

Firms' Inflation Expectation Pass-Through into Prices and Wages

Evidence from an RCT survey

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*“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

Data

Main questions:

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

Survey with RCT design:

- Survey of 3,384 firms in Switzerland, with information treatments to elicit their inflation expectation revisions and subsequent price and wage revisions.

Main findings:

- There is a significant PT of changes in inflation expectations into prices and wages. The PT-coefficient is between 0.25 – 0.5.
- IEPT into prices is significantly lower for firms with state-dependent pricing compared to firms conducting Taylor pricing.
- Stronger IEPT into prices of short-term inflation expectations (6m to 1y) compared with long-term expectations.
- For wages, long-term expectations have similar IEPT rate compared to near-term expectations.

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

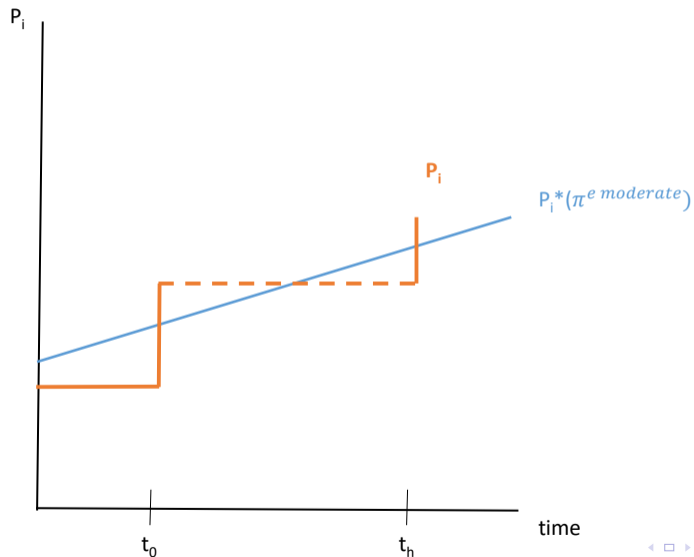
- Evidence of the importance of inflation expectations for wage growth (firms: Savignac et al., 2021; Buchheim, Link, Moehrle, 2023; workers: Hajdini et al., 2023)
- Evidence of the importance of inflation expectations for prices (Coibion et al., 2018; Coibion, Gorodnichenko & Ropele, 2020, 2023; Coibion et al, 2021; Rosolia, 2021; Enders et al., 2021; Meyer et al, 2021; Andrade et al.,2022)

Role of price-setting mechanism for pass-through of inflation expectations into prices:

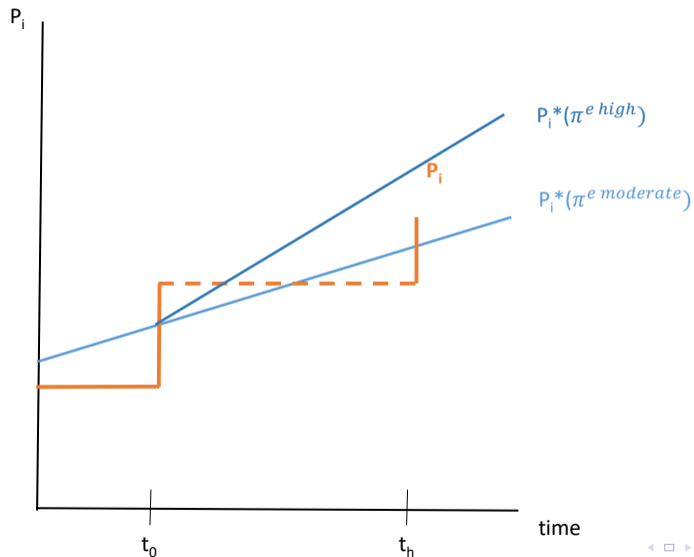
- Theoretically, IEPT depends on price-setting behavior: Calvo=1; Taylor=1/2; $SDP \approx (0, 1/2)$ (Werning, 2022)

⇒ This paper: study IEPT, role of inflation expectation horizon, and interaction with price-setting behavior empirically

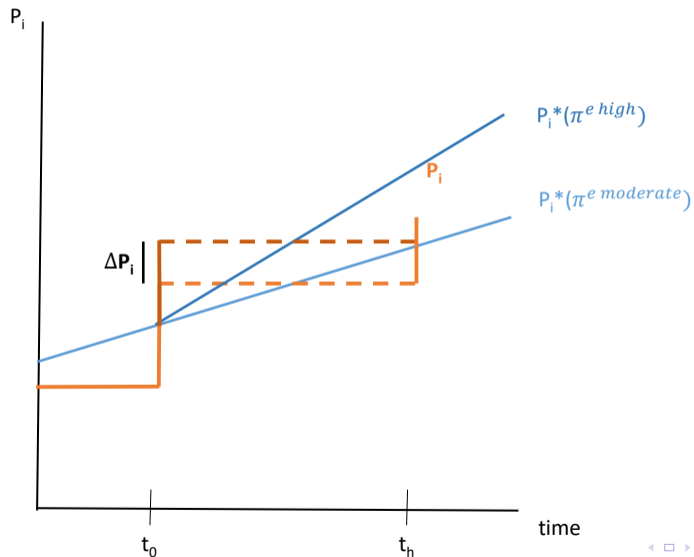
Price Setting and IEPT



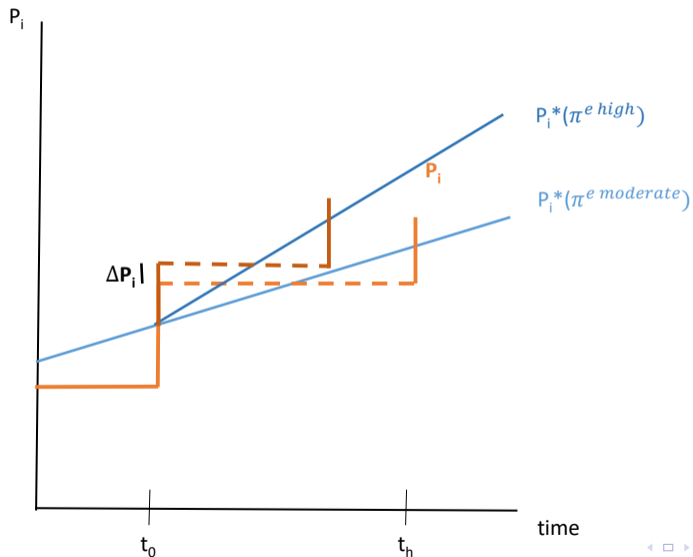
Price Setting and IEPT



Price Setting and IEPT



Price Setting and IEPT



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](#)

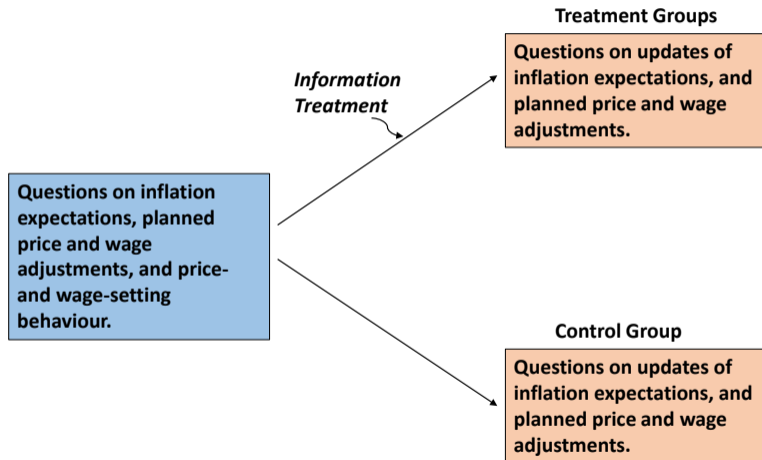
Time period: 11/24/2022 – 1/4/2023

Survey mode: Online

Response rate: 39.3%

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

Survey structure with 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: ____

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.

Treatment 1

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

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.

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

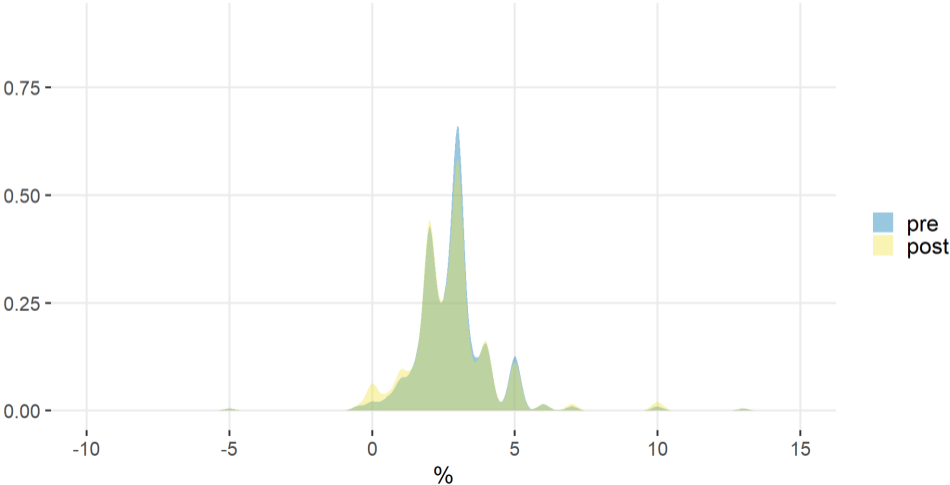
Respondents

	Responses	Treatm 1	Treatm 2	Control
Surveyed	3384			
Responded	1330	457	461	412
Wages next year (5.)	1284	441	443	400
Prices next year (13.)	1032	369	349	314
Inflation exp. 6m (14.)	1219	421	419	379
Inflation exp. 1y (15.)	1217	421	416	380
Inflation exp. 5y (16.)	1194	417	404	373
Update wages next year (18a.)	1246	424	430	392
Update prices next year (18b.)	1002	354	339	309
Update inflation exp. 6m (18c.)	1163	397	397	369
Update inflation exp. 1y (18d.)	1156	395	396	365
Update inflation exp. 5y (18e.)	1143	393	388	362

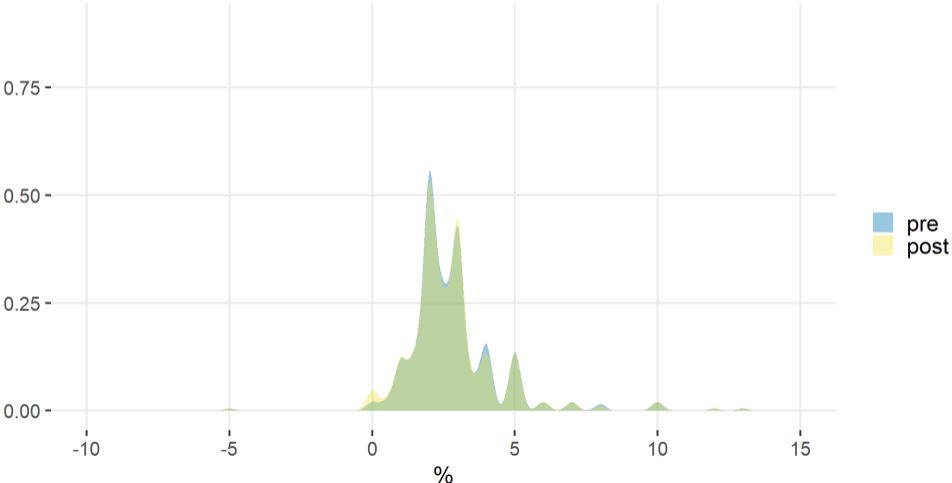
Descriptive Statistics

	Mean				SD			
	all	T1	T2	C	all	T1	T2	C
Wages next year (5.)	2.5	2.5	2.5	2.5	1.3	1.4	1.3	1.3
Prices next year (13.)	3.1	3.3	3.2	2.8	3.8	3.8	4.1	3.4
Inflation exp. 6m (14.)	2.8	2.8	2.9	2.8	1.3	1.3	1.5	1.2
Inflation exp. 1y (15.)	2.8	2.8	2.9	2.8	1.6	1.7	1.7	1.5
Inflation exp. 5y (16.)	3.1	3.0	3.2	3.1	3.3	3.3	3.3	3.3
Update wages next year (18a.)	2.3	2.4	2.2	2.2	1.2	1.2	1.2	1.1
Update prices next year (18b.)	3.0	3.1	3.1	2.8	3.6	3.5	3.8	3.3
Update inflation exp. 6m (18c.)	2.7	2.8	2.6	2.8	1.4	1.4	1.4	1.4
Update inflation exp. 1y (18d.)	2.7	2.8	2.6	2.7	1.6	1.7	1.6	1.5
Update inflation exp. 5y (18e.)	2.9	3.0	2.7	3.0	2.9	3.1	2.6	3.0

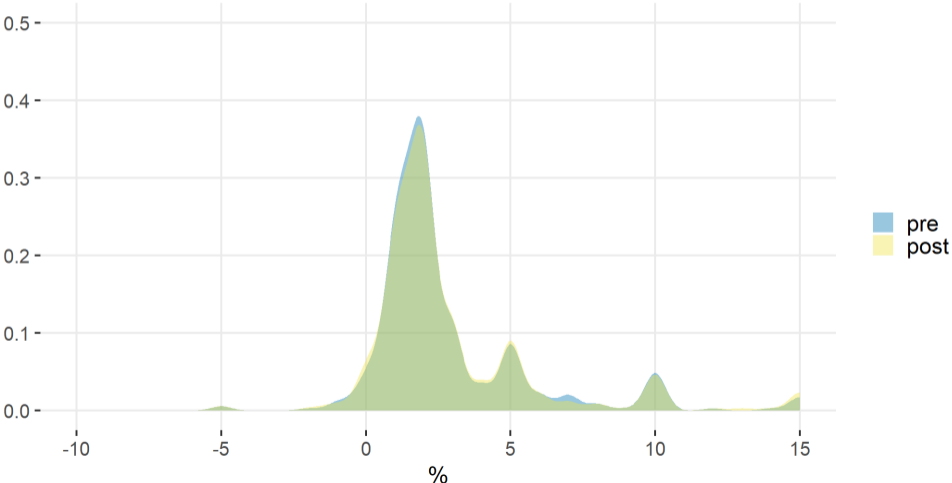
Inflation expectations 6m



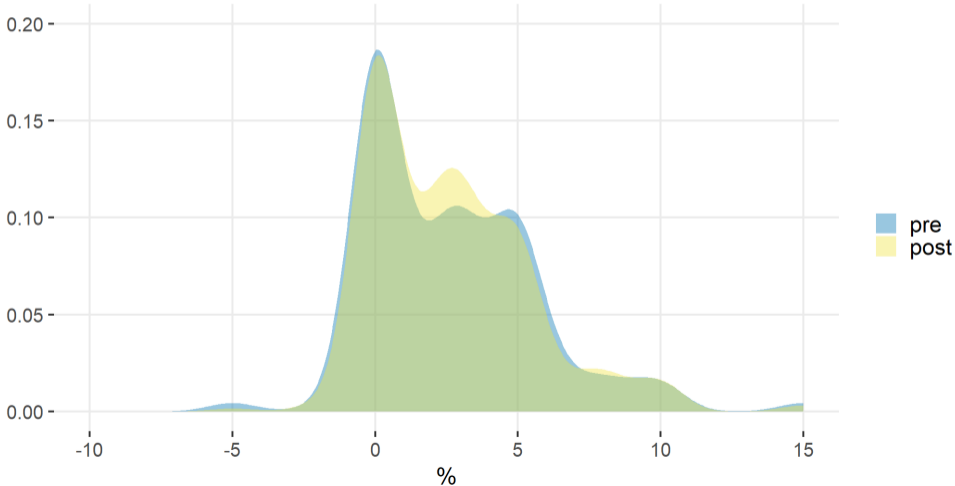
Inflation expectations 1y



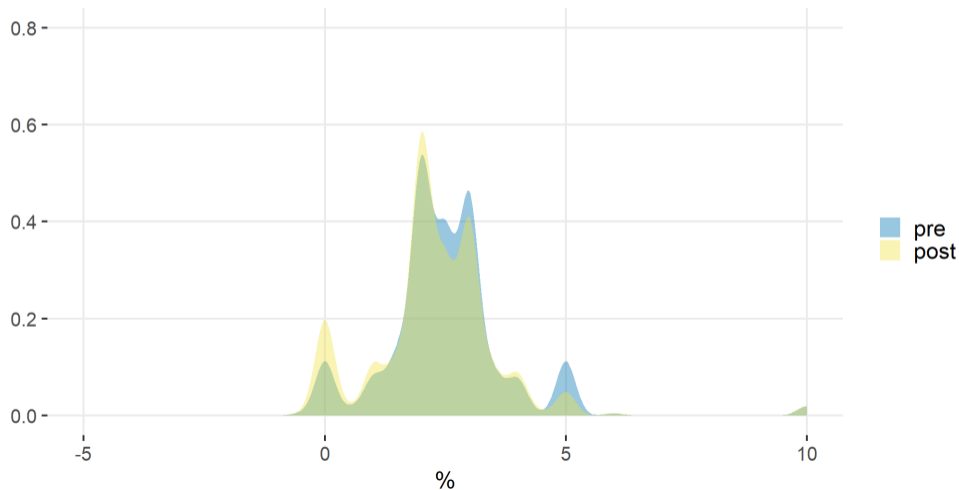
Inflation expectations 5y



Price expectations



Wage expectations



Average Treatment Effects

Estimate effect of treatment on average outcomes (inflation expectations, wages, prices)

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

Coefficients of interest:

- β 's measure the effect of the information treatment on the revision of y_i

What is the causal effect of changes in inflation expectations on prices and wages?

$$y_{i,post} - y_{i,pre} = \alpha + \beta(\pi_{i,h}^{e,post} - \pi_{i,h}^{e,pre}) + \theta(\pi_{i,h}^{e,post} - \pi_{i,h}^{e,pre}) \times B_i + \delta B_i + \gamma X_i + \epsilon_i \quad (2)$$

Coefficients of interest:

- β is the IEPT (for Taylor pricing firms when including B, which is an indicator variable for state-dep. price setting, SDP)
- $\beta + \theta$ is the IEPT for SDP

Results: Average Treatment Effects

Dependent Variables: Model:	dWages (1)	dPrices (2)	dInfl. 6m (3)	dInfl. 1y (4)	dInfl. 5y (5)
<i>Variables</i>					
T1	0.28* (0.14)	-0.05 (0.14)	0.09 (0.09)	0.06 (0.10)	0.12 (0.12)
T2	-0.13 (0.19)	-0.07 (0.17)	-0.19** (0.08)	-0.23*** (0.07)	-0.31*** (0.11)
<i>Fixed-effects</i>					
Sector FE	Yes	Yes	Yes	Yes	Yes
<i>Fit statistics</i>					
Observations	1,258	1,017	1,175	1,166	1,165
R ²	0.02	0.02	0.03	0.03	0.03
Within R ²	0.004	0.0002	0.01	0.01	0.01

*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1.*

Robust standard errors in parentheses

Results: IEPT into Prices

Dependent Variable:	dPrices		
Model:	6m	1y	5y
<i>Variables</i>			
dInflation	0.45*** (0.15)	0.48*** (0.11)	0.27*** (0.10)
<i>Fixed-effects</i>			
Sector FE	Yes	Yes	Yes
<i>Fit statistics</i>			
Observations	927	923	924
R ²	0.07	0.09	0.06
Within R ²	0.06	0.08	0.05

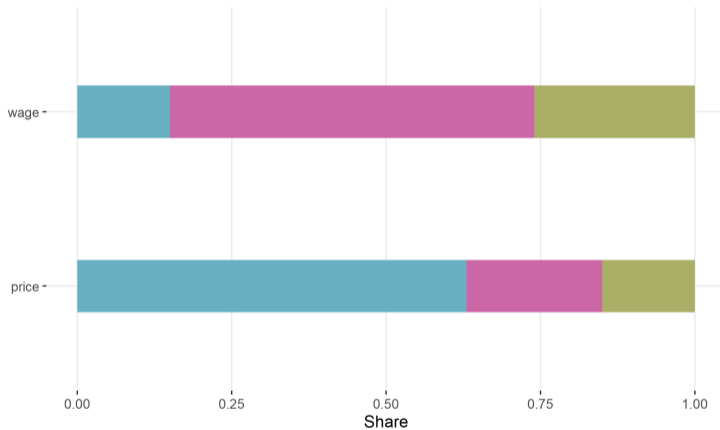
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1.
Robust standard errors in parentheses.*

Results: IEPT into Wages

Dependent Variable:	dWages		
Model:	6m	1y	5y
<i>Variables</i>			
dInflation	0.39** (0.17)	0.39*** (0.11)	0.32*** (0.08)
<i>Fixed-effects</i>			
Sector FE	Yes	Yes	Yes
<i>Fit statistics</i>			
Observations	1,138	1,130	1,128
R ²	0.04	0.04	0.07
Within R ²	0.02	0.03	0.05

*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1.
Robust standard errors in parentheses.*

Price and Wage Setting Mechanisms



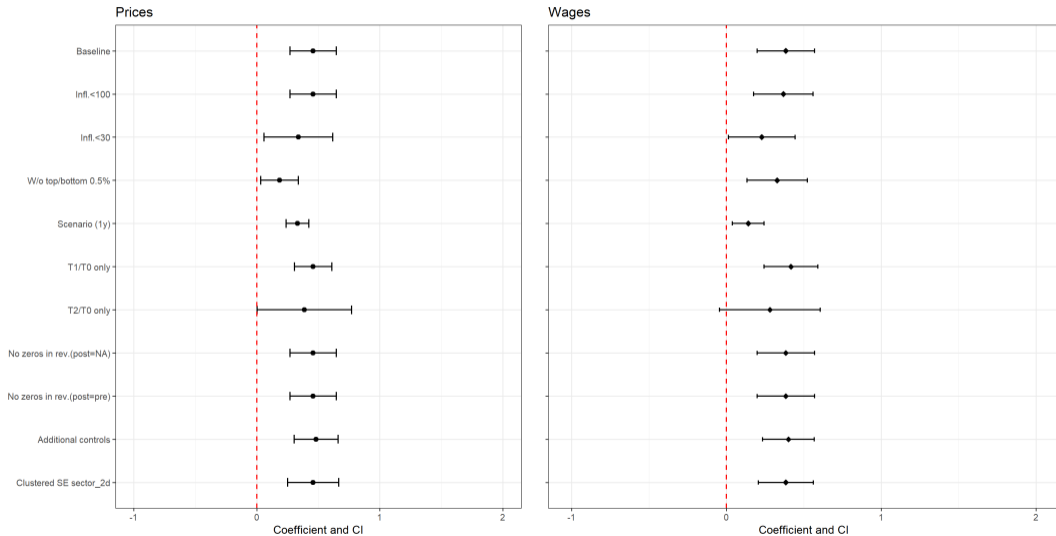
- Fixed time intervals, less than once per year
- Fixed time intervals, once per year or more frequently
- Irregular, whenever adjustment is needed

Results: IEPT into prices and price setting behavior

	6M	1y	5y
<i>Variables</i>			
dInflation	0.81*** (0.15)	0.55*** (0.06)	0.40*** (0.08)
dInflation × SDP	-0.48** (0.19)	-0.14 (0.24)	-0.26** (0.13)
dInflation × Noadj ₂₀₂₃	-1.5* (0.80)	-0.78** (0.34)	-0.06 (0.26)
Noadj ₂₀₂₃	-0.21 (0.25)	-0.19 (0.24)	-0.17 (0.24)
SDP	0.10 (0.11)	0.10 (0.11)	0.13 (0.11)
Sector FE	Yes	Yes	Yes
Observations	927	923	924
R ²	0.10	0.10	0.08
Within R ²	0.09	0.09	0.06

*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

IEPT estimates robustness



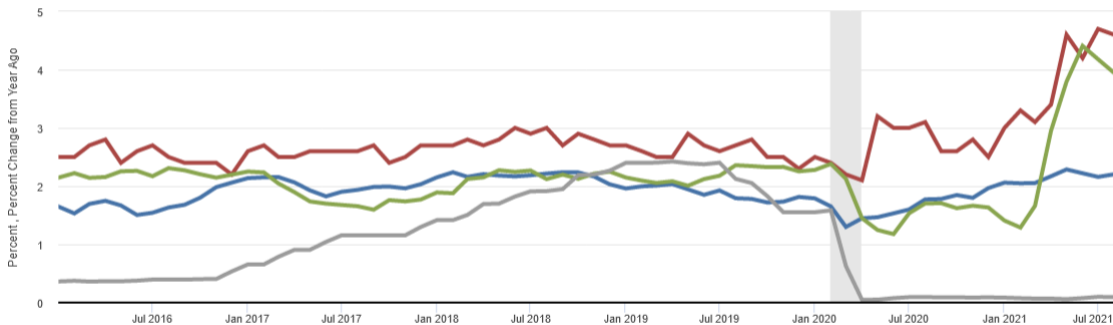
- Alternative standard errors Robustness 1
- Alternative sector fixed effects Robustness 2
- Additional controls Robustness 3
- Alternative measure SDP/TDP Robustness 4
- Hypothetical questions Robustness 5

- Significant pass-through of inflation expectations into prices and wages
- Pass-through coefficient always below one
- For prices, substantial differences in IEPT between Taylor-type price setters and state-dependent price setters
- Near-term inflation expectations more important for IEPT into prices, compared to long-term expectations

Appendix: Motivation

FRED 

- 5-Year, 5-Year Forward Inflation Expectation Rate
- University of Michigan: Inflation Expectation
- Consumer Price Index for All Urban Consumers: All Items Less Food and Energy in U.S. City Average
- Effective Federal Funds Rate



Shaded areas indicate U.S. recessions.

Sources: St. Louis Fed; Univ of Michigan; New York Fed; BLS

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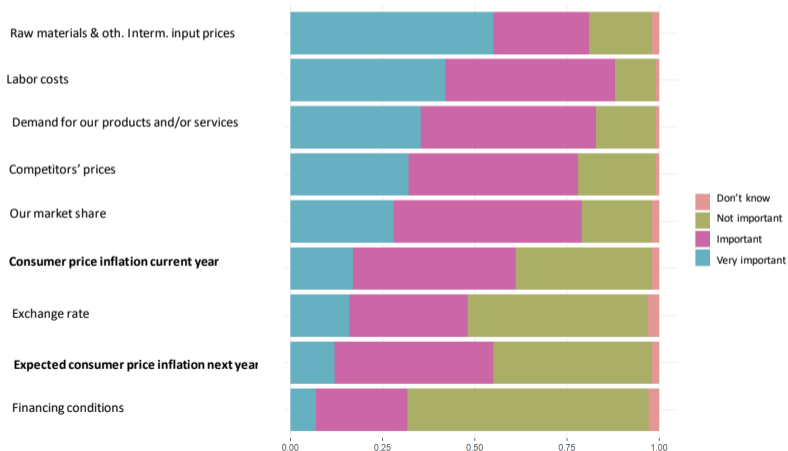
Appendix: Sectors

Sector group	Share of firms (%)
Manufacturing	34.3
Construction	6.0
Retail Trade	4.1
Financial and Insurance Activities	6.1
Other Service Activities	41.6
Other	8.0

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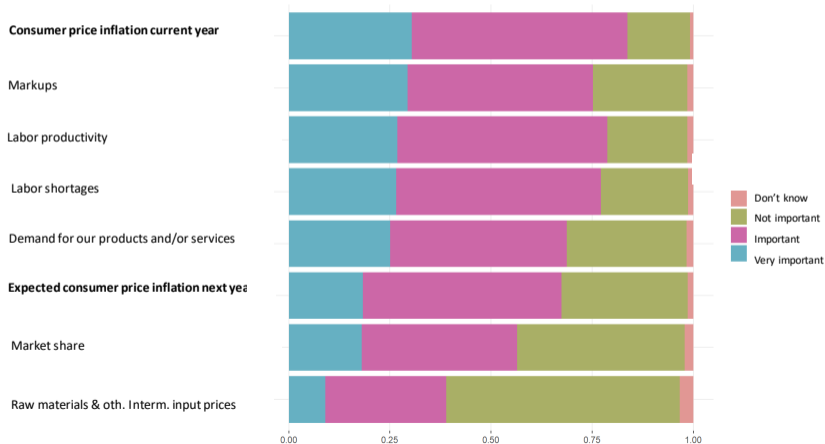
Questions on Price Setting Behavior

How important do you expect the following factors to be when setting prices over the next 12 months?



Questions on Wage Setting Behavior

How important do you expect the following factors to be when setting wages over the next 12 months?



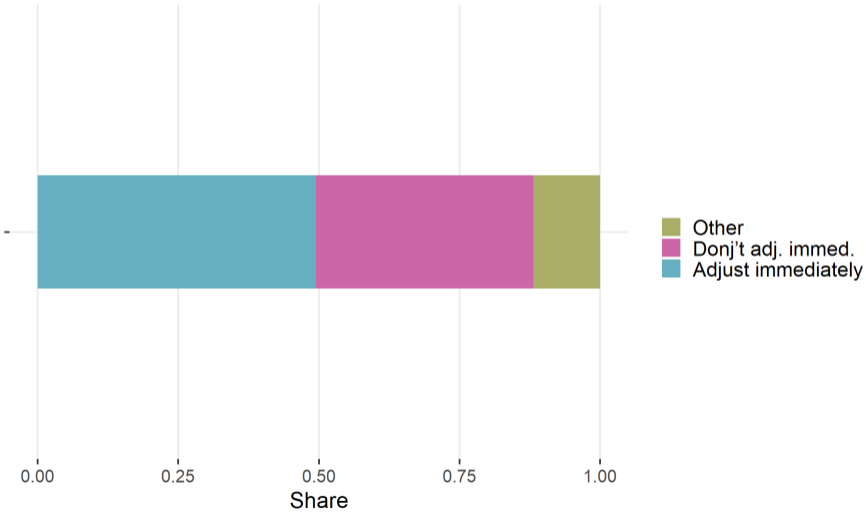
Question II on Price-Setting Behavior

Suppose you are facing an unexpectedly large increase in input prices (for example prices of intermediate inputs or wages), what would you do in the short term?

- We usually increase our selling prices right away
- We usually keep our selling prices more or less unchanged in the short term and absorb that via markups/ profits
 - We cannot change prices immediately (longer term contracts, etc.)
 - We choose to decrease markups in order maintain market share
 - Other
- Other

Similar question for wages.

Question on Price-Setting Behavior



Appendix: IEPT Prices Clustered Standard Errors

Dependent Variable:	dPrices		
Model:	6m	1y	5y
<i>Variables</i>			
dInflation	0.45*** (0.15)	0.48*** (0.13)	0.27*** (0.10)
<i>Fixed-effects</i>			
Sector FE	Yes	Yes	Yes
<i>Fit statistics</i>			
Observations	927	923	924
R ²	0.07	0.09	0.06
Within R ²	0.06	0.08	0.05

Clustered (2-digit sector) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Appendix: IEPT Wages Clustered Standard Errors

Dependent Variable:	dWages		
Model:	6m	1y	5y
<i>Variables</i>			
dInflation	0.39** (0.18)	0.39*** (0.11)	0.32*** (0.09)
<i>Fixed-effects</i>			
Sector FE	Yes	Yes	Yes
<i>Fit statistics</i>			
Observations	1,138	1,130	1,128
R ²	0.04	0.04	0.07
Within R ²	0.02	0.03	0.05

Clustered (2-digit sector) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Appendix: IEPT Interact. Clustered Standard Errors

Dependent Variable: Model:	dPrices					
	6m	6m	1y	1y	5y	5y
<i>Variables</i>						
dInflation	0.73*** (0.20)	0.81*** (0.17)	0.53*** (0.08)	0.55*** (0.07)	0.40*** (0.08)	0.40*** (0.08)
dInflation × SDP	-0.40 (0.24)	-0.48** (0.22)	-0.13 (0.27)	-0.14 (0.27)	-0.25* (0.15)	-0.26* (0.15)
dInflation × Noadj ₂₀₂₃		-1.5* (0.87)		-0.78** (0.33)		-0.06 (0.31)
SDP	0.15* (0.08)	0.10 (0.09)	0.14 (0.09)	0.10 (0.10)	0.17* (0.09)	0.13 (0.10)
Noadj ₂₀₂₃		-0.21 (0.22)		-0.19 (0.21)		-0.17 (0.22)
<i>Fixed-effects</i>						
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
<i>Fit statistics</i>						
Observations	927	927	923	923	924	924
R ²	0.09	0.10	0.10	0.10	0.08	0.08
Within R ²	0.08	0.09	0.08	0.09	0.06	0.06

Clustered (2-digit sector) standard-errors in parentheses

Signif. Codes: ***: 0.01, **: 0.05, *: 0.1

Appendix: IEPT Prices Detailed Sector FE

Dependent Variable: Model:	6m	dPrices 1y	5y
<i>Variables</i>			
dInflation	0.46*** (0.14)	0.50*** (0.12)	0.29*** (0.10)
<i>Fixed-effects</i>			
2-digit Sector FE	Yes		Yes
Yes	Yes	Yes	
<i>Fit statistics</i>			
Observations	927	923	924
R ²	0.11	0.13	0.10
Within R ²	0.06	0.08	0.05

*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

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Appendix: IEPT Wages Detailed Sector FE

Dependent Variable:	dWages		
Model:	6m	1y	5y
<i>Variables</i>			
dInflation	0.39** (0.17)	0.39*** (0.11)	0.33*** (0.08)
<i>Fixed-effects</i>			
2-digit Sector FE	Yes		Yes
Yes	Yes	Yes	
<i>Fit statistics</i>			
Observations	1,138	1,130	1,128
R ²	0.12	0.13	0.17
Within R ²	0.02	0.03	0.05

Signif. Codes: ***: 0.01, **: 0.05, *: 0.1

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Appendix: IEPT Prices Interaction Detailed Sector FE

Dependent Variable: Model:	dPrices					
	6m	6m	1y	1y	5y	5y
<i>Variables</i>						
dInflation	0.72*** (0.18)	0.81*** (0.17)	0.54*** (0.07)	0.56*** (0.07)	0.40*** (0.08)	0.40*** (0.08)
dInflation × SDP	-0.35 (0.22)	-0.48** (0.22)	-0.09 (0.24)	-0.11 (0.24)	-0.23 (0.14)	-0.23* (0.14)
dInflation × Noadj ₂₀₂₃		-1.5* (0.87)		-0.89** (0.40)		-0.03 (0.28)
SDP	0.10 (0.11)	0.10 (0.09)	0.10 (0.11)	0.06 (0.11)	0.14 (0.11)	0.09 (0.12)
Noadj ₂₀₂₃		-0.21 (0.22)		-0.21 (0.26)		-0.20 (0.26)
<i>Fixed-effects</i>						
2-digit Sector FE	Yes		Yes	Yes	Yes	Yes
<i>Fit statistics</i>						
Observations	927	927	923	923	924	924
R ²	0.12	0.10	0.13	0.13	0.11	0.11
Within R ²	0.07	0.09	0.08	0.09	0.06	0.06

Signif. Codes: ***: 0.01, **: 0.05, *: 0.1

Appendix: Additional Controls I

Dependent Variable: Model:	6m	dPrices 1y	5y
<i>Variables</i>			
dInflation	0.48*** (0.14)	0.48*** (0.11)	0.28*** (0.10)
Infl. current year important	0.08 (0.12)	0.06 (0.13)	0.06 (0.13)
Infl. next year important	0.10 (0.11)	0.13 (0.11)	0.13 (0.11)
<i>Fixed-effects</i>			
Sector FE	Yes	Yes	Yes
<i>Fit statistics</i>			
Observations	918	916	915
R ²	0.09	0.10	0.07
Within R ²	0.08	0.09	0.06

Signif. Codes: ***: 0.01, **: 0.05, *: 0.1

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Appendix: Additional Controls II

Dependent Variable:		dPrices					
Model:	(1)	6m (2)	1y (3)	(4)	(5)	5y (6)	
<i>Variables</i>							
dInflation	0.79*** (0.16)	0.82*** (0.15)	0.54*** (0.07)	0.55*** (0.06)	0.40*** (0.08)	0.40*** (0.08)	
dInflation × SDP	-0.43** (0.20)	-0.46** (0.19)	-0.09 (0.24)	-0.10 (0.23)	-0.24* (0.13)	-0.23* (0.13)	
dInflation × Noadj ₂₀₂₃		-0.66*** (0.18)		-0.76** (0.35)		0.11 (0.41)	
SDP	0.16 (0.11)	0.15 (0.11)	0.16 (0.11)	0.14 (0.11)	0.19* (0.11)	0.18 (0.12)	
Infl. current year important	0.09 (0.13)	0.08 (0.13)	0.06 (0.13)	0.05 (0.13)	0.07 (0.13)	0.07 (0.13)	
Infl. next year important	0.13 (0.12)	0.14 (0.12)	0.16 (0.12)	0.16 (0.12)	0.14 (0.11)	0.14 (0.11)	
Noadj ₂₀₂₃		-0.06 (0.21)		-0.06 (0.21)		-0.04 (0.20)	
<i>Fixed-effects</i>							
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	
<i>Fit statistics</i>							
Observations	891	891	889	889	889	889	
R ²	0.11	0.11	0.11	0.11	0.08	0.08	
Within R ²	0.10	0.10	0.10	0.10	0.07	0.07	

Appendix: Hypothetical questions and results

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:---

Appendix: Hypothetical questions and results I

Dependent Variables: Model:	dPrices (1)	dWages (2)
<i>Variables</i>		
dInflation 1y	0.34*** (0.06)	0.13** (0.06)
<i>Fixed-effects</i>		
Sector FE	Yes	Yes
<i>Fit statistics</i>		
Observations	961	1,179
R ²	0.18	0.03
Within R ²	0.03	0.008

Heteroskedasticity-robust standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

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Appendix: Hypothetical questions and results II

Dependent Variables: Model:	dPrices		dWages	
	(1)	(2)	(3)	(4)
<i>Variables</i>				
dInflation 1y	0.39*** (0.10)	0.40*** (0.11)	0.33*** (0.09)	0.39*** (0.09)
dInflation 1y × SDP	-0.07 (0.13)	-0.08 (0.13)	-0.20 (0.13)	-0.26** (0.12)
dInflation 1y × Noadj ₂₀₂₃		-0.07 (0.30)		-0.47 (0.30)
SDP	0.66 (0.41)	0.61 (0.46)	-0.51* (0.31)	-0.57 (0.37)
Noadj ₂₀₂₃		-0.22 (0.51)		-0.19 (0.56)
<i>Fixed-effects</i>				
2-digit sector FE	Yes	Yes	Yes	Yes
<i>Fit statistics</i>				
Observations	961	961	1,033	1,033
R ²	0.25	0.25	0.25	0.26
Within R ²	0.03	0.03	0.03	0.03

*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Appendix: Longer Term Effects of Treatments

Dependent Variable: Model:	Unexp. price change	
	OLS	Probit
<i>Variables</i>		
Constant (OLS)	-0.03 (0.08)	
Constant (-1 to 0)		-0.52
Constant (0 to 1)		0.62
T1	0.18* (0.10)	0.27
T2	0.06 (0.09)	0.10
<i>Fit statistics</i>		
Observations	90	90
R ²	0.04	
Adjusted R ²	0.02	

Coefficients ordered probit: marginal effects
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Merge firms to regular business tendency survey. Do the information treatments affect firms 3 months after the survey?

Appendix: Longer Term Effects of Treatments

Dependent Variable:	Unexp. price change	
Model:	OLS	Probit
<i>Variables</i>		
Constant	0.38*** (0.08)	-0.11 ()
T1/T2 (base: Control)	-0.08 (0.10)	-0.08 ()
<i>Fit statistics</i>		
Observations	117	117
R ²	0.006	
Adjusted R ²	-0.003	

Coefficients ordered probit: marginal effects
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Appendix: Longer Term Effects of Treatment

Dependent Variable:	Exp. price change (in 2023Q1)	
Model:	OLS	Probit
<i>Variables</i>		
Constant (OLS)	0.35*** (0.06)	()
Constant (-1 to 0)		-0.61 ()
Constant (0 to 1)		0.10 ()
T1	-0.02 (0.08)	-0.01 ()
T2	0.06 (0.08)	0.05 ()
<i>Fit statistics</i>		
Observations	309	309
R ²	0.004	0.004
Adjusted R ²	-0.003	-0.003

Coefficients ordered probit: marginal effects
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*