

The Pass-Through from Inflation Perceptions to Inflation Expectations

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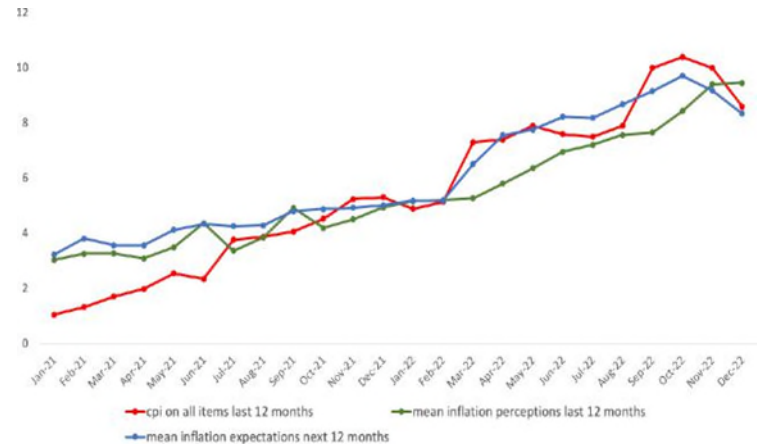
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Motivation

- Inflation **expectations and perceptions** of individuals show (very) **similar trends** and **increased** substantially between Feb and Dec 2022
- High **policy relevance** of inflation expectations:
 - Lagarde (2020): “For the actual process of setting wages and prices, it is the expectations of the public that matter most.”
 - Households’ inflation expectations may influence spending (e.g., Duca-Radu et al., 2021; Ichiue and Nishiguchi, 2015)

Mean inflation perceptions and expectations of individuals in Germany, and CPI



Source: Bundesbank Online Panel Households (BOP-HH). Expectations and perceptions: Weighted means, observations truncated to interval [-5;+30].

What drives inflation expectations?

1. Information and central bank/media communication

(e.g., Lamla and Vinogradov, 2019; Fuester et al. 2018; Kryvtsov and Petersen, 2021)

2. Knowledge, IQ and financial literacy

(e.g., Bruine de Bruin et al., 2010; Burke and Manz, 2014; D'Acunto et al., 2019; Coibion and Gorodnichenko, 2015; Doern et al. , 2015; Lein and Maag, 2011)

3. Historic inflation experiences

(e.g., Angelico and Di Giacomo 2019; Malmendier et al. 2017; Goldfayn-Frank and Wohlfart 2020)

4. Personal shopping experience

(e.g., Weber et al., 2022; D'Acunto et al., 2021)

5. **Perceptions of price changes in the past**

(e.g., Jonung 1981; Draeger, 2015; Arioli et al., 2017; D'Acunto et al., 2021; Bosch et al., 2015; Weber et al., 2022; Cavallo et al. 2017)

Do inflation perceptions help to understand inflation expectations?

1. Do perceptions causally drive short-term expectations?
2. Do perceptions matter for long-term expectations?
3. What drives the link between perceptions and expectations?



Factors **moderating the pass-through** strength:

- * Differences in information sources used to form perceptions
- * Level of uncertainty about the development of the inflation rate

Overview

1. Data and key variables
2. The perception – expectations link
 - Baseline regressions for short-term expectations
 - RCT to establish causality
 - Comparing periods with high and low inflation rates
 - Long-term expectations and perceptions
3. Heterogeneity in the perception-expectation link
4. Conclusions and policy implications



Data and Key Variables

Data - Bundesbank Online Panel Households (BOP-HH)

- **Monthly online survey of individuals in Germany**, from April to June 2019 (pilot-phase) and April 2020 to August 2023
- Offline-recruited online **panel** with a rotating panel design
- Weighted sample **representative of the German online population** along age, gender, education and region
- Completed **interviews with 2 500 to 5 000 individuals** per month
- Anonymised **data available for research** (“Scientific Use Files”)

BOP-HH: Questionnaire and Key Variables

BOP-HH contains **core questions** included **each month** or quarter and **questions proposed by researchers** in **selected waves**

- **Inflation Perceptions:**

- *Quantitative*: What do you think the rate of inflation or deflation in Germany was over the past twelve months?

- **Inflation Expectations:**

- *Quantitative (short-term)* : What do you think the rate of inflation will roughly be over the next 12 months?
- *Quantitative (long-term)*: What value do you think the rate of inflation or deflation will take on average over the next five/ten years/in three years?
- *Probabilistic*: In your opinion, how likely is it that the rate of inflation will develop as follows over the next twelve months? (10 bins ala NY Fed Survey)



The perception – expectations link



Baseline Regressions

Result 1: Inflation perceptions have a positive, large and significant effect on individuals' short-term inflation expectations.

Inflation Expectations – Next 12 Months							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS	OLS	OLS	OLS	Panel: fixed ef.	RE-Panel: random ef.	Panel: change on change
Infl. Perceptions	0.831***	0.759***	0.820***	0.736***	0.749***	0.786***	0.525***
	(0.005)	(0.008)	(0.006)	(0.008)	(0.007)	(0.007)	(0.025)
Wave FEs	No	Yes	No	Yes	-	-	-
Control Variables	No	No	Yes	Yes	-	-	-
N	74,733	74,733	70,816	70,816	50,852	50,852	8,366
R2	0.515	0.545	0.515	0.547	0.457	0.458	0.197

Notes: *** p<0.001, ** p<0.01, * p<0.05. Robust standard errors (Eicker-White) are reported in parentheses. Wave controls include a dummy for each wave. Socio-demographic controls include gender, household income, education, current employment status, East residence dummy, age, age squared. Perceptions and expectations truncated [30;-5]. The data span waves 1-36 of the survey (April - June 2019, April 2020 - December 2022).

RCT to establish causality

Randomized Control Trial (RCT) design to establish causality

Basic idea:

- Randomly split the sample into four equally sized groups
- Provide three of the groups with information on the actual inflation rate and thereby influence their perceptions
- Collect information on expectations (and perceptions) after the treatment from all four groups and compare the outcome for the three groups with those for the fourth group not receiving any treatment

Experiment included in only one wave – August 2022

Establishing causality – RCT experiment in August 2022 BOP-HH

Pre-Treatment perceptions *and* expectations from regular core questions

Reminder of respondents' expectation for the inflation rate over past 12 months

Treatment 1

Treatment 2

Treatment 3

Control

Post-treatment perceptions

-

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Post-treatment expectations (min/max/most likely, Coibion et al. 2021)

Establishing causality – RCT experiment in August 2022 BOP-HH

Pre-Treatment perceptions and expectations from regular core questions

Reminder of respondents' expectation for the inflation rate over past 12 months

You indicated that you believe the overall inflation rate, i.e. including energy and food, was [...] over the past twelve months.

Treatment 1: CPI excl. energy

Treatment 2

Treatment 3

Control

The Federal Statistical Office reported the official inflation rate for Germany for the past twelve months, for the definition excluding energy and food, as being **3.2%** in July 2022.

Post-treatment perceptions

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Post-treatment expectations (min/max/most likely, Coibion et al. 2021)

Establishing causality – RCT experiment in August 2022 BOP-HH

Pre-Treatment perceptions and expectations from regular core questions

Reminder of respondents' expectation for the inflation rate over past 12 months

You indicated that you believe the overall inflation rate, i.e. including energy and food, was [...] over the past twelve months.

You indicated that you believe the inflation rate was [...] over the past twelve months.

Treatment 1: CPI excl. energy

Treatment 2: CPI

Treatment 3

Control

The Federal Statistical Office reported the official inflation rate for Germany for the past twelve months, for the definition excluding energy and food, as being **3.2%** in July 2022.

The Federal Statistical Office reported the official inflation rate for Germany for the past twelve months, as measured by the consumer price index, as being **7.5%** in July 2022.

Post-treatment perceptions

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Post-treatment expectations (min/max/most likely, Coibion et al. 2021)

Establishing causality – RCT experiment in August 2022 BOP-HH

Pre-Treatment perceptions and expectations from regular core questions

Reminder of respondents' expectation for the inflation rate over past 12 months

You indicated that you believe the overall inflation rate, i.e. including energy and food, was [...] over the past twelve months.

You indicated that you believe the inflation rate was [...] over the past twelve months.

You indicated that you believe the inflation rate was [...] over the past twelve months.

Treatment 1: CPI excl. energy

Treatment 2: CPI

Treatment 3: HICP

Control

The Federal Statistical Office reported the official inflation rate for Germany for the past twelve months, for the definition excluding energy and food, as being **3.2%** in July 2022.

The Federal Statistical Office reported the official inflation rate for Germany for the past twelve months, as measured by the consumer price index, as being **7.5%** in July 2022.

The Federal Statistical Office reported the official inflation rate for Germany for the past twelve months, as measured by the Harmonised Index of Consumer Prices, as being **8.5%** in July 2022.

No information

Post-treatment perceptions

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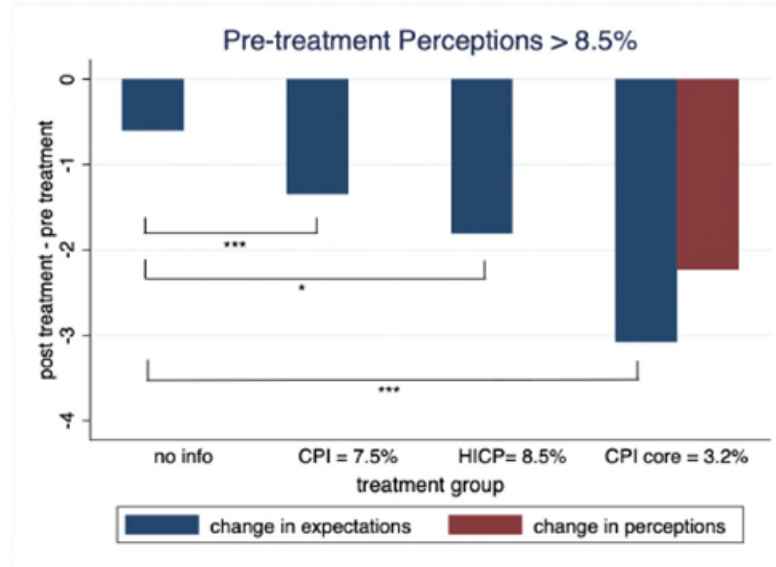
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Post-treatment expectations (min/max/most likely, Coibion et al. 2021)

Inflation perceptions and expectations do adjust to treatment

Figure 2: Treatment effect on consumers' perceptions and expectations



Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Stars denote statistically significant differences between the control treatment (no information) and the information treatment groups (MWU Tests). Sample restricted to respondents with pre-treatment inflation perceptions higher than 8.5%. For these respondents, all information treatments present good news about actual inflation.

Result 2: Perception changes cause changes in expectation

$$\mathbb{E} \left(\pi_{i,t \rightarrow t+12}^{post} \right) - \mathbb{E} \left(\pi_{i,t \rightarrow t+12}^{pre} \right) = \beta_0 + \beta_1' X_{i,t} + \beta_2 (\tilde{P}_{i,t}^{post} - \tilde{P}_{i,t}^{pre}) + \varepsilon_{i,t}$$

Change in Inflation Expectations – Next 12 Months

	T1: CPI Core=3.2%	T2: CPI=7.5%	T3: HICP=8.5%	T1-T3 pooled
Post-Pre	0.258***	0.362***	0.347***	0.326***
	(0.059)	(0.088)	(0.084)	(0.043)
N	580	612	608	1,800
R2	0.133	0.137	0.149	0.119

Notes: Columns 1-4 report OLS estimates. Robust standard errors (Eicker-White) are reported in parentheses. Significance levels: *** p<0.001, ** p<0.01, * p<0.05. Socio-demographic controls include gender, household income, education, current employment status, region, age, age squared. Perceptions and expectations truncated [30;-5]. The data span wave 32 of the survey (August 2022).

Comparing periods with high and low inflation rates

Result 3: Correlation between perceptions and expectations *stronger in times of low inflation*

Inflation Expectations – Next 12 Months			
	1 – Low inflation period (before July 2021)	(2) – High inflation period (July 21-Dec. 22)	Full sample
Infl. perceptions	0.872***	0.665***	0.860***
	(0.015)	(0.010)	(0.015)
High Infl. period			1.370***
			(0.131)
Perception X High			-0.193***
			(0.018)
N	20,702	50,114	70,816
R2	0.578	0.452	0.551

Notes: OLS estimates. *** p<0.001, ** p<0.01, * p<0.05. Robust standard errors (Eicker-White) in parentheses. High-inflation dummy equal to 1 for periods starting from July 2021 and 0 otherwise. Before July 2021, the German economy experienced a stable and low inflation rate equal to 1.1 on average (sd of 0.83). After July 2021, the average inflation rate equaled 6.7 (sd of 2.2). Control variables include: gender, household income, education, age, region (East-West), uncertainty about inflation expectations, wave fixed effects.



Long-term expectations and perceptions

Result 4: Long term expectations related to short-term perceptions and expectations

- Even **after controlling for short-term inflation expectations**, perceptions play a role for long-term inflation expectations

Inflation Expectations – Average Over the Next 5 or 10 Years				
	5-year	5-year	10-year	10-year
Inflation perception past 12 months	0.529***	0.190***	0.545***	0.249***
	(0.013)	(0.014)	(0.015)	(0.017)
Inflation expectations 12 months		0.514***		0.421***
		(0.011)		(0.014)
N	35,491	35,066	26,898	26,574
R2	(0.232)	(0.366)	(0.190)	(0.255)

Notes: OLS estimates. *** p<0.001, ** p<0.01, * p<0.05. Robust standard errors (Eicker-White) in parentheses. Perceptions and expectations truncated [30;-5]. Survey waves 1-36 (April - June 2019, April 2020 - December 2022). Control variables include: gender, household income, education, age, region (East-West), uncertainty about inflation expectations, wave fixed effects.



Heterogeneity in the perception-expectation link

Heterogeneity in pass-through strength

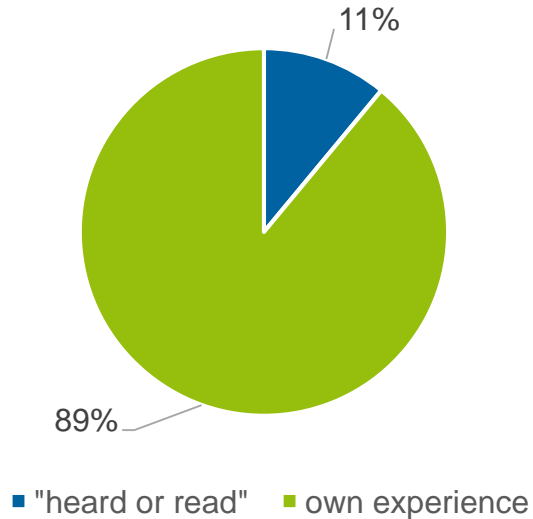
- **Sample splits** show that the strength of the relationship between perceptions and expectations (12 months) depends on socio-demographic characteristics, like gender, region, income, age and several other factors.

⇒ **What is behind the observed heterogeneity?**

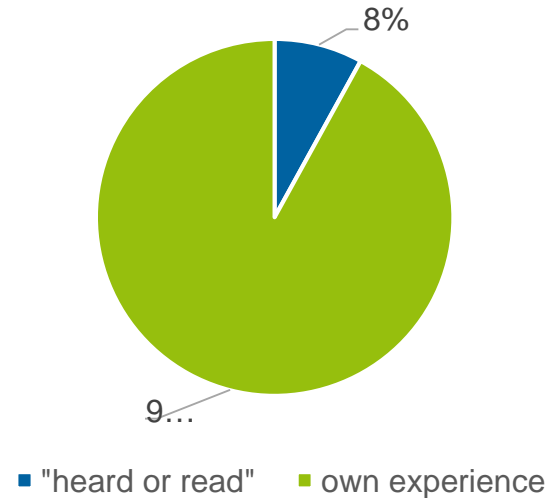
1. Differential information acquisition
2. Different levels of uncertainty about inflation dynamics

Result 5: Most individuals rely on own experience for perceptions ...

You said you think prices for essential goods [...] over the past twelve months. Is that based more on things you have heard or read or on your own experiences when shopping?



July 2021



November 2022

... and this matters for their expectations

- Indirect effect of information acquisition on expectations, through perceptions

Inflation Expectations – Next 12 Months	
Base perception on own experience	-0.157 (0.243)
Perceptions	0.498*** (0.107)
Perceptions X own experience	0.130* (0.056)
N	4,364
R2	0.485

Notes: OLS estimates. *** p<0.001, ** p<0.01, * p<0.05. Socio-demographic controls include gender, household income, education, current employment status, region, age, age squared. Perceptions and expectations truncated [30;-5]. The data span wave 19 (July 2021) and wave 35 (November 2022).

Result 6: Individual uncertainty about inflation going forward matters for the strength of the pass-through

- Extract SD from probabilistic inflation expectation question.
- Women, low-income, low-educated, residents of East Germany, the young show higher levels of uncertainty.
- Stronger pass-through for individuals with higher uncertainty.

Inflation Expectations – Next 12 Months	
Perceptions	0.543*** (0.011)
Uncertainty	0.020*** (0.002)
Perceptions X Uncertainty	0.002**** (0.0003)
N	64,536
R2	0.647

Notes: OLS estimates. *** p<0.001, ** p<0.01, * p<0.05. Controls include gender, income, education, employment status, region, age, age squared. Survey waves 1-36 (April-June 2019, April 2020 - December 2022).



Conclusions and Policy Implications

Conclusions and policy implications

- **Short- and long-term inflation expectations** extrapolated from **perceptions** about past inflation
- **Link** between inflation perceptions and expectations **stronger in times of low inflation**
- Inflation **perceptions** mainly **driven by shopping experience**
- To what degree can communication actually influence expectations, if a large part is pure extrapolation from perceptions about past inflation?
- **It may be possible to influence expectations by influencing perceptions** about past inflation rates through communication



Thank you for your attention.

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