-estimate the asymmetric ITC equation using a logit model. In our application, the average marginal effects of the logit model are very close to the estimated coefficients of the linear model, see column (2) in Table 3.[9] Therefore, we follow the literature on inflation expectations and base the further analysis on the linear probability model.

4.2 Asymmetric ITC and inflation (in)attention

The lack of response of ITC to inflation, when inflation is below target, could potentially be explained by inflation inattention. Pfäuti (2024) estimates that inflation expectations of US consumers are particularly attentive to inflation if it exceeds a threshold of 4%. In our application, the inflation (in)attention hypothesis would imply a significant response of ITC to positive target deviations only if inflation is above the attention threshold. To account for the attention hypothesis, we augment the asymmetric ITC model with an additional regressor that allows ITC to respond differently when infla-

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[8]These patterns regarding personal characteristics are also evident from the Bundesbank survey of consumer expectations, see https://www.bundesbank.de/en/bundesbank/research/survey-on-consumer-expectations/inflation-expectations-848334.

[9]In fact, none of the probabilities implied by the linear model is above one, and less than 0.1% are below zero.

tion is very high. Specifically, we interact the target deviation with a dummy variable equal to one if inflation is above 4%.

The estimation results, presented in the second column in Table 3, indicate that adding an inflation attention threshold to the asymmetric ITC model does not alter our main findings. Specifically, there remains an asymmetric response of ITC to positive and negative target deviations even for inflation rates below 4%. While there is some evidence of non-linearity at very high inflation rates, the estimated coefficient suggests that the response of ITC becomes weaker, not stronger, when inflation exceeds 4%. Therefore, inflation (in)attention does not appear to be the primary factor influencing the development of inflation target credibility.

4.3 Asymmetric ITC when inflation rates are below zero

From July to December 2020, inflation rates in Germany fell below zero for five months. This deflationary period may introduce additional nonlinearity in how consumers assess deviations from the target. To account for potential differences in consumer responses during deflationary periods, we interact the target deviation with a dummy variable equal to one if inflation is negative.

The estimation results, presented in the third column in Table 3, show that the asymmetry in ITC is not merely driven by a few deflationary months. When inflation is below zero, there is no significant response of ITC to target deviations and the total effect is virtually zero ($0.058 - 0.052 = 0.006$). In fact, the asymmetry is even more pronounced during periods when inflation is positive but still below target. In the more common scenario, with inflation rates between 0% and 2%, the response coefficient (0.058) is (at the 10% significance level) even positive. Consequently, ITC *declines* when inflation rises, for instance, from 1% to 2%. While ITC continues to respond significantly and in a plausible direction when inflation exceeds the target, our results suggest that efforts to raise low yet positive inflation rates back to the target even reduce ITC.

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4.4 Asymmetric ITC and personal characteristics

In line with the empirical literature on the formation of inflation expectations, the ITC equations estimated in the previous sections controlled for a wide range of personal characteristics. While demographics cannot explain the time-variation of inflation target credibility, the estimation results confirmed their significance and the heterogeneity of ITC. In the previous sections, the influence of demographics was constrained to the average level of ITC, implying that the impact of target deviations on individual ITC is homogeneous. However, the actual effect of target deviations and, thus, the credibility of the inflation target might differ for population subgroups. Therefore, we re-estimate the asymmetric ITC equation for sub-groups of the population to allow for a heterogeneous response of ITC to target deviations of inflation.

Table 4   Asymmetric inflation target credibility: the role of personal characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\|\pi_t - 2\|^+$	−0.062	−0.057	−0.067	−0.059	−0.063	−0.066	−0.059	−0.067	−0.051
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005	(0.005	(0.005)	(0.004)
$\|\pi_t - 2\|^-$	0.013	0.011	0.016	0.015	0.012	0.009	0.017	0.022	−0.0004
	(0.010)	(0.010)	(0.011)	(0.011)	(0.010)	(0.011)	(0.010)	(0.012)	(0.009)
Personal characteristics									
Female	−0.085	− −	− −	−0.070	−0.089	−0.080	−0.089	−0.068	−0.104
	(0.005)			(0.009)	(0.005)	(0.006)	(0.007)	(0.005)	(0.009)
East	−0.071	−0.062	−0.081	− −	− −	−0.082	−0.058	−0.085	−0.045
	(0.004)	(0.006)	(0.006)			(0.006)	(0.005)	(0.005)	(0.008)
College	0.036	0.040	0.034	0.021	0.042	− −	− −	0.036	0.043
	(0.004)	(0.006)	(0.005)	(0.007)	(0.004)			(0.004)	(0.008)
Age ≥ 50	0.024	0.036	0.012	0.009	0.029	0.026	0.024	− −	− −
	(0.006)	(0.009)	(0.008)	(0.010)	(0.007)	(0.008)	(0.007)		
R^2	9.9	8.0	10.5	9.1	9.8	10.2	9.3	12.0	7.2
Obs.	219,629	73,786	145,843	50,593	169,036	108,822	110,807	190,004	29,625

NOTE. Results of the asymmetric ITC equation $ITC_{it} = \alpha + \beta X_i + \gamma^+ |\pi_t - 2|^+ + \gamma^- |\pi_t - 2|^- + \varepsilon_{it}$ estimated separately for different personal characteristics including (1) Everyone, (2) Female, (3) Male, (4) East, (5) West, (6) College, (7) No College, (8) Age ≥ 50, (9) Age < 50. For further information, see Table 2.

The results for the most relevant subset of demographics are shown in Table 4.[10] For comparison, we included the homogeneous equation as a benchmark in column (1). The results obtained for the subgroups convincingly demonstrate that the asymmetry in inflation target credibility found for the whole sample is not driven by the idiosyn-

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[10]Results for the remaining demographics lead to the same conclusions. They are not presented but are available on request from the authors.

cratic behavior of a particular population subgroup. In fact, the estimates for γ^+ are very similar across demographics and closely match the plausibly signed and significant estimate obtained for the whole sample. Similar conclusions can be drawn for γ^-, the response coefficient of ITC to negative deviations of inflation from the target. All of these estimates are significantly smaller in absolute terms than their counterparts, and the symmetry of the ITC response can be strongly rejected. Evidently, all demographic subgroups of the German consumer population experience similar difficulties in appreciating the symmetry of the ECB's inflation target.

5 Robustness analysis

5.1 ITC throughout the week

Inflation expectations may depend on consumer sentiment. The survey literature considers various intertemporal effects that may influence both the participation probability and the consumer's sentiment. Most prominently, the *Blue Monday* effect assumes that the emotional status is the worst on Mondays while consumer sentiment is expected to be better on the weekend, see e.g. Fang et al. (2021) and the literature cited therein. Binder (2022) confirms intertemporal effects in surveys of inflation expectations. She finds that Saturday respondents are more likely to provide reasonable answers, defined as expectations between -5% and 5%. Therefore, it is worth investigating whether and how our measure of inflation target credibility depends on the day of the week. Table A3 in the appendix shows the distribution of survey participation for the whole population and demographic subgroups for each day of the week. Participation is slightly higher on Mondays. However, regardless of the demographic subgroup, survey participation is distributed rather equally across weekdays.

Table 5 reports the results concerning day-of-week effects on the measure of inflation target credibility. In the first column, we augment our benchmark equation for asymmetric ITC by day-of-week dummies, using Monday as the reference day. Apparently, while the asymmetric response of ITC to target deviations and the role of demographics

remain unaffected by the inclusion of day-of-week dummies, ITC is slightly lower on the weekend compared to Mondays. This suggests that e.g. low degrees of inflation target credibility cannot be explained by the worse emotional status of survey respondents as to be expected from the Blue Monday effect. In the remaining columns of Table 5, we re-estimate the ITC equation for each weekday separately. The results confirm that asymmetric inflation target credibility is a robust phenomenon that does not depend on the day of the week.

Table 5   Asymmetric inflation target credibility during the week

	Baseline	Mon	Tue	Wed	Thu	Fri	Sat	Sun
$\|\pi_t - 2\|^+$	−0.062	−0.065	−0.059	−0.062	−0.070	−0.060	−0.055	−0.064
	(0.005)	(0.005)	(0.006)	(0.007)	(0.005)	(0.006)	(0.007)	(0.005)
$\|\pi_t - 2\|^-$	0.013	0.002	0.010	0.012	0.008	0.016	0.020	0.025
	(0.010)	(0.014)	(0.011)	(0.017)	(0.015)	(0.011)	(0.012)	(0.015)
Personal characteristics								
Female	−0.085	−0.078	−0.075	−0.084	−0.082	−0.095	−0.090	−0.090
	(0.005)	(0.009)	(0.010)	(0.011)	(0.011)	(0.009)	(0.010)	(0.009)
East	−0.071	−0.079	−0.061	−0.070	−0.071	−0.065	−0.082	−0.064
	(0.004)	(0.010)	(0.012)	(0.010)	(0.013)	(0.012)	(0.009)	(0.010)
College	0.036	0.034	0.057	0.024	0.020	0.043	0.044	0.031
	(0.004)	(0.009)	(0.009)	(0.011)	(0.009)	(0.011)	(0.008)	(0.009)
Age $\geq$ 50	0.024	0.025	0.024	0.011	0.009	0.033	0.038	0.031
	(0.006)	(0.014)	(0.015)	(0.012)	(0.013)	(0.014)	(0.012)	(0.012)
Weekdays, Monday as reference								
Tuesday	−0.001							
	(0.009)							
Wednesday	−0.017							
	(0.009)							
Thursday	−0.009							
	(0.007)							
Friday	−0.023							
	(0.008)							
Saturday	−0.017							
	(0.010)							
Sunday	−0.021							
	(0.008)							
R^2	9.9	9.8	9.0	9.3	11.4	9.6	9.9	11.3
Obs.	219,629	35,211	31,926	29,426	31,300	30,266	28,868	32,632

NOTE. The first column (baseline) shows the results obtained for the asymmetric ITC equation $ITC_{it} = \alpha + \beta X_i + \gamma^+ |\pi_t - 2|^+ + \gamma^- |\pi_t - 2|^- + \varepsilon_{it}$ that is augmented by day-of-week dummy variables. In the remaining columns, the ITC equation is estimated for each weekday separately. For further information see Table 2.

5.2 ITC and being (not) on the right track

According to Baqaee (2020), consumers' responses are stronger for inflationary news than for disinflationary news. Therefore, in addition to the target deviation ($|\pi_t - 2|$) that only refers to the level of inflation, the perceived credibility of the inflation target might also be affected by the change in inflation. For example, if inflation has increased from, say, 4% to 5%, consumers may be inclined to expect a further increase of the rate of inflation. By contrast, if inflation has decreased from 6% to 5%, inflation is at least on the right track, and the same target deviation of +3% may have a less distorting impact on ITC. To investigate the relevance of this "being on the right track" asymmetry, we re-estimate the asymmetric ITC equation for months with increasing and decreasing inflation rates separately. Specifically, we estimate the equations

$$\Delta \pi_t > 0: \quad ITC_{it} = \alpha_> + \beta_> X_i + \gamma_>^+ |\pi_t - 2|^+ + \gamma_>^- |\pi_t - 2|^- + \varepsilon_{it>} \quad (4)$$

$$\Delta \pi_t < 0: \quad ITC_{it} = \alpha_< + \beta_< X_i + \gamma_<^+ |\pi_t - 2|^+ + \gamma_<^- |\pi_t - 2|^- + \varepsilon_{it<} \quad (5)$$

where, e.g., $\gamma_>^+$ refers to the impact of positive target deviations on ITC when inflation has increased in the month before ($\Delta \pi_t > 0$). The "being on the right track" effect would imply that $|\gamma_>^+| > |\gamma_<^+|$ as the same positive target deviation might be seen as more critical if inflation has increased and is thus not on the right track. Similarly, we would expect $|\gamma_>^-| < |\gamma_<^-|$.

The upper and lower panel of Table 6 show the estimation results of Equations (4) and (5) that allow ITC to depend on the inflation track, i.e. the sign of $\Delta \pi_t$. The first columns show the results obtained for all respondents, and the remaining columns consider various demographic subgroups. The general impression is that there is some evidence in favor of a "being on the right track" effect. For example, suppose inflation is one percentage point above the target such that $|\pi_t - 2|^+ = 1$. In that case, ITC decreases by $|\gamma_>^+| = 6.7$ percentage points when inflation has increased in the month before ($\Delta \pi_t > 0$) compared to only $|\gamma_<^+| = 5.7$ percentage points when too-high inflation is on the right track because it has converged to the target ($\Delta \pi_t < 0$). However, these effects

Table 6   Asymmetric ITC and the change of inflation

(a) Rising inflation ($\Delta\pi > 0$)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$|\pi_t - 2|^+$	**−0.067** (0.008)	**−0.063** (0.008)	**−0.071** (0.009)	**−0.062** (0.008)	**−0.069** (0.008)	**−0.071** (0.008)	**−0.064** (0.009)	**−0.074** (0.009)	**−0.054** (0.007)
$|\pi_t - 2|^-$	0.005 (0.014)	−0.003 (0.016)	0.010 (0.015)	0.008 (0.015)	0.004 (0.014)	−0.004 (0.013)	0.013 (0.016)	0.013 (0.015)	−0.007 (0.014)
<u>Personal characteristics</u>									
Female	**−0.084** (0.007)	— —	— —	**−0.081** (0.012)	**−0.085** (0.008)	**−0.078** (0.011)	**−0.089** (0.007)	**−0.069** (0.008)	**−0.100** (0.014)
East	**−0.071** (0.006)	**−0.069** (0.007)	**−0.074** (0.009)	— —	— —	**−0.087** (0.008)	**−0.054** (0.009)	**−0.088** (0.008)	**−0.041** (0.011)
College	**0.039** (0.005)	**0.045** (0.008)	**0.034** (0.007)	0.022 (0.012)	**0.046** (0.005)	— —	— —	**0.037** (0.006)	**0.048** (0.009)
Age $\geq$ 50	0.021 (0.009)	0.032 (0.013)	0.010 (0.012)	0.001 (0.012)	0.026 (0.011)	0.017 (0.010)	0.026 (0.012)	— —	— —
R^2	10.3	8.6	20.7	9.3	10.3	10.5	9.8	12.7	7.2
Obs.	110,188	36,096	74,092	25,058	85,130	54,762	55,426	96,218	13,970

(b) Falling inflation ($\Delta\pi < 0$)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$|\pi_t - 2|^+$	**−0.057** (0.005)	**−0.052** (0.005)	**−0.062** (0.005)	**−0.057** (0.005)	**−0.057** (0.005)	**−0.061** (0.005)	**−0.054** (0.005)	**−0.062** (0.006)	**−0.048** (0.004)
$|\pi_t - 2|^-$	0.017 (0.013)	0.017 (0.011)	0.017 (0.015)	0.017 (0.014)	0.017 (0.013)	0.017 (0.013)	0.017 (0.014)	0.028 (0.015)	0.001 (0.011)
<u>Personal characteristics</u>									
Female	**−0.086** (0.006)	— —	— —	**−0.059** (0.012)	**−0.093** (0.007)	**−0.083** (0.008)	**−0.090** (0.009)	**−0.068** (0.007)	**−0.107** (0.011)
East	**−0.071** (0.005)	**−0.055** (0.008)	**−0.088** (0.008)	— —	— —	**−0.078** (0.007)	**−0.063** (0.008)	**−0.083** (0.007)	**−0.050** (0.012)
College	**0.034** (0.005)	**0.034** (0.009)	**0.034** (0.007)	0.021 (0.009)	**0.038** (0.006)	— —	— —	**0.034** (0.005)	**0.039** (0.012)
Age $\geq$ 50	**0.027** (0.009)	**0.040** (0.012)	0.015 (0.010)	0.015 (0.015)	**0.031** (0.010)	**0.033** (0.011)	0.022 (0.012)	— —	— —
R^2	9.5	7.5	10.4	9.1	9.3	9.8	8.9	11.3	7.2
Obs.	109,441	37,690	71,751	25,535	83,906	54,060	55,381	93,786	15,655

NOTE. Estimation results of Equations (4) and (5) for different personal characteristics including (1) Everyone, (2) Female, (3) Male, (4) East, (5) West, (6) College, (7) No College, (8) Age $\geq$ 50, (9) Age < 50. Standard errors clustered at the monthly level. Bold font signifies significance at the 1% level. Sample period: Jan 2019 to Nov 2024.

are not sizable and, more importantly, do not affect our main findings on asymmetric inflation target credibility. In particular, there is no significant effect of inflation on ITC when inflation is below target, regardless of whether inflation has risen or fallen. Table 6 further demonstrates that the "being on the right track" effect holds for all demographic subgroups but remains quantitatively unimportant.

5.3 ITC and the introduction of the new target

The introduction of a fully symmetric inflation target as a key component of the ECB's recent monetary policy strategy revision of July 2021 was welcomed by most economists. For example, in a special survey of professional forecasters on the effects of the new inflation target initiated by the ECB, a majority viewed the new target as an improvement of the ECB's strategy, see Meyler et al. (2021). In particular, while 39% of professionals shared the opinion that the new target makes it more likely that the ECB achieves its target, only 6% believed that the new target makes it less likely. In the following, we investigate whether such a pronounced credibility-increasing effect of the new target can also be observed in our consumer survey.

To identify the effect of the target change, we follow Lamla and Vinogradov (2019) and Binder et al. (2024) and focus on the behavior of ITC in a 5-day event window centered around the announcement of the target change.[11] To do so, we construct the dummy variable E_t, which is one if day t is between July 6 and July 10, 2021, and zero otherwise. The target change was announced on July 8, 2021, at the beginning of the ECB's press conference that started at 2:30 pm (GMT+2). Using the timestamp of each survey response, our data set clearly distinguishes between pre- and post-announcement responses. Specifically, we define the variable A_{it} to be one (zero) if the survey response of person i was submitted after (before) the beginning of the press conference.[12] The effect of the new target is then revealed by the coefficient δ_{EA} that

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[11] We are not aware of any further important events or announcements that might have affected ITC in that 5-day window.

[12] Defining A_{it} using 2:15 pm (time of the press release) does not change the results.

indicates how ITC changed in the 5-day event window:

$$ITC_{it} = \alpha + \beta X_i + \gamma^+ |\pi_t - 2|^+ + \delta_E E_t + \delta_{EA} E_t A_{it} + \varepsilon_{it}, \tag{6}$$

We estimate the equation using the approximately 5000 responses in the relevant 45-day data window, ranging from July 6 to August 20, 2021. During that period, inflation was consistently above target. As a consequence, Equation (6) contains only $|\pi_t - 2|^+$.[13]

Table 7   The effect of the new inflation target on ITC

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\hat{\delta}_{EA}$	−0.044	−0.013	−0.048	−0.157	0.041	−0.102	0.016	0.031	−0.287
	(0.081)	(0.125)	(0.093)	(0.139)	(0.089)	(0.116)	(0.099)	(0.064)	(0.159)
R^2	3.3	3.7	3.1	4.8	3.3	4.1	3.8	3.9	8.8
Obs.	4,778	1,471	3,307	965	3,813	2,479	2,299	4,310	468

NOTE. Estimates of δ_{EA} as in Eq. (6) for different subgroups: (1) Everyone, (2) Female, (3) Male, (4) East, (5) West, (6) College, (7) No College, (8) Age $\geq$ 50, (9) Age $<$ 50. Sample period: July 6 to August 20, 2021. Robust standard errors in parentheses.

The estimated effect of the new target on ITC is presented in the first column of Table 7. The small and insignificant effect ($\hat{\delta}_{EA} = -0.044$) confirms the results provided by Galati et al. (2022) and Hoffmann et al. (2023), who find that inflation expectations of consumers make little difference between the ECB's previous strategy of targeting inflation rates below, but close to, 2% and the new strategy with a symmetric 2% target. This weak reaction of consumers to important revisions of monetary policy strategy seems to be an international phenomenon. In particular, Coibion et al. (2023) show that the Fed's switch to an average inflation target in August 2020 has no significant effect on survey responses of US consumers.

A plausible explanation for this puzzling indifference of consumers toward an important and widely discussed monetary policy strategy revision is that the target change is simply too sophisticated for the average consumer. This suggests that the effect of the new target on ITC depends on demographics. In particular, highly educated consumers

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[13]Alternatively, we could have restricted the sample to the 455 observations available in the 5-day event window. However, in this case, the demographic weights provided by Civey would be invalid because they refer to the distribution of the demographics observed in the corresponding 45-day window.

might respond more strongly to the announcement and more similarly to professionals than people without a college degree. To investigate the role of demographics in the perception of the new target, we estimate Equation (6) for each demographic subgroup separately. However, columns (2)-(7) of Table 7 show that the effect of the new target on ITC is negligible for all subgroups. According to column (6), the new target might have even decreased ITC for persons with a college degree.

5.4 Further robustness checks

Although the observed inflation rate is the most natural candidate for explaining the time variation of inflation target credibility, other macroeconomic variables or geopolitical shocks correlated with inflation could bias our estimates. The following analysis sheds more light on the robustness of our results.

5.4.1 Russia's invasion of Ukraine

First, we investigate whether the asymmetric response of ITC to inflation is primarily driven by Russia's invasion of Ukraine and the subsequent increases in German energy prices and general political instability. To do so, we re-estimate the asymmetric ITC equation, restricting the sample to the pre-war period that ended in February 2022. The results presented in column (1) in Table 8 show that the asymmetry of ITC with respect to target deviations is also highly significant in the pre-war period.

5.4.2 Time-fixed effects

Second, we add year-fixed effects to control for additional sources of time variation in ITC. Due to the persistence of monthly inflation rates, the yearly dummies absorb some of the effect of deviations from the target. Most importantly, however, the ITC asymmetry remains highly significant, see column (2) in Table 8.

Table 8   Additional robustness checks: ITC and (1) Russia's invasion of Ukraine, (2) time-fixed effects and (3) the unemployment rate

	(1)	(2)	(3)
$|\pi_t - 2|^+$	**−0.115**	**−0.031**	**−0.062**
	(0.010)	(0.006)	(0.005)
$|\pi_t - 2|^-$	**−0.025**	0.004	**0.029**
	(0.009)	(0.011)	(0.007)
u_t			**−0.063**
			(0.015)
Personal characteristics			
Female	**−0.098**	**−0.083**	**−0.084**
	(0.006)	(0.005)	(0.005)
East	**−0.075**	**−0.070**	**−0.070**
	(0.005)	(0.004)	(0.004)
College	**0.039**	**0.034**	**0.036**
	(0.004)	(0.003)	(0.004)
Age ≥ 50	**0.041**	**0.024**	**0.024**
	(0.006)	(0.006)	(0.006)
Fixed effects	No	Year	No
R^2	5.7	11.4	10.2
Obs.	127,703	219,629	219,629

NOTE.   Column (1) reports estimation results of the asymmetric ITC equation for the pre-war period that ends on the 23rd February 2022. Estimation results in column (2) contain year-fixed effects. In column (3), the model is estimated over the whole sample, including the unemployment rate as an additional control.

5.4.3 The rate of unemployment

Finally, we include the German unemployment rate (u) from the previous month to account for the effects of the macroeconomic environment on consumer perceptions beyond the inflation rate. According to column (3) in Table 8, the estimated coefficient of the unemployment rate (−0.063) is significant and plausibly signed. Remarkably, the asymmetry found in the response of ITC to target deviations is even stronger than in the benchmark specification without the unemployment rate.

6 Conclusion

An important innovation in the ECB's monetary policy strategy revision of July 2021 was the introduction of a fully symmetric inflation target. According to the ECB, symmetry in the inflation target means that monetary policy considers negative and positive deviations of inflation from the target to be equally undesirable. Based on a unique survey of about 140,000 German citizens, we find that this symmetry is not reflected in consumers' perceptions. Specifically, the impact of deviations from the target on the individual perception of inflation target credibility (ITC) is only significant and plausibly signed if inflation is above target. The asymmetric response of consumers to target deviations cannot be explained by inflation (in)attention thresholds or by different reactions during periods of rising or falling inflation. It is well documented that inflation expectations depend on personal characteristics such as gender, age, and education level. However, our results suggest that asymmetric ITC is a robust phenomenon, observable regardless of demographics.

According to Blinder et al. (2024) "the largest benefits from central bank communication with the general public accrue when the central bank [. . .] clarifies its objectives". Unlike primarily favorable feedback from experts, our findings indicate that the new symmetric target has not enhanced consumers' perceptions of ITC. Rather, asymmetric ITC implies that credibility will not improve in the next too-low inflation period when the central bank announces that inflation should increase. Efforts to raise low, yet positive inflation rates back to the target may even reduce ITC.

There is growing evidence that consumers tend to have a stagflationary view of the economy, interpreting increasing inflation primarily as bad news about their purchasing power, see e.g. Candida et al. (2020) and Baqaee (2020). According to Binetti et al. (2024), "inflation is perceived as an unambiguously negative phenomenon without any potential positive economic correlates". In contrast to the symmetry of the inflation targets introduced by the ECB and many other central banks, our results confirm that consumers disapprove rising inflation even when it should.

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Appendix

1 Multiple responses

Table A1   The symmetric ITC model with and without multiple responses

$$ITC_{it} = \alpha + \beta X_i + \gamma |\pi_t - 2| + \varepsilon_{it}$$

$|\pi_t - 2|$	**−0.065** (0.005)	**−0.067** (0.005)
Personal characteristics		
Female	**−0.085** (0.005)	**−0.094** (0.006)
East	**−0.071** (0.004)	**−0.066** (0.005)
College	**0.037** (0.004)	**0.042** (0.005)
Age ≥ 50	**0.023** (0.006)	**0.040** (0.007)
Repeated responses	Yes	No
R^2	8.8	7.2
Observations	219,629	121,969

NOTE. $ITC = 1$ if survey response is C or B. Additional controls include job position, employment status and marital status. Bold font signifies significance at the 1% level. Sample period: Jan 2019 to Nov 2024. For no repeated responses, only the most recent answer is included. For more information, see Table 2.

2 Alternative inflation measures

Table A2   The asymmetric ITC model for different measures of inflation

$$ITC_{it} = \alpha + \beta X_i + \gamma^+ |\pi_t - 2|^+ + \gamma^- |\pi_t - 2|^- + \varepsilon_{it}$$

	CPI	HICP	Average	Core
$|\pi_t - 2|^+$	**−0.062**	**−0.050**	**−0.054**	**−0.094**
	(0.005)	(0.004)	(0.004)	(0.011)
$|\pi_t - 2|^-$	0.013	0.033	0.021	0.031
	(0.010)	(0.013)	(0.013)	(0.020)
Personal characteristics				
Female	**−0.085**	**−0.085**	**−0.082**	**−0.083**
	(0.005)	(0.005)	(0.005)	(0.005)
East	**−0.071**	**−0.070**	**−0.070**	**−0.071**
	(0.004)	(0.004)	(0.004)	(0.004)
College	**0.036**	**0.036**	**0.037**	**0.036**
	(0.004)	(0.004)	(0.004)	(0.003)
Age ≥ 50	**0.024**	**0.025**	**0.021**	**0.021**
	(0.006)	(0.006)	(0.006)	(0.007)
R^2	9.9	9.9	7.3	8.0
Observations	219,629	219,629	219,629	219,629

NOTE. $ITC = 1$ if survey response is *C* or *B*. Additional controls include job position, employment status, and marital status. Standard errors are clustered at the monthly level. Sample period: Jan 2019 to Nov 2024. Bold font signifies significance at the 1% level. Note that the asymmetric effects on ITC are even stronger for the average inflation rate.

3 Survey participation during the week

		Mon	Tue	Wed	Thu	Fri	Sat	Sun
			Table A3	Survey participation during the week				
Entire Sample		16.0	14.6	13.5	14.3	13.8	13.1	14.7
Gender	Male	16.2	14.8	13.3	14.5	13.8	12.9	14.6
	Female	15.7	14.4	13.8	13.9	13.7	13.4	15.1
Location	West	16.2	14.6	13.3	14.2	13.8	13.1	14.8
	East	15.6	14.9	13.9	14.4	13.7	12.9	14.6
Professional Education	Else	16.0	14.5	13.4	14.2	13.7	13.2	15.0
	College	16.0	14.6	13.4	14.3	13.9	13.1	14.7
Age	< 50	15.6	15.4	14.2	14.8	14.0	12.3	13.7
	≥ 50	16.3	14.4	13.1	14.1	13.6	13.6	14.9

NOTE. Total number of responses: 250,703. The table shows how survey responses are distributed during the week. All numbers are in per cent.

4 Inflation targets below, but close to 2%

On July 8, 2021, the ECB changed the inflation target from *below, but close to 2%* to *close to 2%* . So far, we defined target deviations as $|\pi - 2|$ before and after the introduction of the new target. Yet, the public probably viewed the reform as an upward adjustment of the ECB's inflation target. In the following, we re-estimate the ITC equation assuming that an inflation target of *below, but close to 2%* translates into point targets of 1.8% or 1.9% before July 2021. The inflation rate ranged between 1.8 (1.9) and 2% for a total of 5 (3) months between Jan 2019 and July 2021. Table A4 shows that our results remain virtually unchanged when we account for the implicit upward adjustment of the inflation target in July 2021.

Table A4   ITC and the upward adjustment of the inflation target in July 2021

$$ITC_{it} = \alpha + \beta X_i + \gamma_{\pi_t^*}^+ |\pi_t - \pi_t^*|^+ + \gamma_{\pi_t^*}^- |\pi_t - \pi_t^*|^- + \varepsilon_{it}$$

	(1)	(2)
$|\pi_t - \pi_t^*|^+$	**−0.063**	**−0.063**
	(0.005)	(0.005)
$|\pi_t - \pi_t^*|^-$	0.006	0.009
	(0.010)	(0.011)
Personal characteristics		
Female	**0.085**	**0.085**
	(0.005)	(0.005)
East	**−0.071**	**−0.071**
	(0.004)	(0.004)
College	**0.036**	**0.036**
	(0.004)	(0.004)
Age $\geq$ 50	**0.024**	**0.024**
	(0.006)	(0.006)
Observations	219,629	219,629
R^2	9.8	9.9

NOTE. Estimation results using different threshold values (1) $\pi_t^* = 1.8$, (2) $\pi_t^* = 1.9$, before the monetary policy strategy review in July 2021 and 2% after. Standard errors are clustered at the monthly level. Sample period: Jan 2019 to Nov 2024.

Figure A1   Share of "clearly above 2%" (*A*) responses by personal characteristics

(a) Gender

(b) Location

(c) Education

(d) Age
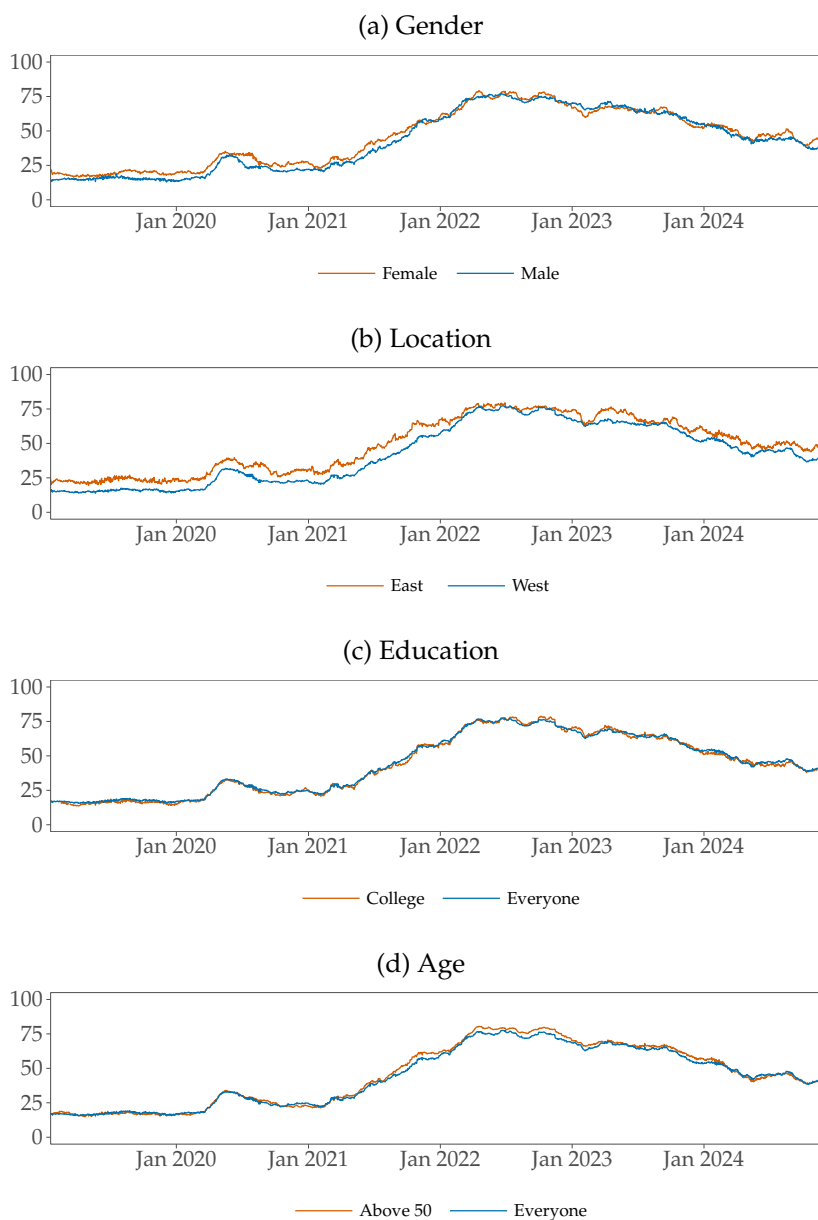
NOTE. Shares of "clearly above 2 %" responses (*A*) for different demographics, taken from the representative results as in Coleman and Nautz (2023a). Sample period Jan 2019 to November 2024.

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