

Inflation and Wage Expectations of Firms and Employees

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Expected Inflation → Wages?

How large is the pass-through of expected inflation to wage growth?

Key mechanism in potential **wage-price spiral!**

Yet, effect of inflation expectations on wage setting relatively little understood

- ↪ Very few **estimates for pass-through** thus far
- ↪ **Relevant mechanisms** for pass-through?

This Paper: Measuring and Understanding Pass-Through

We use novel **panel survey data among German firms and employees** to:

1. Provide **quantitative benchmark** for the size of **pass-through**

→ **Pass-through** ($\hat{\phi}$) **is small**, but larger for firms ($0.1 \lesssim \hat{\phi} \lesssim 0.25$) than for employees ($0 \lesssim \hat{\phi} \lesssim 0.1$)

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We use novel **panel survey data among German firms and employees** to:

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2. Shed light on potential **mechanisms** behind these estimates

- i) *Wage rigidities*: **Pass-through higher at “intensive margin”**, substantial role of current (realized) inflation
- ii) *Role of bargaining*: **Inflation expectations \perp initiation of bargaining**, but employees with more bargaining power expect higher pass-through

Contribution

Parallel work on pass-through of inflation expectations into wage (expectations):

- Empirical: Savignac et al. (2022); Hajdini et al. (2022); Jain et al. (2022); Pilossoph and Ryngaert (2022); Jorda and Nechio (2023)
- Theoretical: Werning (2022)

⇒ Evidence on inflation pass-through for *firms and employees from panel data*

⇒ Evidence on *potential mechanisms*

More broadly, our paper is related to literatures on:

- Determinants of inflation expectations (surveys by d'Acunto et al., 2022; Candia et al., 2022)
- Macroeconomic expectations and choices (e.g., Coibion et al., 2020, 2023a,b)
- Role of expectations on labor market outcomes, e.g., expected job finding rate (survey by Mueller and Spinnewijn, 2022) or outside options (e.g., Jäger et al., 2023)

Data

Data: Panels of Firms and Households

- Parallel survey among ~3,000 firms and ~1,500 employees in Germany
 - ▶ Firms: ifo Business Survey
 - ▶ Employees: online HH survey representative of German population
- Quarterly panel → allows to control for unobserved heterogeneity
- Starting in December 2021 (ongoing; by now 6 waves): Strong fluctuations in inflation [▶ Context](#)
- Similar wording: comparability & immunity to wording choices (Bruine de Bruin et al., 2012)

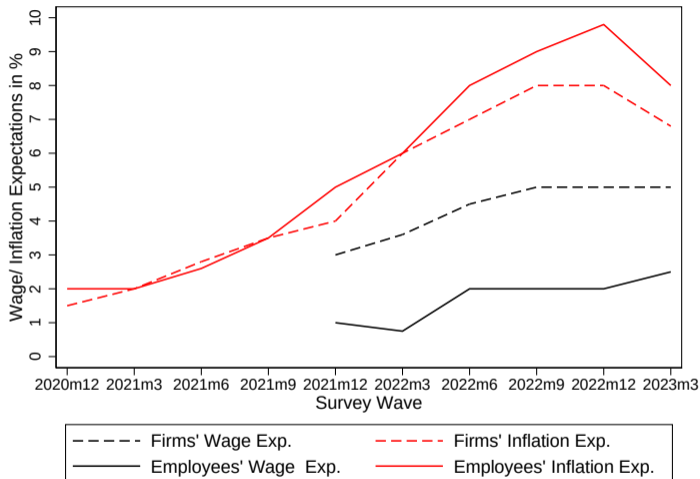
Data: Key Variables

- Expected (aggregate) inflation and (own) wage growth over the next 12 months ▶ Survey questions
- Realized wage growth over the last 12 months ▶ Validation: Wages
- Bargaining intentions (Dummy variable)
- Information on how wages are set: bilateral bargaining, collective bargaining agreements (CBA), minimum wage, wage posting
- Other potential wage determinants, such as: expected unemployment levels, business expectations and realizations, job search behavior

Median Wage and Inflation Expectations

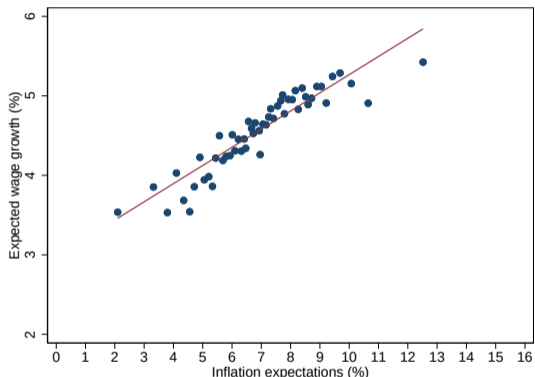
▶ Other GER surveys

▶ Comp. to French firm data

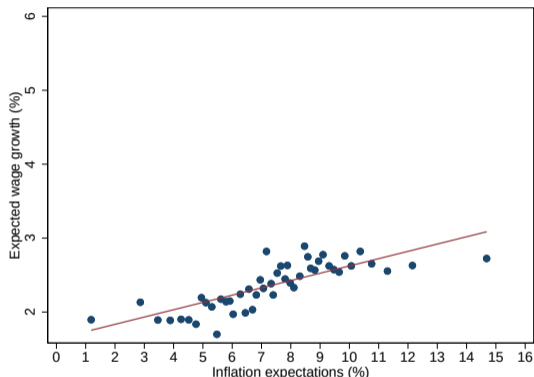


Average Pass-Through

Panel A: Firms



Panel B: Employees



- Pass-through identified from time variation in inflation and wage growth expectations (firm/employee FEs)
- **Positive, but low average pass-through**, larger among firms (0.23) than employees (0.06)

Average Pass-Through: All Specifications

	Expected Wage Growth Next 12 Months							
	Firms				Employees			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exp. Inflation Rate	0.221*** (0.012)	0.150*** (0.014)	0.234*** (0.012)	0.092*** (0.015)	0.083*** (0.015)	0.056*** (0.016)	0.064*** (0.018)	0.007 (0.021)
Exp. Fundamentals	yes	yes	yes	yes	yes	yes	yes	yes
Firm/Ind. FE	no	no	yes	yes	no	no	yes	yes
Time FE	no	yes	no	yes	no	yes	no	yes
Firm/Ind. Controls	yes	yes	no	no	yes	yes	no	no
Observations	15742	15742	15742	15742	6119	6119	6130	6130

Estimates in Line with the Literature

Our panel estimates on **low pass-through among firms and employees** are comparable with recent studies documenting small degrees of pass-through in different contexts:

Employees ($\hat{\phi} \in [0, 0.09]$):

- Jain et al. (2022): Canadian employees; repeated cross-section: $\hat{\phi} \in (0.15, 0.2)$
- Hajdini et al. (2022): U.S. consumers, survey experiment, cross section, income exp.: $\hat{\phi} = 0.2$

Firms ($\hat{\phi} \in [0.09, 0.23]$):

- Savignac et al. (2022): French firms: $\hat{\phi} \in (0.05, 0.08)$ in cross-section, 0 for first difference

**Potential Mechanism I:
Wage Rigidities**

Wage Posting with Rigid Wages

Nominal wages without wage rigidities

- Normalize $P_0 = 1$; assume that log real wage is given by fundamentals $f(y_0)$
- Assume further that the target log nominal wage w_t^* is log-linear in fundamentals and inflation:

$$w_t^* = \sum_{t=1}^t \pi_t + f(y_t)$$

- Then, wages reset every period, with **wage growth** given by

$$w_t^* - w_{t-1}^* = \pi_t + f(y_t) - f(y_{t-1})$$

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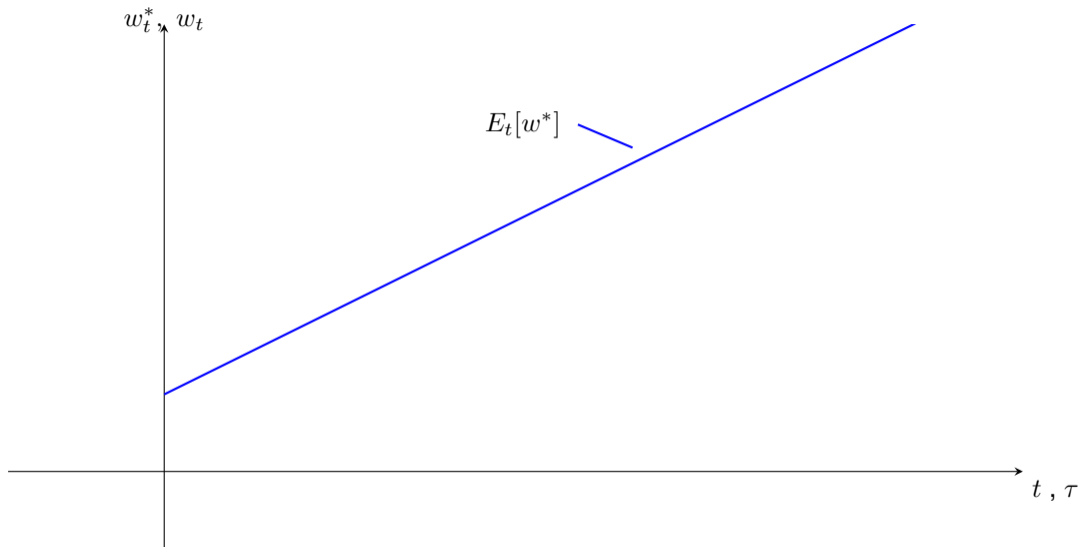
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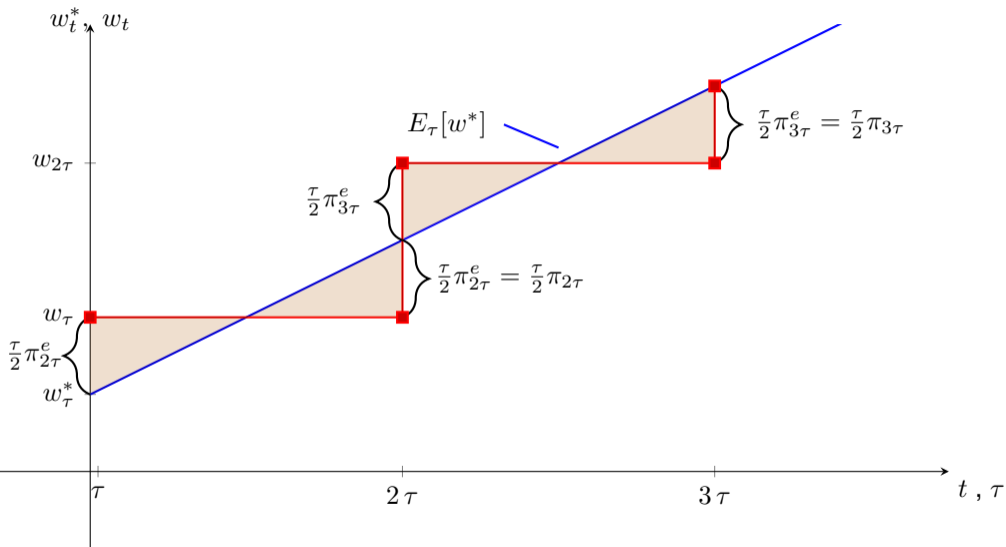
Nominal wages with wage rigidities

- Wages cannot be reset in every period
- ⇒ Fixed **nominal** wage are set such that—**over the course of the expected wage spell**—the average distance to the target wage w_t^* is minimized

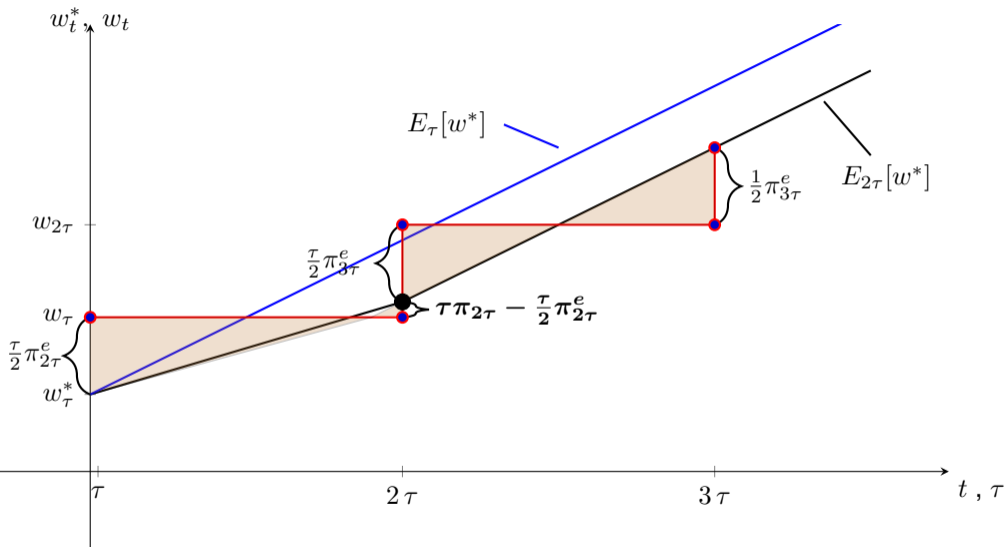
Wage Posting without Rigidities



Wage Posting with Rigid Wages: Taylor Pricing



Wage Posting with Rigid Wages: Taylor Pricing



Pass-Through of Inflation with Wage Rigidities

1. Wage setting is forward-looking, so that there is pass-through
2. Degree of average pass-through depends on the type of wage rigidity (Werning, 2022)
 - ▶ With *Taylor pricing*: $\phi \sim 1/2$; with *Calvo pricing*: $\phi \sim 1$
 - ⇒ *Estimates thus far not in line with these quantitative predictions*

Pass-Through of Inflation with Wage Rigidities

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2. Degree of **average pass-through depends on the type of wage rigidity** (Werning, 2022)
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 - ⇒ *Estimates thus far not in line with these quantitative predictions*
3. **“Backward-looking pass-through”**: nominal wages **catch-up with realized inflation**
 - ▶ Either because forward-looking pass-through is smaller than 1 (e.g., Taylor pricing), or due to forecast errors
4. Average pass-through is combination of **extensive and intensive margin**
 - ▶ If, at worker-firm match, wages are fixed, pass-through is zero (by assumption)
 - ⇒ **Pass-through larger if agents expect to reset wages**

Role of (Perceived) Realized Inflation?

	Expected Wage Growth Next 12 Months				
	Firms		Employees		
	(1)	(2)	(3)	(4)	(5)
Expected Inflation Rate	0.234*** (0.012)	0.159*** (0.012)	0.056*** (0.016)	0.001 (0.016)	0.021 (0.016)
Current Realized Inflation Rate		0.188*** (0.014)		0.209*** (0.022)	
Current Perceived Inflation Rate					0.099*** (0.015)
Exp. Fundamentals	yes	yes	yes	yes	yes
Firm/Ind. FE	yes	yes	yes	yes	yes
Time FE	no	no	no	no	no
Observations	15742	15742	6130	6130	6106

(Perceived) Realized Inflation → Expected Wage Growth

- **Expected wage growth is associated with past inflation** (as predicted by wage rigidities)
- **But: Forward-looking pass-through declines**
 - ▶ For firms: Forward- and backward-looking pass-through of comparative size
 - ▶ For employees: Expected wage growth related to past realized / perceived inflation only

Intensive Margin I: Likelihood of Wage Negotiations?

	Expected Wage Growth Next 12 Months	
	Firms (1)	Employees (2)
Exp. Inflation \times 1(Never Expect Bargaining)	0.086** (0.043)	0.029 (0.021)
Exp. Inflation \times 1(Sometimes Expect Bargaining)	0.133*** (0.022)	-0.032 (0.027)
Exp. Inflation \times 1(Always Expect Bargaining)	0.128*** (0.020)	0.103** (0.044)
Current Infl. \times 1(Never Expect Bargaining)	0.000 (0.049)	0.136*** (0.030)
Current Infl. \times 1(Sometimes Expect Bargaining)	0.109*** (0.024)	0.257*** (0.039)
Current Infl. \times 1(Always Expect Bargaining)	0.161*** (0.022)	0.349*** (0.067)
Exp. Fundamentals	yes	yes
Firm/Ind. FE	yes	yes
Time FE	no	no
Observations	13318	6303

Intensive Margin II: Expiring Dates of CBAs

- We merge industry-level (two-digit industry code) data on expiring dates of collective bargaining agreements (CBA)
 - ▶ Measures the percentage of employees that are covered by valid CBA within specific time horizon (e.g., 12 months ahead)
 - Exploit **exogenous variation** across time and industry in (the length of) **coverage of CBAs**:
 - ▶ If industry CBA expires during next 12 months
 - firms covered by CBA know that wage adjustments are more likely
 - ▶ If industry CBA valid for 12+ months
 - covered firms may expect less room for new wage adjustments within the next year
- ⇒ *“Higher” inflation pass-through for firms in industries with (high share of) expiring collective agreements?*

Expiring CBAs → Higher Pass-Through

	Expected Wage Growth Next 12 Months					
	Firms w/ CBA			Firms w/o CBA		
	(1)	(2)	(3)	(4)	(5)	(6)
Share Valid CBA in 12m	-0.016 (0.130)	1.182*** (0.345)	4.054*** (0.609)	0.161 (0.099)	0.303 (0.289)	0.856 (0.527)
Expected Inflation Rate	0.114*** (0.021)	0.194*** (0.030)	0.144*** (0.031)	0.170*** (0.016)	0.176*** (0.020)	0.171*** (0.021)
Exp. Infl. × Share Valid CBA		-0.180*** (0.048)	-0.080 (0.051)		-0.021 (0.040)	-0.006 (0.042)
Current Realized Inflation Rate	0.248*** (0.024)	0.249*** (0.024)	0.475*** (0.046)	0.167*** (0.018)	0.167*** (0.018)	0.200*** (0.032)
Current Infl. × Share Valid CBA			-0.459*** (0.080)			-0.086 (0.069)
Observations	4071	4071	4071	9782	9782	9782
Exp. Fundamentals	yes	yes	yes	yes	yes	yes
Firm/Ind. FE	yes	yes	yes	yes	yes	yes
Time FE	no	no	no	no	no	no

Perspective II:

Role of Wage Bargaining for Pass-Through

Role of Bargaining for Pass-Through

Initiation of wage bargaining

1. Wage bargaining via (threat of) job-to-job transitions á la Cahuc et al. (2006)?

▶ Results

- ▶ Expected inflation $\uparrow \Rightarrow$ real value of current wage $\downarrow \Rightarrow$ job search \uparrow to generate offers and counteroffers
- ▶ Pilossoph and Ryngaert (2022) provide evidence from Survey of Consumer Expectations
- ▶ *In our data*: no or very small association between inflation expectations and on-the-job search

2. Only small association between inflation expectations and bargaining intensity

▶ Results

Role of Bargaining for Pass-Through

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2. Only small association between inflation expectations and bargaining intensity [▶ Results](#)

Role of bargaining power for pass-through

1. Higher pass-through for employees who search on the job [▶ Results](#)
2. Positive pass-through expected only by employees with some say in wage setting (e.g., individual wage bargaining vs. wage posting) [▶ Results](#)
3. Higher pass-through for firms who report shortage of skilled labor [▶ Results](#)

Additional Findings

Additional Findings

- Medium-run inflation expectations do not enter wage growth expectations [▶ Results](#)
- Estimated pass-through varies little over time [▶ Results](#)
- Limited role of stagflationary view (e.g., Andre et al., 2022) [▶ Results](#)
- No differential pass-through among firms more strongly affected by rising energy costs [▶ Results](#)

Summary

- Study pass-through of inflation expectations on wage setting among panels of German firms and employees
- **Average pass-through is low** for firms ($\hat{\phi} < 0.25$) and even lower for employees ($\phi < 0.1$)
- **Evidence for wage rigidities**
 - ▶ Substantial role of (perceived) realized inflation for wage expectations, particularly for employees
 - ▶ Pass-through higher at intensive margin
- **Pass-through via bargaining**
 - ▶ Role of additional wage bargaining for pass-through limited at best
 - ▶ Pass-through is higher when employees have more bargaining power

Thank you!

Back Up

a. Für Ihren typischen Beschäftigten: Wie hoch ist das zum jetzigen Zeitpunkt **bereits vereinbarte**

Bruttolohn-Wachstum für die nächsten 12 Monate (also bis zum Dezember 2022) (z.B. durch einen bestehenden Tarifvertrag, Vereinbarung mit Beschäftigten oder ähnliches)? ___% (Bitte tragen Sie ggf. 0 ein, falls noch keine Lohnänderung vereinbart wurde. Angaben mit einer Nachkommastelle möglich)

b. Für Ihren typischen Beschäftigten: Was schätzen Sie, wie hoch wird **das Bruttolohn-Wachstum für die nächsten 12 Monate** (also bis zum Dezember 2022) **insgesamt** sein (inkl. möglicher neuer Tarifabschlüsse, bevorstehender Lohnverhandlungen mit Beschäftigten oder ähnlichem)? ___% (Bitte tragen Sie ggf. Ihre Antwort auf Frage "a." ein, falls Sie keine weitere Lohnänderung als bisher vereinbart erwarten. Angaben mit einer Nachkommastelle möglich)

a. For your typical employee, what is the **gross wage growth already agreed upon** at this time for the next 12 months (i.e., through December 2022) (e.g., through an existing collective bargaining agreement, agreement with employees, or similar)? ___% (If applicable, please enter 0 if no wage change has yet been agreed upon. Figures with one decimal place possible)

b. For your typical employee, what do you estimate will be **the total gross wage growth for the next 12 months** (i.e., through December 2022) (including possible new collective bargaining agreements, upcoming wage negotiations with employees, or similar)? ___% (If applicable, please enter your answer to question "a" if you do not expect any further wage changes than previously agreed. Figures with one decimal place possible)

Survey Questions

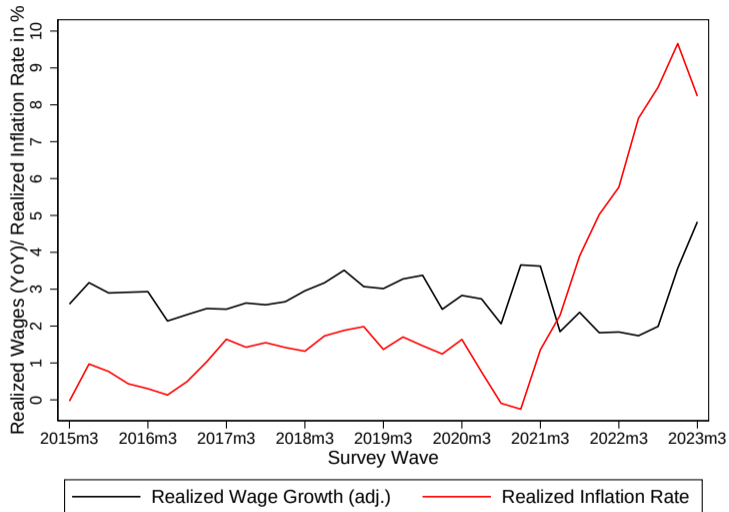
▶ Back

Was denken Sie, wie hoch wird die Inflationsrate (gemessen am Verbraucherpreisindex) über die nächsten 12 Monate (also bis zum Dezember 2022) in Deutschland wahrscheinlich sein? ____% (Angaben mit einer Nachkommastelle möglich)

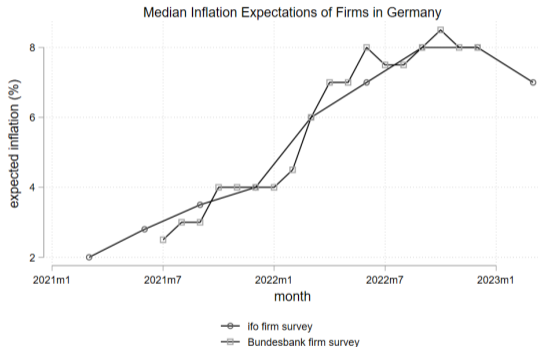
What do you think the inflation rate (measured by the consumer price index) is likely to be over the next 12 months (i.e. until December 2022) in Germany? ____% (figures with one decimal place possible)

Germany: Inflation and Wages over Time

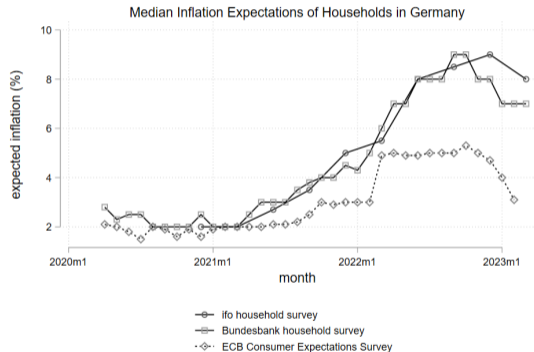
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Panel A: Firms



Panel B: Employees



Similar patterns in French Firm Survey [▶ back](#)

Chart 1: Change in annual inflation rate perceptions and expectations (median, %)

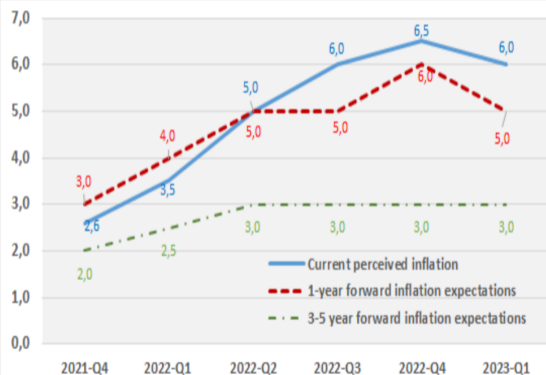
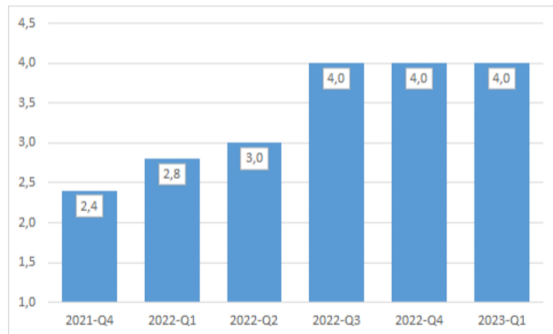


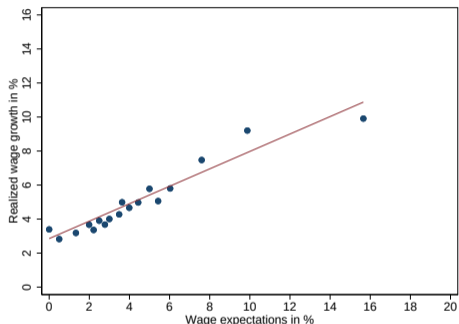
Chart 3: Change in one-year base wage expectation (median, %)



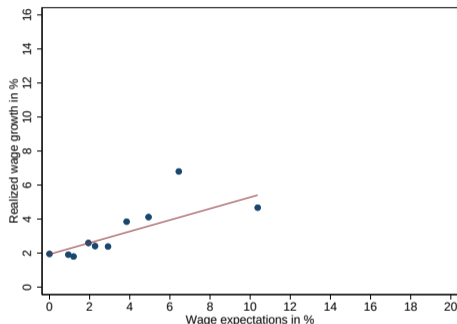
source: Banque de France Business Survey (2023)

Validation: Expected vs. Ex-post Realized Wage Growth ▶ Back

Firms



Employees



- Note: 2 survey waves (expectations: 2021m12+2022m3; realizations: 2022m12&2023m3)

Among employees, pass-through is larger for

- men than women
- younger age individuals compared to older age individuals
- high-income individuals (→bargaining power?)

Among firms, pass-through is larger for

- bigger firms (# of employees)
- firms that report they have lack of skilled labor (→bargaining power?)
- if respondents have more influence on firms' decisions
- in services and manufacturing sector

Inflation Expectations → Ex-post Wage Growth? [▶ Back](#)

	Realized Wage Growth Past 12 Months							
	Firms				Employees			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Expected Wage Growth 12m ago	0.499*** (0.035)	0.035 (0.040)			0.362*** (0.089)	-0.021 (0.074)		
Exp. Inflation Rate 12m ago			0.108*** (0.037)	0.134*** (0.039)			0.056 (0.046)	-0.013 (0.052)
Firm/Ind. FE	no	yes	no	yes	no	yes	no	yes
Time FE	no	no	no	no	no	no	no	no
Observations	2359	2359	2397	2397	620	620	917	917

	Job Search	
	(1)	(2)
Exp. Inflation Rate	0.309*** (0.100)	-0.169 (0.114)
Exp. Fundamentals	yes	yes
Firm/Ind. FE	no	yes
Time FE	no	no
Firm/Ind. Controls	yes	no
Observations	6198	6209
Mean Dep. Var.	7.81	7.81

- Cross-section: Employees w/ higher inflation expectations are more likely to apply for a job
- Including Ind. FE: Results are insignificant.
- But: Low number of job searchers (8%)

Intention to Bargain over Wages in Next 12 Months

	Firms				Employees			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exp. Inflation Rate	0.012*** (0.002)	0.010*** (0.002)	0.011*** (0.002)	0.005** (0.002)	0.006*** (0.002)	0.005*** (0.002)	-0.001 (0.002)	-0.003 (0.002)
Exp. Fundamentals	yes	yes	yes	yes	yes	yes	yes	yes
Firm/Ind. FE	no	no	yes	yes	no	no	yes	yes
Time FE	no	yes	no	yes	no	yes	no	yes
Ind. Controls	yes	yes	no	no	yes	yes	no	no
Observations	13389	13389	13389	13389	6198	6198	6209	6209
Mean dep. var.	0.71	0.71	0.71	0.71	0.24	0.24	0.24	0.24

- Firms w/ higher inflation expectations expect to bargain over wages more often, but the association is small in economic terms.
 - Employees: Association insignificant.
- Extensive margin contributes at best mildly to the pass-through

Employees: On-the-job Search & Pass-through ▶ Back

	Expected Wage Growth Next 12 Months			
	(1)	(2)	(3)	(4)
1(Job Search)	1.180*** (0.155)	-0.088 (0.348)	-0.382* (0.209)	-1.493*** (0.441)
Exp. Infl. × 1(No Job Search)		0.065*** (0.013)		0.051*** (0.015)
Exp. Infl. × 1(Job Search)		0.215*** (0.036)		0.189*** (0.045)
Exp. Fundamentals	yes	yes	yes	yes
Firm/Ind. FE	no	no	yes	yes
Time FE	no	no	no	no
Firm/Ind. Controls	yes	yes	no	no
Observations	6119	6119	6130	6130

- Higher pass-through for employees who search on the job

Employees: Pass-through by Type of Wage Setting

[▶ Back](#)

	Expected Wage Growth Next 12 Months	
	Employees	
	(1)	(2)
Exp. Infl. \times 1(Type: Ind. Barg.)	0.035 (0.029)	0.014 (0.031)
Exp. Infl. \times 1(Type: CBA)	0.060** (0.030)	-0.049 (0.033)
Exp. Infl. \times 1(Type: MW Adj.)	0.024 (0.063)	0.004 (0.066)
Exp. Infl. \times 1(Type: Wage Taker)	-0.009 (0.043)	-0.018 (0.049)
Perc. Infl. \times 1(Type: Ind. Barg.)		0.060** (0.030)
Perc. Infl. \times 1(Type: CBA)		0.221*** (0.028)
Perc. Infl. \times 1(Type: MW Adj.)		0.057 (0.055)
Perc. Infl. \times 1(Type: Wage Taker)		0.014 (0.045)
Firm/Ind. FE	yes	yes
Time FE	no	no
Observations	3594	3581

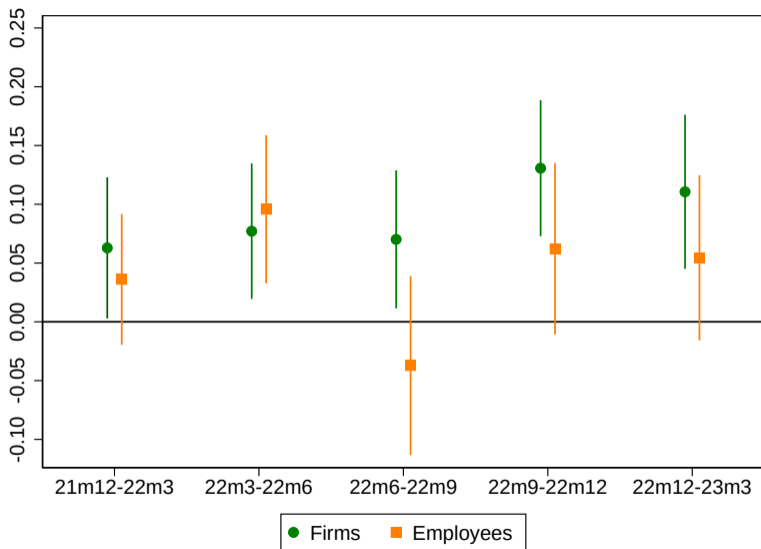
Firms: Pass-through by Reported Skill Shortage

[▶ Back](#)

	Expected Wage Growth Next 12 Months
Exp. Infl. \times 1(No skill shortage)	0.131*** (0.019)
Exp. Infl. \times 1(Sometimes skill shortage)	0.160*** (0.019)
Exp. Infl. \times 1(Always skill shortage)	0.222*** (0.028)
Current Infl. \times 1(No skill shortage)	0.183*** (0.022)
Current Infl. \times 1(Sometimes skill shortage)	0.191*** (0.022)
Current Infl. \times 1(Always skill shortage)	0.193*** (0.032)
Observations	15525
Firm/Ind. FE	yes
Time FE	no

Pass-through Estimated Across Consecutive Waves

[▶ back](#)



Low Average Pass-through: Stagflationary View of the World?

[▶ back](#)

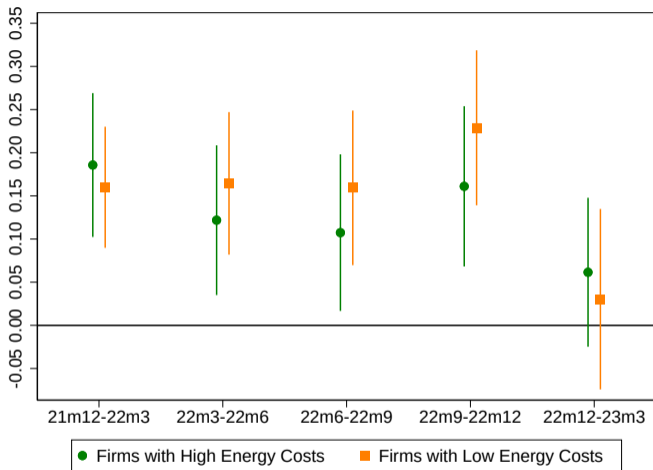
	Expected Wage Growth Next 12 Months				
	(1) Firms	(2) Firms	(3) Employees	(4) Employees	(5) Employees
Exp. Inflation Rate	0.220*** (0.011)	0.227*** (0.011)	0.095*** (0.012)	0.057*** (0.015)	0.047*** (0.016)
Exp. Unemployment Rate		0.003 (0.017)			0.058*** (0.017)
Business State		0.182*** (0.042)			0.066 (0.083)
Business Expectations		0.108*** (0.033)			0.118 (0.074)
Constant	3.123*** (0.079)	3.066*** (0.119)	2.010*** (0.101)	2.441*** (0.137)	2.116*** (0.167)
Observations	15920	15920	8193	6677	6677
R. sq. (within)	0.033	0.036	0.011	0.003	0.007
Firm/Ind. FE	yes	yes	yes	yes	yes

■ Limited role of stagflationary view (e.g., Andre et al., 2022)

- ▶ Adding expected unemployment rate and business conditions: *little change to inflation pass-through*

Firms: No Differential Effect by Share of Energy Costs

▶ Back



- Model estimated in first differences
- Firms split according to share of revenues spent on energy input in 2021

Long-run Inflation Expectations not Important ▶ Back

	Expected Wage Growth Next 12 Months					
	(1) Firms	(2) Firms	(3) Firms	(4) Employees	(5) Employees	(6) Employees
Exp. Infl. Rate 1y ahead	0.068* (0.036)		0.067* (0.036)	-0.003 (0.041)		-0.001 (0.044)
Exp. Infl. Rate 5y ahead		0.012 (0.022)	0.003 (0.023)		-0.006 (0.034)	-0.006 (0.036)
Constant	4.269*** (0.273)	4.732*** (0.110)	4.261*** (0.278)	2.644*** (0.356)	2.658*** (0.221)	2.662*** (0.371)
Observations	5416	5416	5416	2280	2280	2280
R. sq.	0.002	0.000	0.002	0.000	0.000	0.000
Ind./Firm FE	yes	yes	yes	yes	yes	yes

- Limited role of medium-run expectations (esp. with Taylor pricing, they should not matter in wage posting models a la Werning, 2022)