

Firms' Inflation Expectation Pass-Through into Prices and Wages

Evidence from an RCT survey

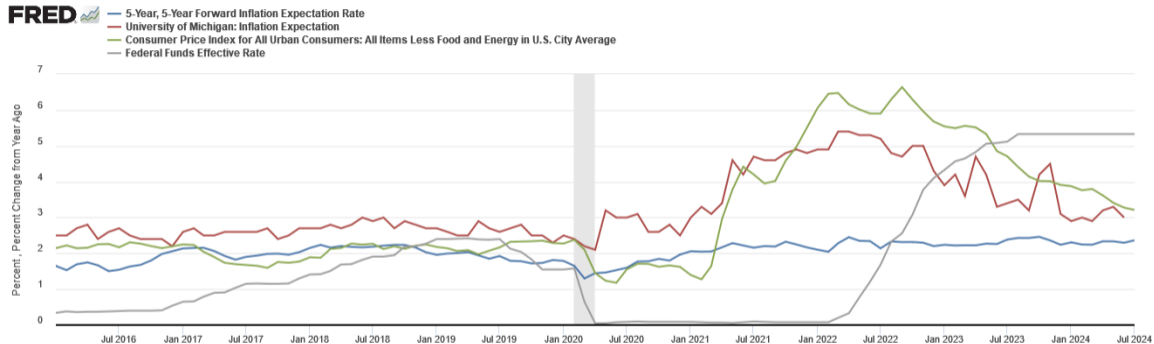
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Motivation



Shaded areas indicate U.S. recessions.

Sources: St. Louis Fed; Univ of Michigan; BLS; Board of Governors

fred.stlouisfed.org

*“Policymakers and analysts generally believe that, as long as **longer-term inflation expectations remain anchored**, policy can and should look through temporary swings in inflation. (...) Longer-term inflation expectations have moved much less than actual inflation or **near-term expectations**, suggesting that households, businesses, and market participants also believe that current high inflation readings are likely to prove transitory.”*

J. Powell, Chair of the Fed, 27 August 2021

*“If **long-term inflation expectations** remain anchored, the risks of a wage-price spiral will be limited.”*

I. Schnabel, ECB Executive Board Member, 30 September 2022

Main questions:

- What is the causal impact of firms' inflation expectations on their prices and wages? Inflation Expectation Pass-Through (IEPT)
- Which horizon of inflation expectations is most relevant for IEPT?
- What is the role of firms' price- and wage-setting behavior for IEPT into prices?

Survey with RCT design:

- Survey of 3,400 firms in Switzerland (response rate 39%), with information treatments to elicit their inflation expectation revisions and subsequent price and wage revisions.

Main findings:

- There is a significant pass-through of changes in inflation expectations into prices and wages. The pass-through coefficient is clearly less than 1-for-1.
- Stronger IEPT into prices of short-term inflation expectations (6m to 1y) compared with long-term expectations.
- For wages, short- and long-term expectations have similar IEPT rate.
- IEPT into prices is lower for firms conducting state-dependent pricing compared to firms conducting Taylor pricing.

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- 2 Literature**
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- 7 Taking Stock

Inflation expectations of firms and impact on their price and wage setting decisions:

- Evidence of IEPT into wages
(*firms*: Savignac et al., 2021; Buchheim et al., 2023; Baumann et al., 2024, *workers*: Hajdini et al., 2024)
- Evidence of IEPT into prices
(Coibion et al., 2018; Coibion, Gorodnichenko & Ropele, 2020, 2023; Coibion et al., 2021; Rosolia, 2021; Enders et al., 2021; Meyer et al., 2021; Andrade et al., 2022)

Role of price-setting mechanism and expectation horizon for pass-through into prices (Werning, 2022):

- Theoretically, IEPT depends on price-setting behavior: Calvo=1; Taylor=1/2; $SDP \approx (0, 1/2)$.
- Relaxation of Calvo assumptions shifts focus to short run expectations.

⇒ [This paper: study IEPT into prices and wages, role of inflation expectation horizon](#)

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Pre-Registration of RCT: AEA RCT Registry under number AEARCTR-0010464,
<https://doi.org/10.1257/rct.10464-1.0>

Panel: selection of firms based on a sample stratified by industry and company size (by KOF ETH Zurich, long experience in firm surveys). Sectoral coverage extends across most sectors in Switzerland (excl. agriculture and public). Sector distribution

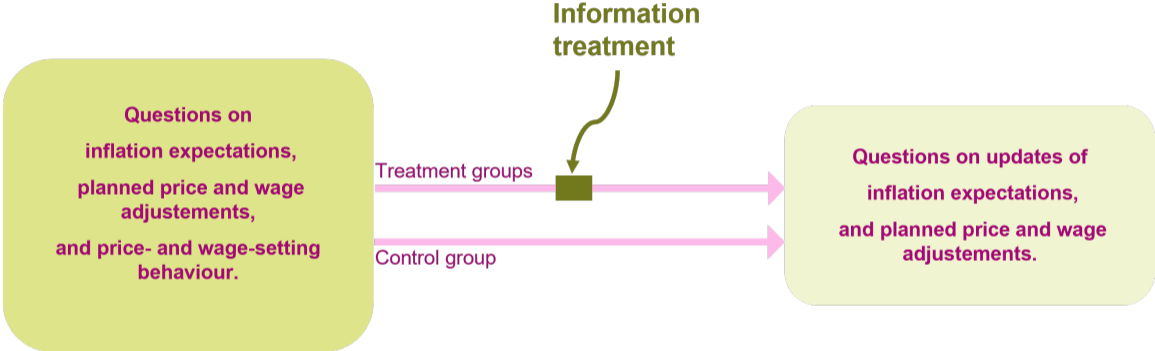
Time period: 24.11.2022 – 04.01.2023

Survey mode: Online

Response rate: 39.1%

Languages: German, French, Italian, English (respondents choice)

Survey structure with RCT



Chronology RCT

Inflation Expectation Questions

What do you think the rate of consumer price inflation will roughly be *six months* from now? Give a quantitative answer in percent: ____

What do you think the rate of consumer price inflation will roughly be *one year* from now? Give a quantitative answer in percent: ____

What do you think the rate of consumer price inflation will roughly be *five years* from now? Give a quantitative answer in percent: ____

Questions on Prices and Wages

By how much are you planning to change the price of your main product or your main service in 2023 (excluding seasonal sales or discounts)? Give a quantitative answer in percent: ____

By how much do you think your company will change gross wages on average per employee in 2023? Give a quantitative answer in percent: ____

Treatment 1 "Energy"

Energy price inflation for consumers in Switzerland has risen from its average of 0% over the ten years before the Covid pandemic to 26% in October 2022.

Treatment 2 "Target"

The Swiss National Bank has achieved its inflation target of 0-2% on average over the past 20 years. During this period, the consumer price inflation rate was 0.4% on average.

The Swiss National Bank's (SNB) mandate is to ensure price stability, while taking account of economic developments. The SNB defines price stability as a rise in the Swiss consumer price index of less than 2% per annum.

Updates

Possibility to update responses on inflation expectations for all three horizons and on expected prices and wages next year. Example:

- You expect consumer price inflation to be π_{pre}^e %¹ *six months* from now. After having answered the survey until here, you are now able to provide a new estimate and confirm or change your previous answer.

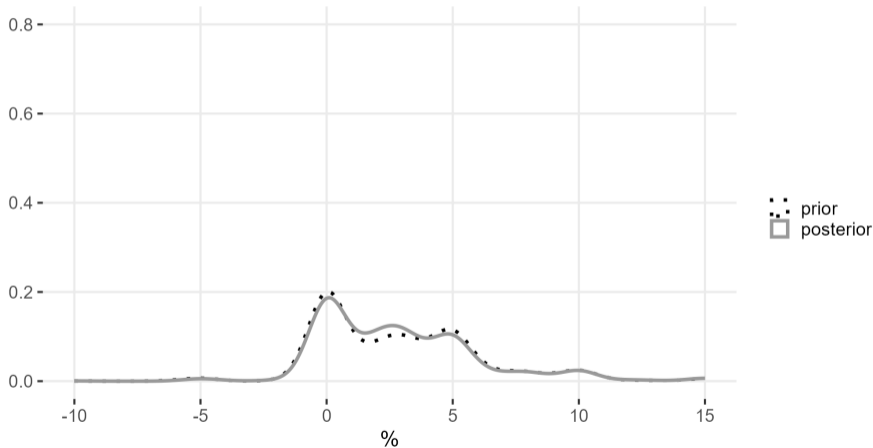
Where do you think consumer price inflation will be *six months* from now? Give a quantitative answer in percent: _____

¹The answer value that the participant has given previously for question 14 is shown for π_{pre}^e .

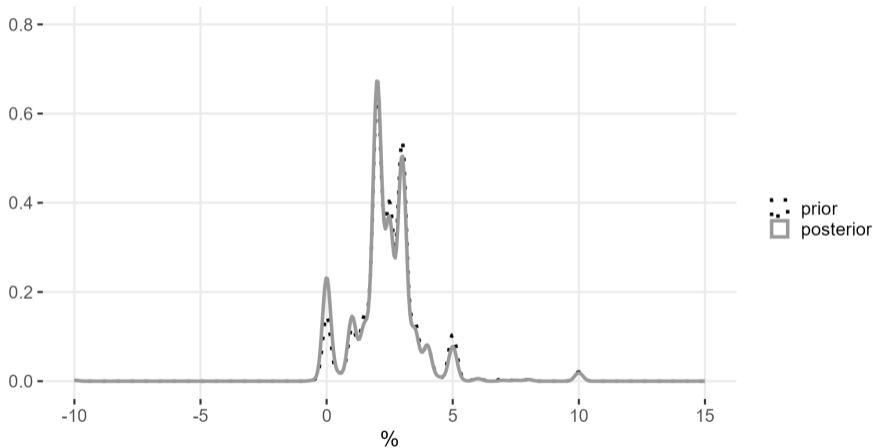
Descriptive Statistics

Mean	prior				posterior			
	all	T1	T2	C	all	T1	T2	C
Inflation exp. 6m	3.0	3.0	2.9	2.9	2.8	3.0	2.7	2.8
Inflation exp. 1y	3.0	3.1	3.0	2.9	2.9	3.1	2.7	2.8
Inflation exp. 5y	3.2	3.1	3.2	3.3	3.1	3.2	2.9	3.2
Wages next year	2.7	2.5	2.7	2.8	2.4	2.6	2.4	2.3
Prices next year	3.4	3.4	3.6	3.1	3.3	3.3	3.5	3.1
SD								
Inflation exp. 6m	2.3	2.8	1.8	2.1	2.2	2.8	1.7	1.8
Inflation exp. 1y	2.8	3.9	2.2	2.1	2.7	3.7	2.1	1.9
Inflation exp. 5y	4.6	3.9	3.8	6.0	4.5	3.6	3.5	6.0
Wages next year	3.5	1.7	3.1	5.1	2.4	2.9	2.6	1.4
Prices next year	5.4	4.6	6.1	5.4	5.2	4.4	5.8	5.3

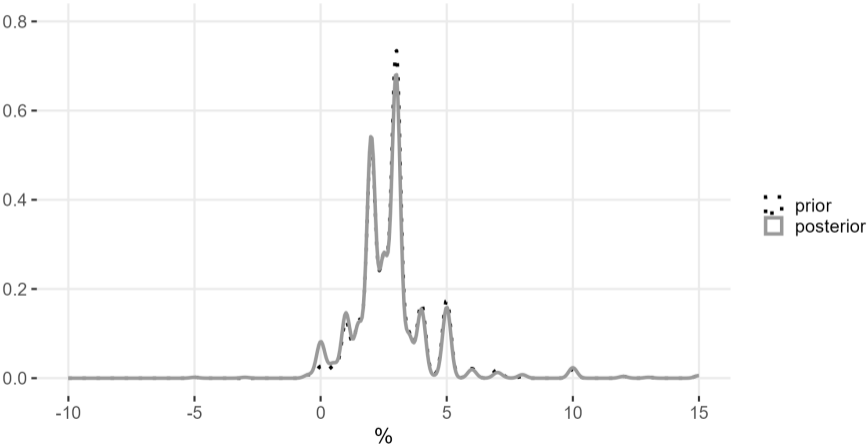
Revisions in Price Expectations



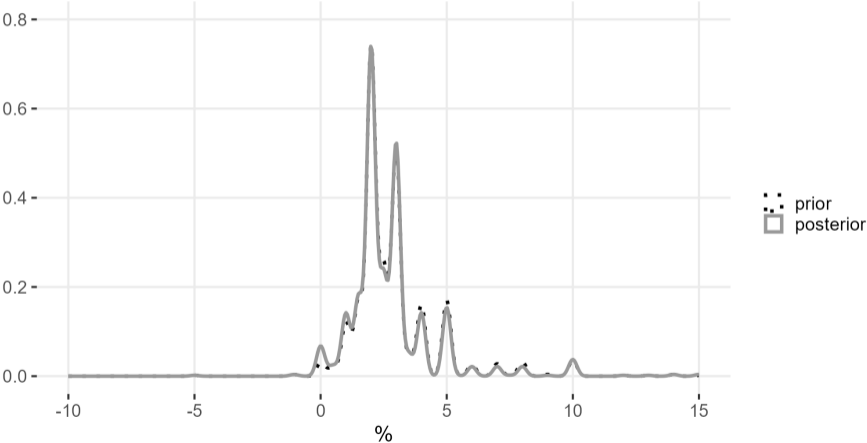
Revisions in Wage Expectations



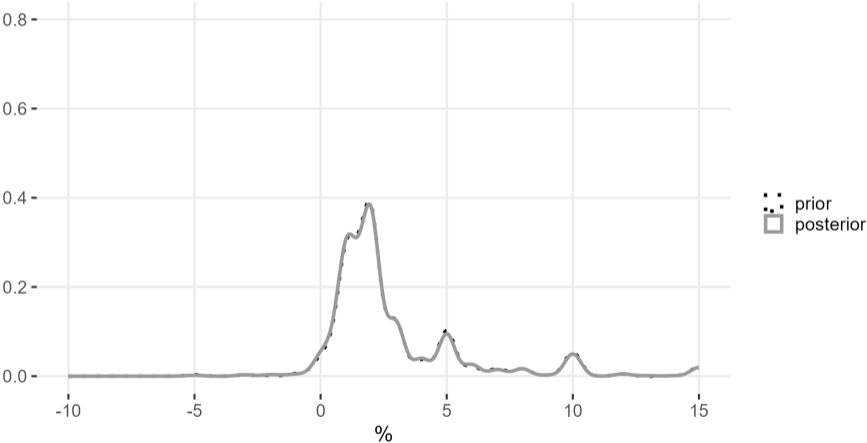
Revisions in 6m Inflation Expectations



Revisions in 1y Inflation Expectations



Revisions in 5y Inflation Expectations



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Average Treatment Effects

Estimate effect of treatment on average inflation expectations π_i

$$\pi_{i,\text{post}} - \pi_{i,\text{prior}} = \alpha + \beta_1 T_i^1 + \beta_2 T_i^2 + \gamma X_i + \epsilon_i \quad (1)$$

- T_i^1 and T_i^2 : indicator variables take on value of one if firm i is randomly assigned to treatment group 1, resp. treatment group 2
- X : set of control variables and sector fixed effects

Coefficients of interest:

- β_1 and β_2 : capture the effect of the information treatment T^1 , resp. T^2 , on the change of π_i relative to the control group

Average Treatment Effects: Results

	Δ Infl. 6m (1)	Δ Infl. 1y (2)	Δ Infl. 5y (3)
<i>Variables</i>			
Treatm. Energy (T1)	0.11** (0.05)	0.09 (0.06)	0.13** (0.06)
Treatm. Target (T2)	-0.15*** (0.05)	-0.19*** (0.06)	-0.25*** (0.07)
FE: Sector	Yes	Yes	Yes
Controls	Yes	Yes	Yes
<i>Fit statistics</i>			
Observations	1,033	1,031	1,016
R ²	0.04	0.05	0.03

Notes: Robust standard errors in parentheses. ***: 1%, **: 5%, *: 10% significance levels.

Updating Inflation Expectations

Estimate the updating of inflation expectations π_i with a slope and intercept effect

$$\pi_{i,h,\text{post}}^e = \alpha_0 + \alpha_1 \pi_{i,h,\text{prior}}^e + \beta_1 \times \pi_{i,h,\text{prior}}^e \times T_i^1 + \beta_2 \times \pi_{i,h,\text{prior}}^e \times T_i^2 + \delta_1 T_i^1 + \delta_2 T_i^2 + \gamma X_i + \epsilon_{i,t} \quad (2)$$

- T_i^1 , T_i^2 and X defined as in equation 1

Coefficients of interest:

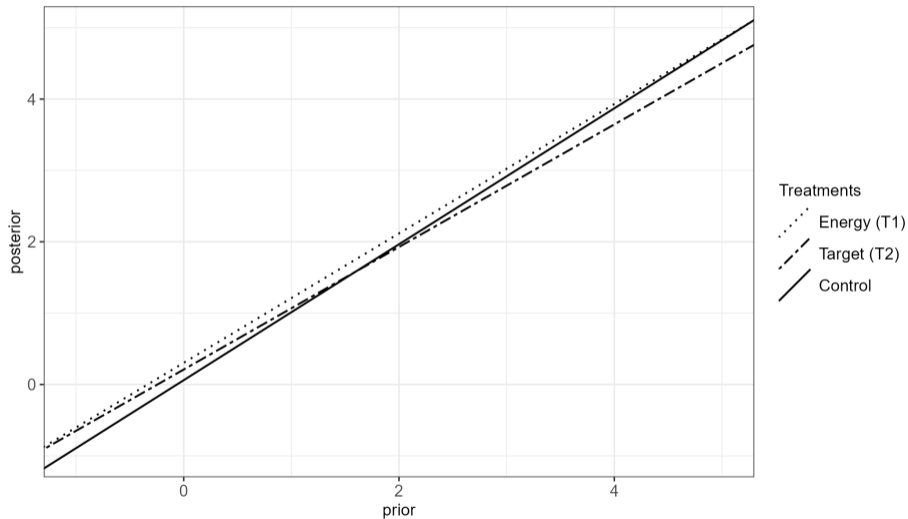
- Intercept α_1 : weight firms in control group put on their prior expectations
- Slopes β_1 and β_2 : reduction in weight put on prior expectation once firms are given new information in treatment group T^1 , resp. T^2

Updating Inflation Expectations: Results

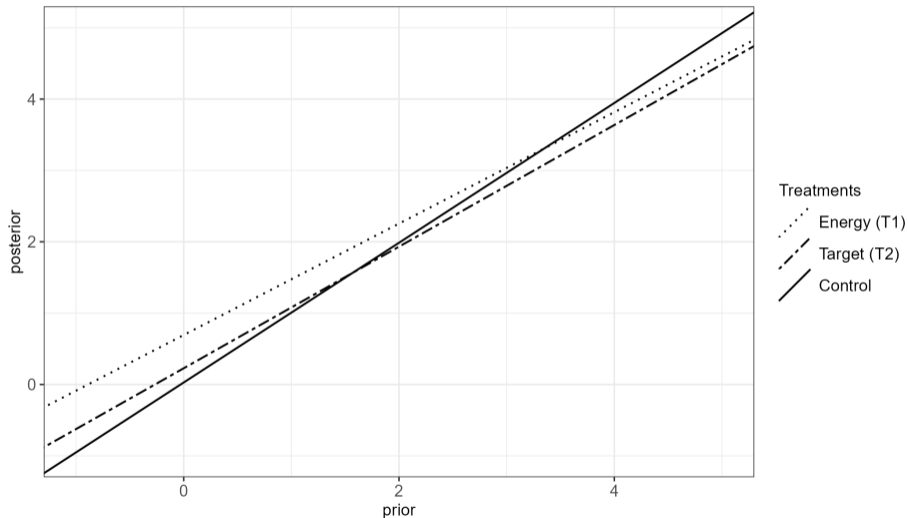
	Infl. 6m post (1)	Infl. 1y post (2)	Infl. 5y post (3)
<i>Variables</i>			
Infl. prior	0.95*** (0.06)	0.98*** (0.02)	0.98*** (0.02)
Treatm. Energy (T1)	0.24 (0.28)	0.65 (0.44)	0.18** (0.09)
Treatm. Target (T2)	0.16 (0.20)	0.18 (0.13)	0.29* (0.17)
Infl. prior × T1	-0.05 (0.11)	-0.20 (0.17)	-0.010 (0.03)
Infl. prior × T2	-0.10 (0.08)	-0.12** (0.05)	-0.19*** (0.07)
FE: Sector	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Observations	1,033	1,031	1,016
R ²	0.93	0.93	0.93

Notes: Robust standard errors in parentheses. ***: 1%, **: 5%, *: 10% significance levels.

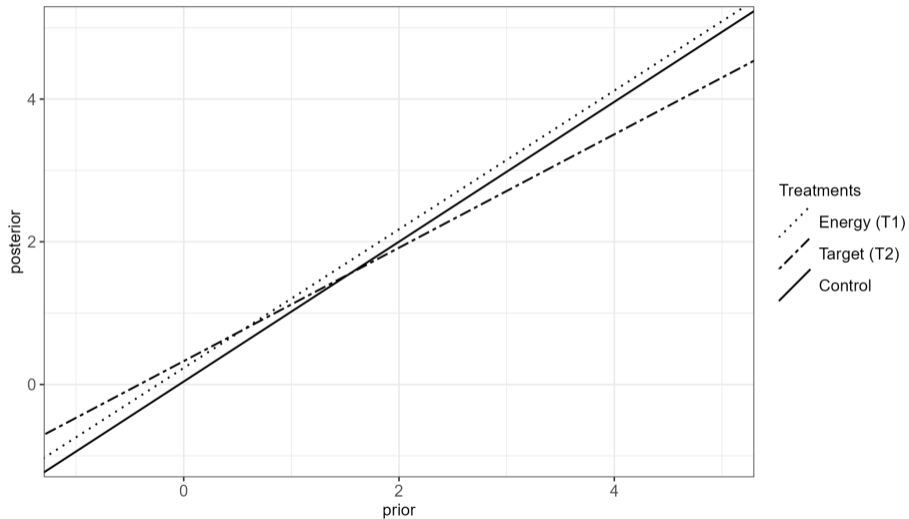
Effect of Treatments: Updating 6m Inflation Expectations



Effect of Treatments: Updating 1y Inflation Expectations



Effect of Treatments: Updating 5y Inflation Expectations



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Inflation Expectations Pass-Through (IEPT)

Revisions in inflation expectations → revisions in planned price and wage adjustments

$$\Delta y_i = \alpha + \beta \Delta \pi_{i,h}^e + \theta \Delta \pi_{i,h}^e \times B_i + \gamma X_i + \epsilon_i \quad (3)$$

- $\Delta \pi_i$ is the revision in inflation expectations $\pi_{i,post} - \pi_{i,prior}$
- Δy_i is the revision in prices or wages $y_{i,post} - y_{i,prior}$
- (B_i extends regression with interaction terms relating to the price/wage setting behavior of the firms)

→ β is an estimate of the IEPT

Results: IEPT into Prices

	Δ Prices			
	(1)	(2)	(3)	(4)
Δ Infl. 6m	0.38*** (0.10)			
Δ Infl. 1y		0.37*** (0.10)		0.33*** (0.11)
Δ Infl. 5y			0.20** (0.08)	0.05 (0.06)
FE: Age of prices	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
<i>Fit statistics</i>				
Observations	910	909	902	900
R ²	0.07	0.07	0.04	0.07

Notes: Robust standard errors in parentheses. ***: 1%, **: 5%, *: 10% significance levels.

Controls

Results: IEPT into Wages

	Δ Wages			
	(1)	(2)	(3)	(4)
Δ Infl. 6m	0.20* (0.10)			
Δ Infl. 1y		0.24*** (0.08)		0.11 (0.07)
Δ Infl. 5y			0.19*** (0.06)	0.14*** (0.05)
FE: Sector	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
<i>Fit statistics</i>				
Observations	1,022	1,020	1,005	1,003
R ²	0.03	0.04	0.05	0.05

Notes: Robust standard errors in parentheses. ***: 1%, **: 5%, *: 10% significance levels.

Inflation Expectations Pass-Through (IEPT)

How much of the planned price/wage adjustment is explained by the updating in inflation expectations

$$y_{i,post} = \alpha_0 + \alpha_1 y_{i,prior} + \alpha_2 \pi_{i,h,prior}^e + \beta \pi_{i,h,post}^e + \theta \times \pi_{i,h,post}^e \times B_i + \gamma X_i + \epsilon_{i,t} \quad (4)$$

Use two-step procedure (IV):

- The posterior inflation expectations $\pi_{i,h,post}^e$ is instrumented by the first stage estimation (equation (2))
- Infer the changes in planned price/wage adjustments that is induced by the updating in inflation expectations

→ β is an estimate of the IEPT

Results: IEPT into Prices

	(1)	Prices posterior		(4)
		(2)	(3)	
Prices prior	0.93*** (0.02)	0.93*** (0.02)	0.94*** (0.02)	0.93*** (0.02)
Infl. 6m post fitted	0.91* (0.52)			
Infl. 1y post fitted		0.73*** (0.18)		0.76*** (0.17)
Infl. 5y post fitted			0.24 (0.23)	-0.06 (0.19)
FE: Age of prices	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
<i>Fit statistics</i>				
Observations	910	909	902	900
R ²	0.94	0.94	0.94	0.94

Notes: Inflation priors included but not shown in table. Robust standard errors in parentheses. ***: 1%, **: 5%, *: 10% significance levels.

Results: IEPT into Wages

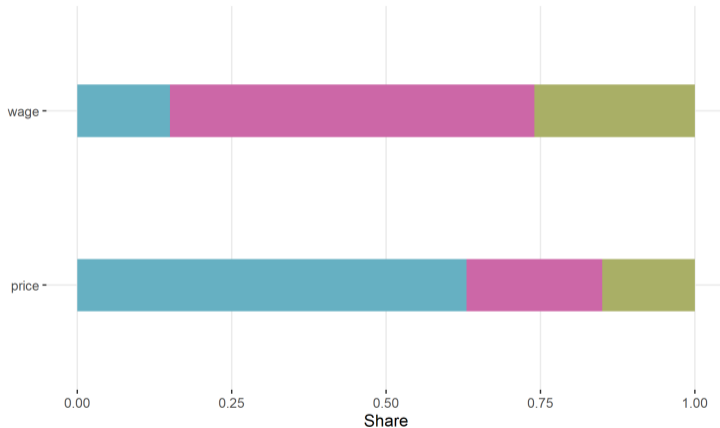
	(1)	Wages posterior		(4)
		(2)	(3)	
Wages prior	0.30** (0.14)	0.30** (0.14)	0.30** (0.14)	0.30** (0.14)
Infl. 6m post fitted	0.70 (1.2)			
Infl. 1y post fitted		0.23 (0.30)		0.10 (0.44)
Infl. 5y post fitted			0.21* (0.12)	0.24 (0.18)
FE: Sector	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
<i>Fit statistics</i>				
Observations	1,020	1,018	1,003	1,001
R ²	0.29	0.29	0.29	0.30

Notes: Inflation priors included but not shown in table. Robust standard errors in parentheses. ***: 1%, **: 5%, *: 10% significance levels.

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Excursion: Price and Wage Setting Mechanisms

Question



- Fixed time intervals, less than once per year
- Fixed time intervals, once per year or more frequently
- Irregular, whenever adjustment is needed

Excursion: IEPT for Different Price Setters

	Δ Prices					
	(1)	6m (2)	(3)	1y (4)	(5)	5y (6)
<i>Variables</i>						
Δ Infl. 6m \times SDP	-0.42** (0.20)	-0.45** (0.20)				
Δ Infl. 6m \times No p.a. 2023		-0.48* (0.25)				
Δ Infl. 1y \times SDP			-0.17 (0.18)	-0.19 (0.18)		
Δ Infl. 1y \times No p.a. 2023				-0.63** (0.29)		
Δ Infl. 5y \times SDP					-0.22* (0.13)	-0.22* (0.13)
Δ Infl. 5y \times No p.a. 2023						0.02 (0.30)
FE: Age of prices	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
<i>Fit statistics</i>						
Observations	887	887	886	886	879	879
R ²	0.08	0.09	0.08	0.08	0.06	0.06

Notes: Variables in levels included but not shown in table. Robust standard errors in parentheses. ***: 1%, **: 5%, *: 10% significance levels.

Taking Stock

- There is a significant pass-through of changes in firms' inflation expectations into prices and wages.
- The pass-through is incomplete: The pass-through rate is clearly less than 1-for-1.
- IEPT into prices: The pass-through is stronger for near-term inflation expectations, compared to of long-term expectations.
- IEPT into wages: Similar pass-through rates for short- and long-term inflation expectations; but stronger evidence for the importance of the long horizon.
- Firms conducting state-dependent pricing have a smaller IEPT compared to Taylor-type price setters.

References

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Appendix: Sectoral distribution of firms

Sector group	Share of firms (%)
Manufacturing	32.0
Construction	7.4
Retail Trade	4.5
Financial and Insurance Activities	6.0
Other Service Activities	42.6
Other	7.4

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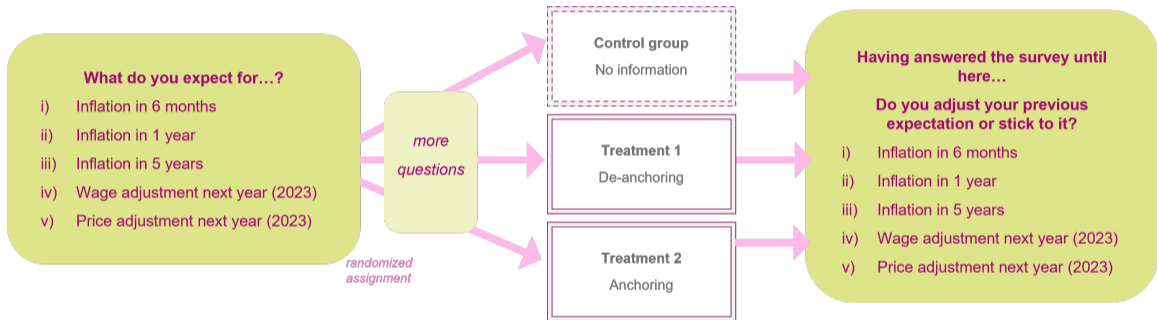
Appendix: Respondents' Functions

	total answers	share %
	771	
Owner/CEO/board director/authorized officer		71.1
Department head		17.4
Team manager		4.2
Specialist		7.4

Appendix: Respondents' Division

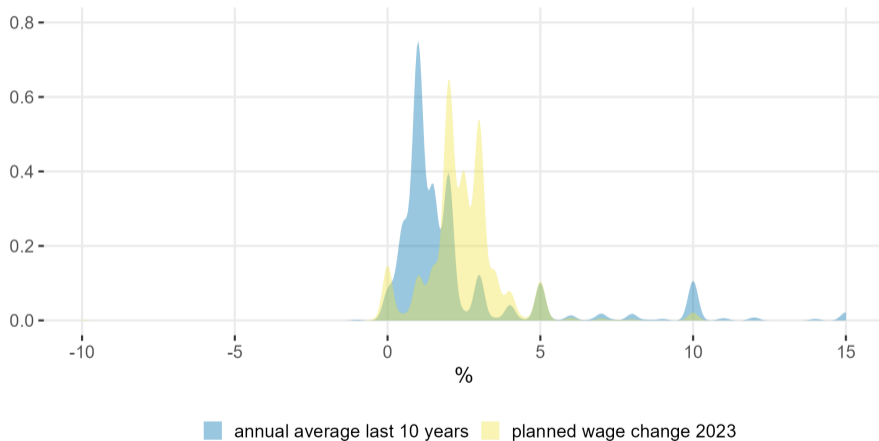
	total answers	share %
	781	
Management		59.5
Finances/controlling/accounting		36.2
Sales		1.4
Marketing/communication		0.3
Human resources		0.6
Executive department/administration		1.9

Appendix: Chronology RCT



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Appendix: Average Wage Growth Last 10 Years



Appendix: Vignette

We now ask you hypothetical questions on how your company would respond to consumer price inflation in terms of wage and price setting:

Suppose you know already today that the consumer prices will increase by $x\%$ over the course of 2023 and you were still able to adjust gross wages. By how much would you adjust gross wages in 2023 (in percent)? Write zero if you do not adjust at all. Give a quantitative answer in percent:....

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Appendix: Vignette Summary Statistics

	all	0%	1%	2%	3%	4%	5%
<hr/>							
Mean							
<hr/>							
Inflation exp. 1y (prior)	3.0	2.7	2.8	3.1	2.9	3.3	3.0
Wages next year (prior)	2.7	2.5	2.5	2.5	2.5	3.2	2.7
Prices next year (prior)	3.4	3.3	3.2	4.0	3.4	3.2	3.3
Wages next year (posterior)	1.9	1.2	0.9	2.4	1.8	2.5	2.4
Prices next year (posterior)	1.8	1.3	0.8	2.0	1.6	2.9	2.3
<hr/>							
SD							
<hr/>							
Inflation exp. 1y (prior)	2.8	1.5	2.0	3.1	2.4	4.5	2.1
Wages next year (prior)	3.5	1.9	2.0	1.6	1.8	7.3	1.4
Prices next year (prior)	5.4	4.9	5.0	7.4	5.6	4.0	5.0
Wages next year (posterior)	5.0	1.8	2.1	9.9	1.3	5.4	1.8
Prices next year (posterior)	4.7	2.1	2.2	7.8	2.0	6.4	2.7
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Appendix: Vignette IEPT

	Δ Prices (1)	Prices ^{post} (2)	Δ Wages (3)	Wages ^{post} (4)
<i>Variables</i>				
Prices prior		0.18** (0.09)		
Wages prior				0.25** (0.12)
Δ Inflation 1y (scen)	0.74*** (0.18)		0.10** (0.05)	
Infl. 1y post (scen)		0.41*** (0.07)		0.30*** (0.03)
FE: Age of prices	Yes	Yes		
FE: Sector			Yes	Yes
Controls	Yes	Yes	Yes	Yes
<i>Fit statistics</i>				
Observations	900	900	1,008	1,006
R ²	0.20	0.08	0.02	0.06

Appendix: Questions on Price Setting Behavior

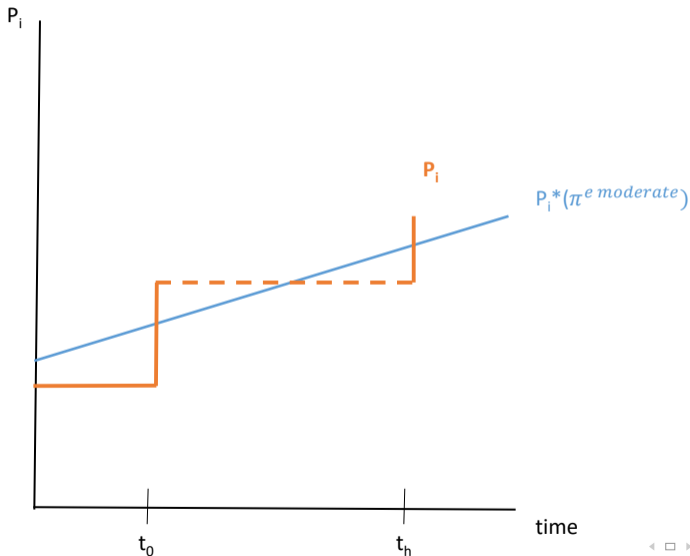
How often do you usually change the price of your main product or your main service per calendar year (excluding seasonal sales or discounts)? Choose one of the following three options that best describes your price adjustment mechanism:

- We change prices at least once per calendar year and usually at the same point in time during the year.
- We do not change prices every year. But when we change prices, then usually at the same point in time. We usually change prices once in every ____ years (enter a number in years)
- We do not change prices at predetermined dates/months, but whenever costs or demand change enough to make a price adjustment necessary.

Similar question for wages.

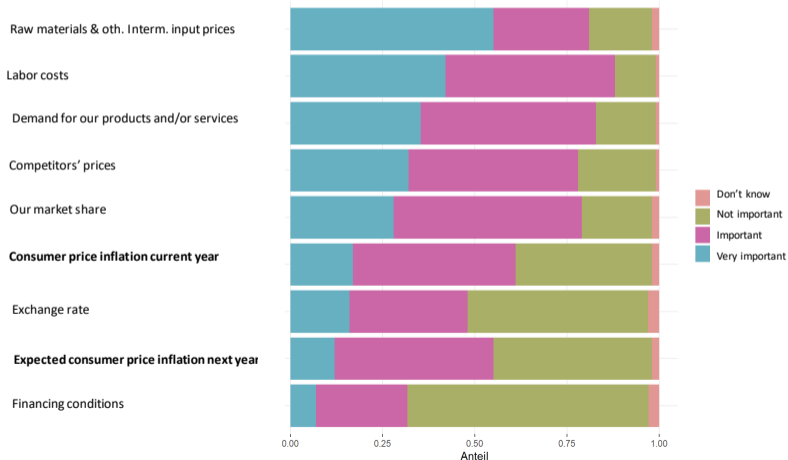
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Appendix: Price Setting and IEPT: Taylor Pricing



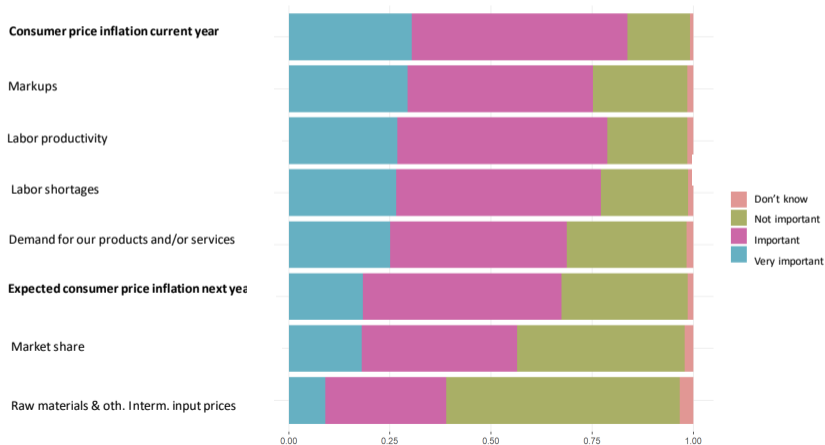
Appendix: Questions on Price Setting Behavior

How important do you expect the following factors to be when setting prices over the next 12 months? [Back](#)



Appendix: Questions on Wage Setting Behavior

How important do you expect the following factors to be when setting wages over the next 12 months? [Back](#)



Robustness: IEPT Estimates

