

# Inflation and Wage Expectations of Firms and Employees

Lukas Buchheim<sup>†</sup> Sebastian Link<sup>§</sup> Sascha Möhrle<sup>\*</sup>

<sup>†</sup>TU Dortmund & CESifo

<sup>§</sup>ifo Institute, LMU Munich, CESifo, & IZA

<sup>\*</sup>ifo Institute & LMU Munich

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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 ( $0 \lesssim \hat{\phi} \lesssim 0.1$ )

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*

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  $\sim 3,000$  firms and  $\sim 1,500$  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

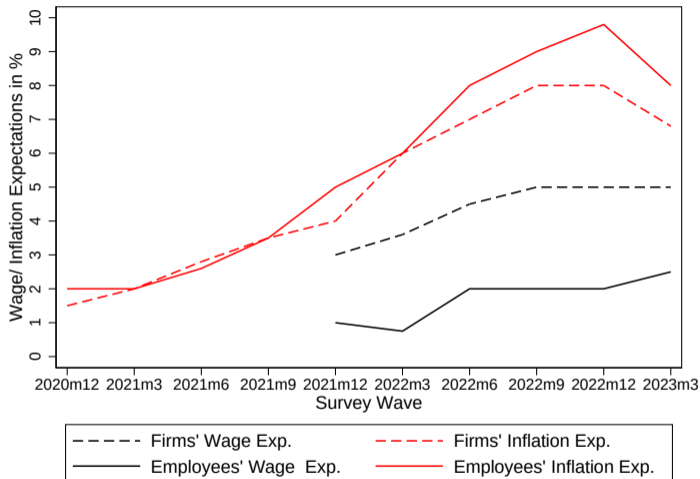
▶ Validation: Wages

- Expected inflation and wage growth over the next 12 months ▶ Survey qs
- 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
- Use two-digit industry code to match with coverage of collective bargaining agreements
  - ▶ Measures the percentage of employees that are covered by valid CBA within specific time horizon (e.g., 12 months ahead)

# Median Wage and Inflation Expectations

▶ Other GER surveys

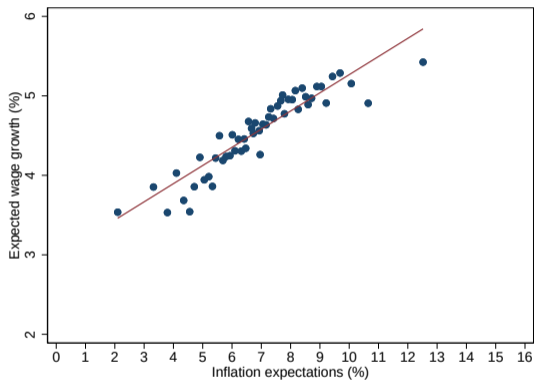
▶ Comp. to French firm data



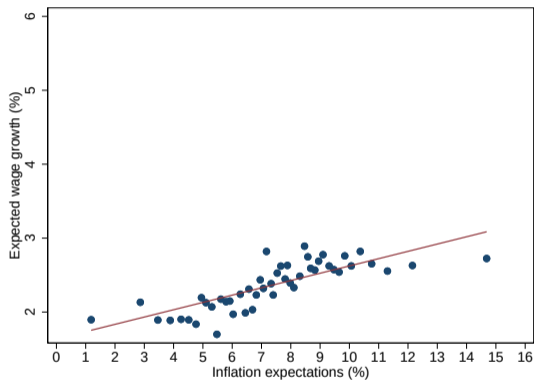


## **Average Pass-Through**

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:

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

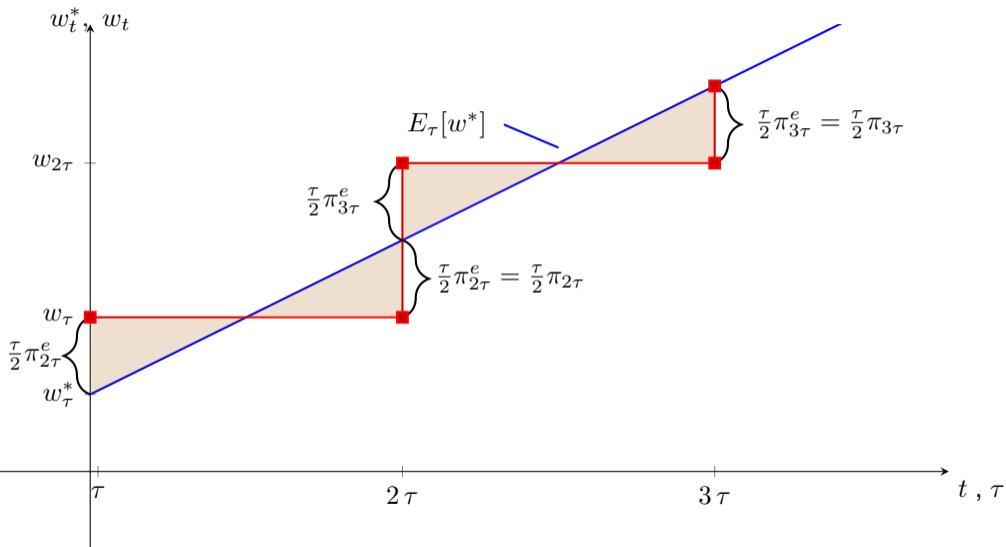
- Then, wages reset every period, with **wage growth** given by

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

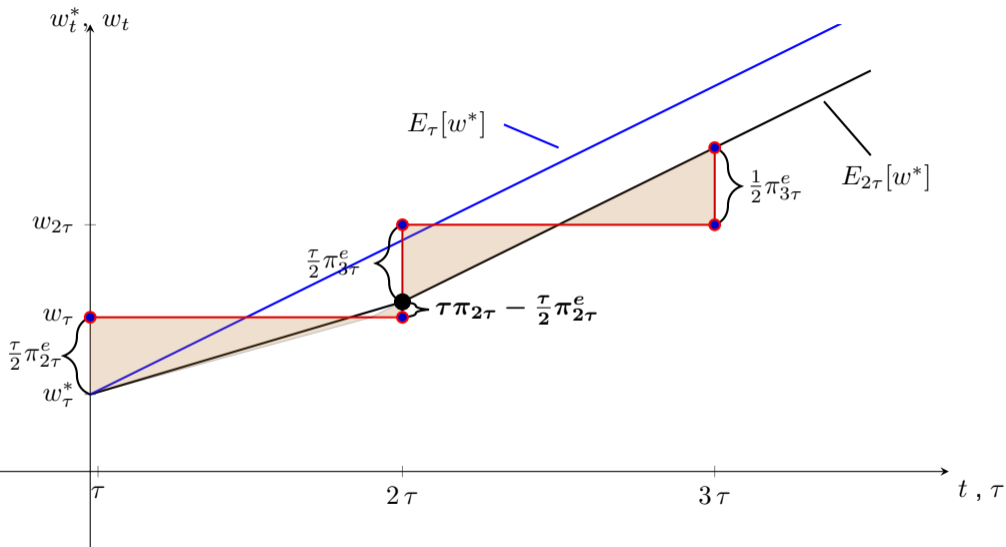
## Nominal wages with wage rigidities

- 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 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*
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 data on expiring dates of collective bargaining agreements (CBA)
  - 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)
Share Valid CBA in 12m	-0.016 (0.130)	4.054*** (0.609)	0.161 (0.099)	0.856 (0.527)
Expected Inflation Rate	0.114*** (0.021)	0.144*** (0.031)	0.170*** (0.016)	0.171*** (0.021)
Exp. Infl. × Share Valid CBA		-0.080 (0.051)		-0.006 (0.042)
Current Realized Inflation Rate	0.248*** (0.024)	0.475*** (0.046)	0.167*** (0.018)	0.200*** (0.032)
Current Infl. × Share Valid CBA		-0.459*** (0.080)		-0.086 (0.069)
Observations	4071	4071	9782	9782
Exp. Fundamentals	yes	yes	yes	yes
Firm/Ind. FE	yes	yes	yes	yes
Time FE	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 association between inflation expectations and on-the-job search

### 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. minimum wage jobs)

▶ 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
  - ▶ Employees with higher bargaining power expect higher pass-through

**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 )

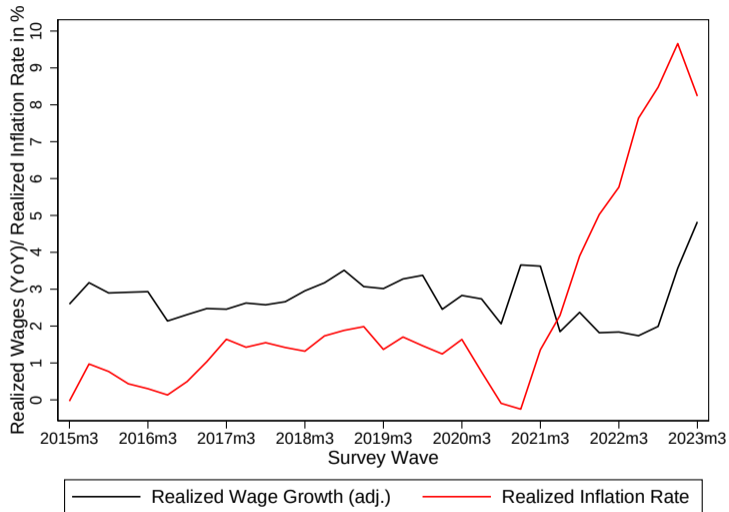
b. Für Ihren typischen Beschäftigten: Was schätzen Sie, wie hoch wird **das Bruttolohn-Wachstum für die nächsten 12 Monate** (also bis zum Dezember 2022) **insgesamt** sein (inkl. möglicher neuer Tarifabschlüsse, bevorstehender Lohnverhandlungen mit Beschäftigten oder ähnlichem)? \_\_\_% (Bitte tragen 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 )

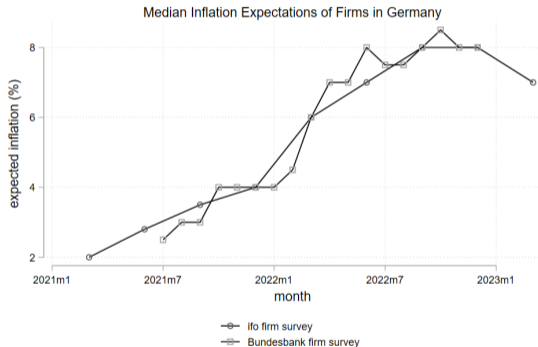
b. For your typical employee, what do you estimate will be **the total gross wage growth for the next 12 months** (i.e., through December 2022) (including possible new collective bargaining agreements, upcoming wage negotiations with employees, or similar)? \_\_\_% (If applicable, please enter your answer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

# Germany: Inflation and Wages over Time

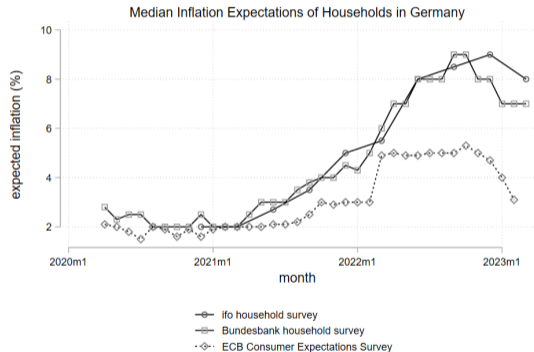
▶ Back



## Panel A: Firms



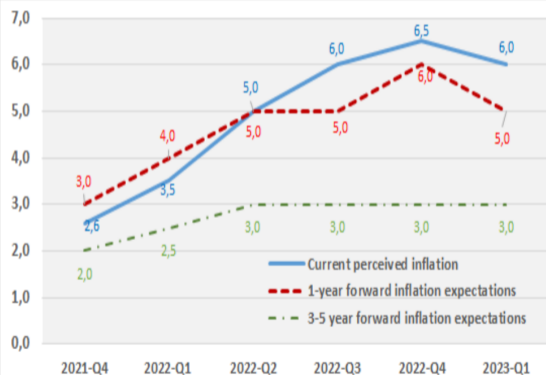
## Panel B: Employees



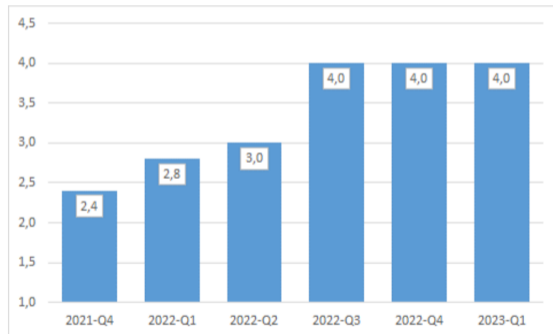


# Similar patterns in French Firm Survey [▶ back](#)

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



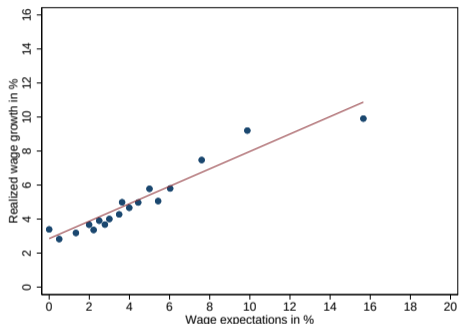
**Chart 3: Change in one-year base wage expectation (median, %)**



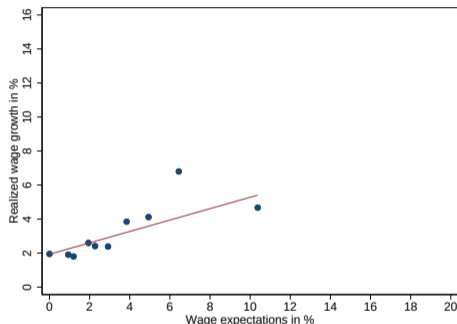
source: Banque de France Business Survey (2023)

# 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 (0.14) than women (0.06)
- younger age individuals compared to older age individuals
- high-income individuals (about 0.2) (→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

# Employees: On-the-job Search & Pass-through [▶ Back](#)

	Job Search (1)	Job Search (2)	Wage Exp. (3)
Exp. Inflation Rate	0.011 (0.061)	-0.169 (0.114)	
1(Job Search)			-1.493*** (0.441)
Exp. Infl. $\times$ 1(No Job Search)			0.051*** (0.015)
Exp. Infl. $\times$ 1(Job Search)			0.189*** (0.045)
Constant	6.607*** (0.645)	7.708*** (1.170)	1.802*** (0.155)
Observations	11773	6209	6130
Exp. Fundamentals	no	yes	yes
Firm/Ind. FE	yes	yes	yes
Time FE	no	no	no
Sample period	12/20 - 03/23	03/22 - 03/23	03/22 - 03/23

## 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

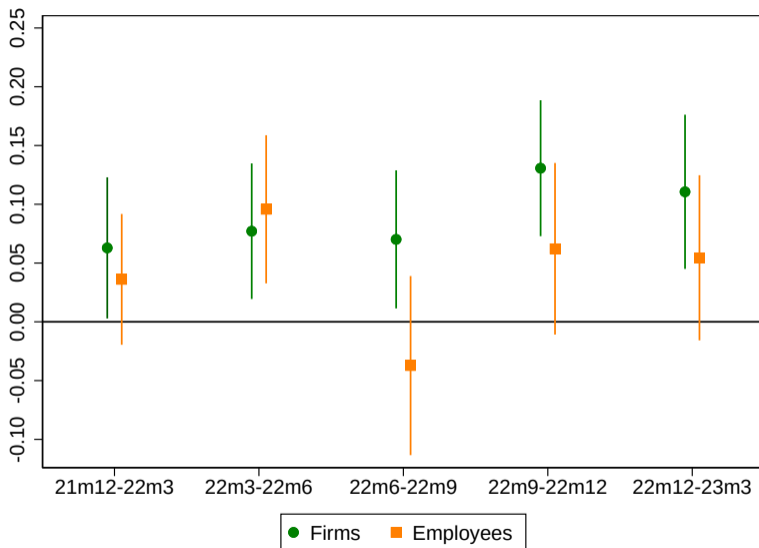
# Employees: Pass-through by Type of Wage Setting

[▶ 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

# Pass-through Estimated Across Consecutive Waves

[▶ back](#)





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

[▶ back](#)

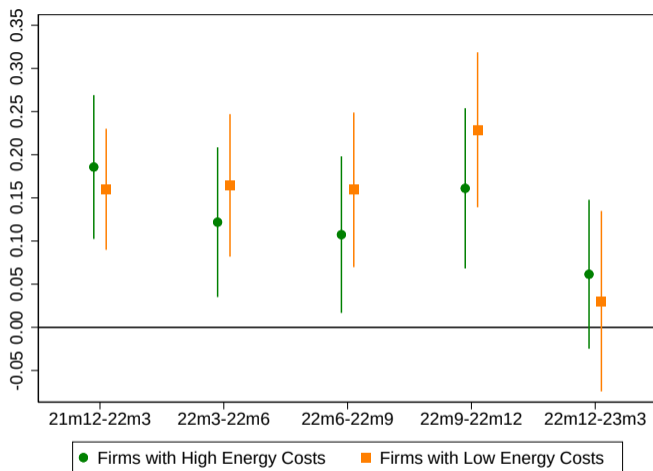
	Expected Wage Growth Next 12 Months				
	(1) Firms	(2) Firms	(3) Employees	(4) Employees	(5) Employees
Exp. Inflation Rate	0.220*** (0.011)	0.227*** (0.011)	0.095*** (0.012)	0.057*** (0.015)	0.047*** (0.016)
Exp. Unemployment Rate		0.003 (0.017)			0.058*** (0.017)
Business State		0.182*** (0.042)			0.066 (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)