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ABSTRACT

Inflation and Wage Expectations of Firms and Employees*

We study the link between expected inflation and wages using novel panel data from German firms and employees. We find that pass-through—the percentage point change in wage growth given a one percentage point change in expected inflation—is small: 0.11–0.17 for firms and 0.03–0.07 for employees. Utilizing variation in the coverage length of collective agreements, we estimate that passthrough at the intensive margin is 1.4-2 times larger than average pass-through, highlighting the importance of wage rigidities for pass-through. Pass-through also rises with the bargaining power of employees. At the extensive margin, expected inflation has little effect on additional wage negotiations.

JEL Classification: E24, E31, D84

Keywords: wage expectations, inflation, pass-through, wage-price spirals, bargaining, firms, employees, survey data

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1. Introduction

How large is the effect of inflation expectations on wage growth? The magnitude of this *pass-through* of expected inflation into wages is one important determinant for the magnitude of potential wage-price spirals: If an increase in expected inflation results in a comparatively large increase in wages—and, thus, unit costs—, this may fuel future inflation via the markup channel. In contrast, if the pass-through of expected inflation into wages is small, this particular channel for wage-price spirals may be of lesser importance.

Despite its potential relevance for the occurrence of wage-price spirals, we know very little about the magnitude of the effect of inflation expectations on wage growth.[1] The first goal of this paper is thus to provide empirical benchmarks for plausible values of pass-through. Given these estimates of average pass-through, our second goal is to enhance the understanding of its mechanism. We focus on two main channels: First, we distinguish average pass-through from pass-through along the intensive margin, i.e., conditional on wages being re-set. This enables us to interpret our findings in light of the quantitative predictions by Werning (2022), who shows that different models of wage rigidities lead to different pass-through, both on average and along the intensive margin. Second, we explore the role of wage bargaining for pass-through. Here, we investigate whether higher inflation expectations lead agents to initiate bargaining and hence to pass-through along the extensive margin of wage setting (similar to Pilossoph and Ryngaert, 2022). We also explore the role of bargaining power for the magnitude of pass-through.

We estimate pass-through using novel panel data on inflation and wage expectations. Starting in December 2021, we ask, on a quarterly basis, a representative sample of approximately 2,900 German firms and at least 1,300 employees about the expected growth of their own wage and their aggregate inflation expectations, both for a one year horizon. We also elicit realized wage growth over the past 12 months. To capture the extensive margin of wage setting, we furthermore collect data on wage bargaining intentions and the timing of wage setting. Finally, we elicit information on determinants of the real wage—such as the surplus of the match or the (expected) unemployment rate—to more cleanly isolate the nominal effects of expected inflation dynamics on wages.

Pass-through is low Pass-through of expected inflation into expected wage growth is low in our data, both for firms and employees. For firms, we find a pass-through between

[1] We discuss parallel work of Abberger, Funk, Lamla, Lein and Siegrist (2024), Baumann, Ferrando, Georgarakos, Gorodnichenko and Reinelt (2024), Hajdini, Knotek, Leer, Pedemonte, Rich and Schoenle (2023), Jain, Kostyshyna and Zhang (2024) and Savignac, Gautier, Gorodnichenko and Coibion (2024) below.

0.11 and 0.17, meaning that a one percentage point increase in expected inflation for the next 12 months is associated with an increase in expected growth of their own wages by between 0.11 and 0.17 percentage points over the same period. For employees, the estimates of pass-through are even lower, with point estimates ranging from 0.03 to 0.07.

Whether the pass-through estimates are at the upper or lower end of the respective intervals largely depends on the source of variation in expected inflation used for estimation. In particular, pass-through is lowest for both firms and employees when estimated using the most idiosyncratic variation in the data, i.e., specifications with firm/employee and time fixed effects. This highlights one of the main challenges in quantifying pass-through of inflation expectations into wage growth: Since wage growth often arises from wage negotiations, it is plausibly driven by *common assessments of the bargaining partners* about the future path of the economy. Yet, these common sources of information (e.g., inflation dynamics) may influence wage bargaining on their own, so that we want to control for them (e.g., via time fixed effects)—at the cost of neglecting common variation of expectations in the estimation. The panel structure of our data allows us to compare estimates of pass-through that utilize different sources of variation, thus providing a range of plausible values for pass-through. Reassuringly, this range of values turns out to be quite narrow across specifications.

Various alternative empirical specifications confirm that the pass-through of inflation expectations into wage growth is generally small and that the pass-through estimates for employees are lower than those for firms. Most notably, we provide evidence that the estimated pass-through is indeed informative for the (partial equilibrium) causal effect of inflation expectations on wage inflation. To this end, we show that our baseline estimates are comparable in size to pass-through estimates from two alternative approaches: (1) hypothetical scenarios, where we ask employees and firms to state their wage growth expectations given different counterfactual inflation expectations, and (2) an instrumental variable strategy, where we use a shift-share instrument for inflation expectations based on the energy intensity of a firm's production (the "share") and the development of a production price index for energy (the "shift") for identification. Moreover, we show that the pass-through of expected inflation into ex-post realized wage growth over the subsequent 12 months is of similar magnitude as the pass-through into expected wage growth, confirming our baseline results. We also ask whether pass-through is potentially state-dependent and, hence, time-varying, and show that the cross-sectional estimates for pass-through from each survey wave exhibit some time variation, but never exceed 0.27 for firms and 0.17 for employees.

Wage rigidities determine pass-through Next, we study pass-through in light of models of wage rigidities. One prediction of these models is that pass-through should be higher at the intensive margin—i.e., for firms and employees who anticipate wage changes—than on average. We measure whether firms or employees, at a given point in time, can plausibly expect wage adjustments within the next 12 months (the forecast window of the wage growth expectations) by exploiting the nature of collective bargaining agreements (CBAs) in Germany. Since CBAs are valid for a certain time period (typically around two years), firms and employees know that wages are likely to be re-set within the next year if their CBA expires within that period. In contrast, there is less scope for wage readjustments within the next year for those firms and employees covered by a CBA that remains valid for more than a year. Administrative data allows us to track the share of employees within two-digit industries covered by a valid CBA for the next 12 months, which provides a measure of the intensive margin of wage adjustments, which varies in both the cross-sectional and the time dimension.

We show that pass-through is substantially higher at the intensive margin than average pass-through. For firms and employees covered by CBAs, pass-through at the intensive margin is, depending on the empirical specification, 1.4 to 2 times larger than the average pass-through. In addition, in most specifications, our estimates imply that pass-through is zero when all collective agreements within an industry are valid for more than 12 months. As a placebo check, we also confirm that the pass-through of firms and employees not covered by collective bargaining is independent of the validity of collective agreements within their industry.

The presence of wage rigidities also implies that, at the time of wage adjustments, wage growth should reflect the accumulated inflation since the previous wage adjustment. The panel dimension of our data allows us to verify that, at the micro level, higher past inflation is indeed associated with higher wage growth.

Overall, our results are thus qualitatively consistent with models of wage setting in the presence of wage rigidities. Quantitatively, though, our estimates of both average pass-through and pass-through at the intensive margin are smaller than the existing theoretical predictions for the magnitude of pass-through (Werning, 2022).

A limited role of wage bargaining for pass-through Inflation expectations may affect pass-through not only via the intensive margin but also via the extensive margin of wage setting, that is, through additional wage negotiations. We investigate whether employees who expect higher inflation seek to increase their wages either by engaging in wage negotiations with their current employer or by searching for a new job to generate outside

offers with higher wages (Pilossoph and Ryngaert, 2022, investigate the latter channel for the US). In the cross-section of our data, employees with one percentage point higher inflation expectations are indeed 0.3 to 0.4 percentage points more likely to ask for a pay rise or apply for another job. This small positive association vanishes, however, when we control for individual heterogeneity.

Still, there is consistent evidence that employees who ask for a pay rise or apply for new jobs expect an economically significant higher pass-through than those employees who do not take measures to initiate wage bargaining. One potential reason for this result is that employees' ability to ask for a pay rise or their willingness to search for alternative jobs reflects their bargaining power, with higher bargaining power leading to higher pass-through. On the firms' side, the data corroborates this result by showing that firms that face tighter labor markets and are hence in a relatively weak bargaining position expect higher pass-through of their inflation expectations compared to firms operating in relatively slack labor markets.

Contribution This paper is part of a body of contemporaneous work that uses survey data to quantify pass-through of inflation expectations into income or wage growth expectations for either firms or employees (firms: Abberger et al., 2024, Baumann et al., 2024, Savignac et al., 2024; employees: Hajdini et al., 2023, Jain et al., 2024).[2] Our work adds to this literature by being the first to identify pass-through from *panel* data on expected inflation and wage growth.[3] Hence, this is, inter alia, the first study to compare pass-through into *expected* wage growth with pass-through into *ex-post realized* wage growth, to learn more about the dynamics of pass-through (e.g., its state dependence), to benchmark the magnitude of pass-through by leveraging various sources of variation, and to construct a shift-share instrument for causal identification. Further, the panel structure of our data enables us to contrast expected inflation and realized inflation as factors for wage growth and to exploit panel variation in the duration of collective agreements to estimate pass-through at the intensive margin. Section 3.6 compares our estimates to the results from these parallel works.[4]

In addition to these predominantly empirical papers, there is a recent theoretical and quantitative literature that seeks to better understand the potential link between inflation expectations, wage growth, and aggregate inflation either in wage posting (e.g., Lorenzoni and

[2] Bernanke and Blanchard (forthcoming) and Jorda and Nechio (2023) are two recent papers that estimate pass-through of (forecasters') inflation expectations into wage growth with aggregate data.

[3] The parallel works use cross-sectional variation from survey experiments (Abberger et al., 2024; Baumann et al., 2024; Hajdini et al., 2023) or (repeated) cross-sections (Jain et al., 2024; Savignac et al., 2024).

[4] More broadly, this paper is also related to the extensive literature that studies the effect of inflation expectations on economic decisions of households and firms (see Candia, Coibion and Gorodnichenko, 2023; Dräger and Lamla, 2024; and Weber, d'Acunto, Gorodnichenko and Coibion, 2022, for surveys.

Werning, 2023; Werning, 2022) or wage bargaining frameworks (e.g., Bloesch, Lee and Weber, 2023; Pilossoph and Ryngaert, 2022). In all these models, average pass-through and, hence, the resulting inflation dynamics are determined by the interplay of different (bargaining) mechanisms at the extensive and intensive margins of wage setting. By providing the first joint estimates of these statistics and by highlighting the role of bargaining power for pass-through, our findings allow to contrast the quantitative predictions of these models with the data.

This paper also contributes to the growing literature on workers' perceptions and beliefs about their labor market outcomes. So far, this literature has focused on eliciting workers' beliefs about their outside option in terms of wages (for a recent examples see, e.g., Conlon, Pilossoph, Wiswall and Zafar, 2018; Jäger, Roth, Roussille and Schoefer, 2024), or their general labor market prospects in terms of search behavior, and job finding or job loss probabilities (see Mueller and Spinnewijn, 2023, for a recent review). We add to this literature by studying how workers' expectations regarding future wages in their *current* jobs are driven, in part, by their inflation expectations, and by complementing the workers' perspective on wage developments with similar assessments from the firm side.

We proceed as follows. The next section describes the data. In Section 3 we report the estimates of average pass-through across a range of empirical specifications. Section 4 quantifies pass-through at the intensive margin and studies the role of realized inflation for wage growth. In Section 5 we investigate whether expected inflation affects the probability of wage bargaining (the extensive margin), and whether bargaining power determines the magnitude of pass-through. Section 6 concludes.

2. Data

2.1. Surveys among Firms and Households: Setting and Samples

Our analysis is based on quarterly surveys of panels of German firms and households that were specifically designed to examine the pass-through of expected inflation into wages and were conducted between December 2021 and December 2023.[5] As shown in Appendix Figure A.1, the sample period covers a period of historically large variation in inflation: German CPI inflation exceeded the ECB's inflation target of 2 percent in the summer of 2021 and marked at 5 percent at the start of our sample period. Inflation accelerated further after

[5]We began adding wage-related questions to the existing quarterly panel of firm and household surveys initiated by Link, Peichl, Roth and Wohlfart (2023a) in December 2021. Data on other variables, including expected inflation, has already been available since December 2020.

Russia's invasion of Ukraine in early 2022, reaching levels of around 10 percent by the end of 2022 before reverting back. In parallel, wages continued to grow at comparably moderate year-over-year growth rates of approximately 2 percent until mid-2022, before accelerating to rates greater than 6 percent towards the end of our sample period.

Firm panel The quarterly firm survey is conducted among firms participating in the ifo Business Survey (IBS), a long-standing monthly survey of a large and representative panel of German firms.[6] Respondents to the online version of the IBS received a separate link to our survey in the invitation email to the regular IBS of the last month of each quarter. On average, approximately 2,900 respondents participated in each wave of our surveys. Given the focus of our analysis on wage setting, we exclude firms with less than 5 employees. Additionally, we restrict the analysis to respondents who participated in at least two waves and provided information on all variables used in our regressions, resulting in an average of 2,400 observations per wave. 34 percent of firms operate in manufacturing, 34 percent in services, 9 percent in construction, and 22 percent are retailers or wholesalers. Overall, firms are in the regression sample for an average of 5.5 out of the 9 survey waves.

Panel A of Appendix Table A.1 shows summary statistics for the firm sample. The median number of employees is 52, and the average share of exports in firms' revenues is 16 percent. In 31 percent of the firms, the job of a "typical employee" is covered by a collective bargaining agreement. 77 percent of respondents report having "very high influence" on their firms' decisions, which corroborates evidence by Sauer et al. (2023) documenting that respondents usually hold upper management positions such as owner, CEO, or department head.[7]

Household panel The household survey is conducted simultaneously and uses identical questions whenever possible, which allows the comparison of results across samples and minimizes sensitivity to wording choices (Bruine de Bruin, Van der Klaauw, Topa, Downs, Fischhoff and Armantier, 2012).[8] In each wave, we first recontact all respondents who

[6]The IBS provides the basis for the ifo Business Climate Index, the most recognized leading indicator of the German business cycle (IBS-CONS, n.d.; IBS-IND, n.d.; IBS-SERV, n.d.; IBS-TRA, n.d.). See Sauer, Schasching and Wohlrabe (2023) for details on the IBS and its representativeness. The IBS microdata have been used extensively in previous research in economics (e.g., Bachmann, Born, Elstner and Grimme, 2019; Bachmann, Carstensen, Lautenbacher and Schneider, 2021; Bachmann, Elstner and Sims, 2013; Buchheim, Dovern, Krolage and Link, 2022; Link, Peichl, Roth and Wohlfart, 2023b).

[7]In the June 2021 wave, Link et al. (2023a) elicited the respondent's influence on the firm's decisions regarding investment, production, personnel, and pricing on a 5-point scale. 65 percent of managers report having "very high influence" (highest category) on personnel decisions in the firm and 77 percent report to have "very high influence" on decisions in at least one of these areas.

[8]The household surveys are conducted in cooperation with the online panel provider Dynata, which is widely used in the social sciences (Haaland, Roth and Wohlfart, 2022).

participated in previous waves before sending the questionnaire to new respondents. In our analysis, we focus only on employed participants. The December 2021 and March 2022 waves were completed by about 2,300 employed participants, the waves since June 2022 comprise about 1,300 employees. We exclude the 5 percent of the sample who completed the questionnaire in the shortest time and restrict the sample to respondents who participated in at least two waves. In the final sample, we observe respondents on average in 4.7 out of 9 survey waves.

Panel B of Appendix Table A.1 shows summary statistics for our sample of employees and a comparison with benchmarks from the 2021 wave of the German Socio-Economic Panel (GSOEP), a representative household survey. Our sample is roughly representative of the employed population along a wide range of characteristics: gender, residency in East/West Germany, percentage with a highschool degree, share of full-time workers, and the coverage rate of collective bargaining agreements.

2.2. Survey Design and Variable Encoding

Our main survey outcomes focus on expected inflation and wage growth.[9] In each survey wave, we ask respondents about their expected CPI inflation and gross wage change over the next 12 months. Employees are instructed to refer to the gross wage of their current job, keeping their job position and working hours constant.[10] For comparability and to ensure that firms have a specific employee in mind when answering our questions, we ask firms to consider the gross wage growth of a "typical" employee with average qualifications, tenure, and job profile. To prevent respondents from reporting only wage changes that have *already been agreed upon* at the time of the survey, we proceed in two-steps: First, we ask about the portion of future gross wage growth already agreed upon, such as through currently valid collective bargaining agreements (CBAs). Then, we ask for the *total* expected wage growth over the next 12 months, including both pre-agreed changes and anticipated outcomes from potential additional wage negotiations or new collective agreements. In some waves, we also collect data on realized wage growth, perceived current inflation (for employees only), and expected inflation over longer horizons.

We also gather detailed information on the wage-setting process. Most importantly, we elicit whether the (typical) employment relationship is subject to a CBA. Together with

[9] Appendix E lists the English translations of the survey questions.

[10] In line with the typically low job churn rates in Germany, only about 7 percent of employees in our sample applied for another job in the month before the survey, and only 5 percent started a new job with a different employer in the past 12 months. In Section 5.1, we show that higher expected inflation is at most weakly associated with more intensive job search.

administrative data on the coverage duration of CBAs, this information allows us to estimate pass-through at the intensive margin in Section 4.1. Further, we collect data on the extensive margin of wage setting (e.g., intention to ask for pay rise), job search, and proxies for bargaining power, which we introduce when relevant.

To better isolate the nominal effects of expected inflation dynamics on wage growth, the surveys also cover other potential determinants of real wages. First, we use assessments of their firms' current and expected future business conditions as proxies for the surplus of the match and the scope for wage negotiations.[11] Second, the survey contains macroeconomic expectations regarding the unemployment rate 12 months after the survey. Third, we use information from the April 2022 wave of the regular IBS on the share of energy costs prior to the Russian invasion of Ukraine, which we use to construct a shift-share instrumental variable for expected inflation in Section 3.3. Lastly, the surveys contain standard demographics for firms and employees listed in Appendix Table A.1.

To reduce the impact of outliers, we trim all belief data at 0 and 20 percent. The lower restriction barely binds, while the upper threshold corresponds to the 96th percentile (for expected inflation) and the 98th percentile (for expected wage growth) in the household sample, and exceeds the 99th percentile for all variables in the firm sample. Trimming at other cutoff values does not change the results considerably, see Appendix B.4.

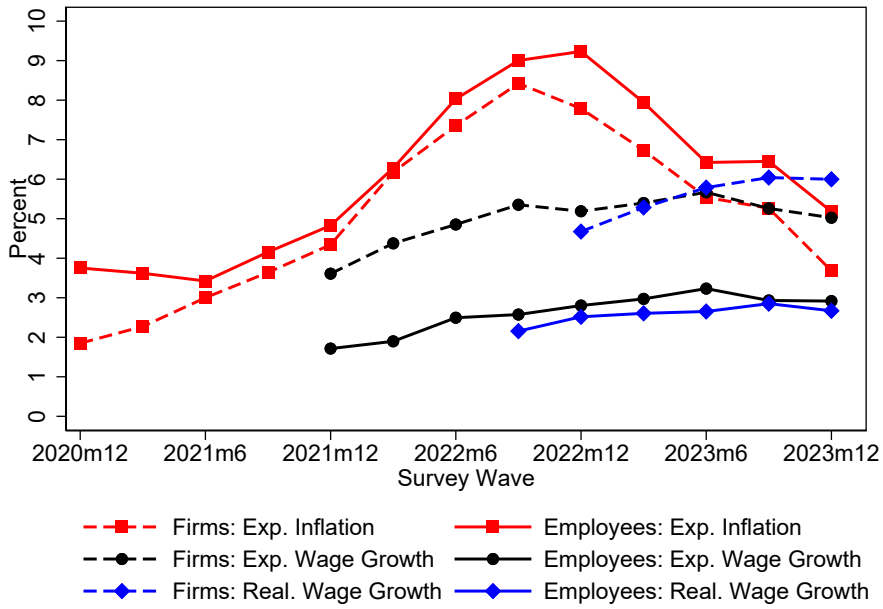
2.3. Data Validation and Descriptive Statistics

Validation of expectations data Respondents provide accurate and informative expectations in our surveys. Expected wage growth for the next 12 months, elicited between December 2021 and December 2022, is strongly correlated with the ex-post realized wage growth reported by the same firms and employees 12 months later, see Appendix Figure A.2. Additionally, average expected CPI inflation in our samples closely tracks the developments reported in the Bundesbank's representative firm and consumer surveys, see Appendix Figure A.3. This suggests that our expectations data are of high quality.

Aggregate dynamics in survey data Mimicking the surge in inflation, Figure 1 shows that average inflation expectations of firms and employees fluctuated strongly over the sample

[11] Sauer et al. (2023) document that firms mainly consider their expected profits and sales when answering these regular IBS questions. For employees, we started eliciting information about current and expected business conditions of their employer in March 2022. To maintain the sample size, current and expected business conditions as of December 2021 are approximated by the employee's assessment from the subsequent survey wave he/she participated in. 20% of employees are asked about their expectations for the next 6 months (the horizon of the regular IBS question), the others about the next 12 months. Because the replies do not differ meaningfully across forecast horizons, we merge them into a single variable.

Figure 1: Aggregate Dynamics of Expected Inflation and Expected/Realized Wage Growth



Notes: This figure shows the average expected CPI inflation rate in Germany over the next 12 months (red squares), expected wage growth over the next 12 months (black dots), and realized wage growth over the past 12 months (blue diamonds) for respondents in the firm survey (dashed lines) and household survey (solid lines). For firms, gross wages refer to a "typical" employee with average qualifications, tenure, and job profile.

period. Starting near the ECB's target of 2 percent, firms' average expectations rose steadily to 4.4 percent in December 2021 and 8.5 percent in September 2022, before reverting to 3.7 percent in December 2023. Employees' mean expectations trended at slightly higher levels and reached their peak one quarter later, rising from 4.9 percent in December 2021 to 9.4 percent in December 2022, then dropping to 5.3 percent in December 2023.

In contrast, the time variation in expected wage growth for the next 12 months is more modest and tends to lag inflation. On average, firms expected their "typical" employee's wage to increase by 3.6 percent in December 2021, peaking at 5.7 percent in June 2023, before slightly declining to 5.1 percent in December 2023. Meanwhile, employees' mean expected wage growth rose from 1.8 percent in December 2021 to 3.2 percent in June 2023, and then slightly decreased to 2.9 percent in September and December 2023. Reassuringly, the patterns of average realized wage growth reported 12 months later are largely comparable.

Overall, the time variation indicates a positive but small correlation between expected inflation and wage growth, given the latter's more muted and lagged development. The relationship appears to be stronger for firms than for employees, with employees generally being more pessimistic about real wage developments across all survey waves.

3. Pass-through of Inflation Expectations into Wage Growth

This section uses the cross-sectional and time dimensions of the panel data on expected inflation and wage growth to provide benchmark estimates for average pass-through for both firms and employees, showing that pass-through is generally low (below 0.2). Pass-through is also low when utilizing alternative empirical approaches that use ex-post realized wage growth—instead of expected wage growth in the main specification—for the estimations, or address potential endogeneity concerns using an instrumental variable approach and hypothetical scenarios. We also assess how pass-through varies during the rise and fall of inflation between December 2021 and December 2023.

3.1. Average Pass-through among Firms and Employees

To estimate the average pass-through, we exploit various dimensions of variation in inflation and wage growth expectations by estimating different versions of the following model:

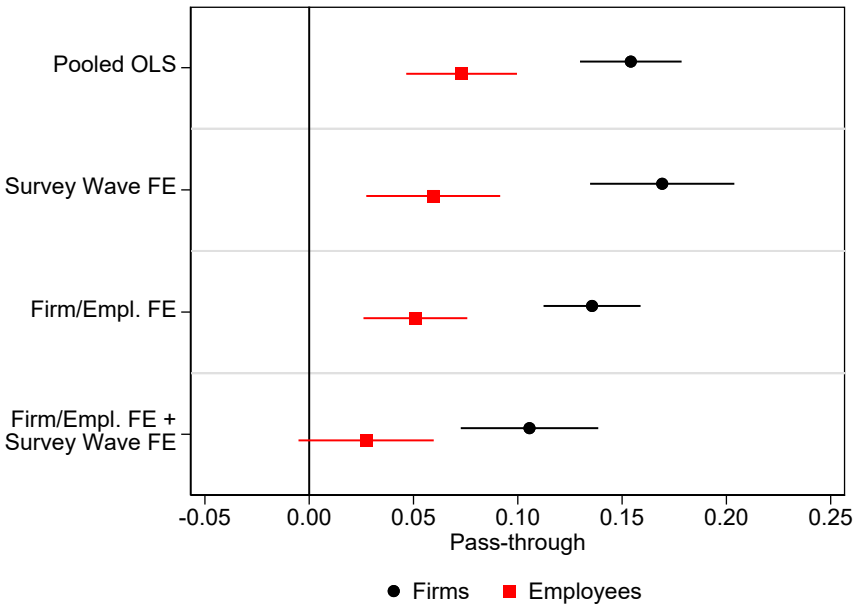
$$w^e_{i,t} = \phi\, \pi^e_{i,t} \;+\; \boldsymbol{X'_{i,t}}\boldsymbol{\gamma}\; [+\,\alpha_i \;+\; \delta_t] \;+\; \varepsilon_{i,t}, \tag{1}$$

where $w^e_{i,t}$ is the expected growth in own wages (12 months ahead) of firm or employee i in wave t, and $\pi^e_{i,t}$ is the expected inflation rate (12 months ahead), the main explanatory variable of interest.

The control vector $\boldsymbol{X_{i,t}}$ captures several potential determinants of real wage growth. These include time-varying determinants such as the expected unemployment rate as a measure of workers' outside options, and assessments of the respective firm's/employer's current and expected future business conditions, which proxy the value of the match. Other elements of $\boldsymbol{X_{i,t}}$ subsume potential time-invariant demographic and firm-specific determinants of wages.[12] In some specifications, the latter are replaced by fixed effects at the firm or employee level (α_i) to additionally control for unobserved heterogeneity. In other specifications, we add survey wave fixed effects (δ_t) to remove date-specific variation, including the general economic and inflationary conditions prevailing at the survey month t. This time variation in economic conditions may i) directly affect wage growth—at least if the effect of aggregate conditions

[12] In the employee sample, we control for gender, age, education, numeracy, employment status, and income, mostly collected in the first wave of participation in the panel. In the firm sample, we control for the number of employees (in logs), export share, and a dummy that is one if the respondent reports having a "very high" influence on the firm's decisions regarding investment, production, personnel, or pricing, elicited in June 2021. We code missing values for the number of employees, the export share, and the respondent's influence as zero and include dummies indicating missing values in the respective variables.

Figure 2: Average Pass-through of Expected Inflation into Expected Wage Growth



Notes: The figure plots the regression coefficients of the expected inflation rate over the next 12 months for different specifications of the empirical model (1) with expected wage growth as the dependent variable. We estimate(1) separately for our samples of firms (black dots) and employees (red squares). Each specification controls for respondents' expected unemployment rate in 12 months and their assessment of their firms' current and expected future business conditions. The first two specifications also control for time-invariant demographic controls; see Footnote 12 for details. Confidence intervals are displayed at the 95% level, with standard errors clustered at the level of firms/employees. The complete regression output is displayed in Appendix Table B.1.

on wage growth is not captured by the firm/employer-specific business conditions and expectations, which we always control for—and ii) constitute common sources of information for inflation expectations, which may be particularly important in wage bargaining. $\varepsilon_{i,t}$ is the error term, and standard errors are clustered at the firm or employee level, respectively.

The pass-through of expected inflation into expected wage growth is positive but small in our data for both firms and employees, and is largely independent of the specification of the control vector. As summarized in Figure 2, we find pass-through ($\hat{\phi}$) between 0.11 and 0.17 for firms, meaning that a one percentage point increase in expected inflation over the next 12 months is associated with an increase in expected wage growth over the same period of between 0.11 and 0.17 percentage points. For employees, the pass-through is even smaller, with point estimates ranging from 0.03 to 0.07.

More precisely, the first row of Figure 2 shows that the pass-through estimates are at the upper end of the intervals when driven by the full variation in expected inflation, i.e., across respondents and over time. The inclusion of survey wave fixed effects in the second row

Table 1: Pass-through of Expected Inflation into Realized Wage Growth (Firms)

	Realized Wage Growth over next 12 Months	
	(1)	(2)
Expected Inflation next 12m	0.159***	0.078***
	(0.023)	(0.030)
Observations	5673	5673
R2	0.039	0.048
Expectation Controls	yes	yes
Firm-specifics	yes	yes
Firm FE	no	no
Survey Wave FE	no	yes

Notes: This table shows the results of regressions of ex-post realized wage growth (in percent) over the past 12 months (lagged by 12 months) on ex-ante expected inflation over the same period for the sample of firms. Realized wage growth is elicited between December 2022 and December 2023, so the sample is restricted to December 2021–December 2022. Each specification controls for the expected unemployment rate, firms' current and expected future business conditions, and the time-invariant firm–specific controls listed in Footnote 12. Standard errors are clustered at the firm level. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

does not change the coefficients substantially, even though the estimates are only driven by cross-sectional variation in expected inflation, and we control for all general dynamics over time, including inflation and the common component of expectations. Additionally, the estimated pass-through coefficients are only slightly lower when controlling for unobserved heterogeneity across participants with individual/firm fixed effects, which also control for the overall level difference in average wage and inflation expectations between the two samples shown in Figure 1. The pass-through coefficients are smallest in the most restrictive empirical specification that controls for fixed effects in both dimensions. The complete regression output underlying Figure 2 is shown and described in the appendix (Section B.1).

3.2. Pass-through of Expected Inflation into Realized Wage Growth

The panel dimension of the data enables us, as the first paper in the literature, to estimate the pass-through of expected inflation into realized wage growth. We elicit realized wage growth retrospectively for the past 12 months, allowing us to relate forward-looking inflation expectations from the five waves between December 2021 and December 2022 to the realized wage growth reported in the survey waves between December 2022 and December 2023. We estimate pass-through into realized wage growth by estimating equation (1) as above, but with realized wage growth over the subsequent 12 months as the dependent variable.

Table 1 reports the results for firms. We find pass-through between 0.08 (in the specification with survey wave fixed effects) and 0.16 (for pooled OLS), and thus in the same range as the corresponding results for expected wage growth.[13] We report the results for employees in the appendix (Section B.1), as the subsample with data on both realized wage growth and corresponding inflation expectations represents less than 15 percent of the original sample. Still, even within this small sample, the pass-through estimates for realized wage growth are of comparable magnitude to the pass-through estimates for expected wage growth.

These results suggest that within the 12-month period between measuring inflation expectations and retrospective wage growth, wages have adjusted to the expected inflation as initially expected. This is notable because, within this period, wages may have responded not only to the original inflation expectations but also to developments that were not anticipated at the time of measuring expectations.

3.3. Causality

The preferred interpretation of the coefficient estimates for ϕ in Equation (1) is that they measure the immediate causal effect of expected inflation on (expected) wage growth in partial equilibrium, that is expected by firms and employees in the short run. Of course, this interpretation might be questionable since our main specification does not rely on (quasi-) random variation in inflation expectations.

One concern may be that the empirical associations we measure are driven by some unobserved third factor. Note, though, that we already control for potential confounders of other macroeconomic expectations or the assessments of current and expected business conditions, which may both correlate with expected inflation and wage growth.

Another concern is the potential ambiguity in the direction of causality. In particular, agents might anticipate that a stronger expected increase in their wages could induce their firms to raise prices more in the future to prevent markups from falling too sharply. If they perceived this as a broad-based phenomenon, they might also expect higher inflation rates in the overall economy. Note, however, that our preferred interpretation of causality running from expectations about *aggregate* inflation rates to expected wage growth at the *individual/firm-level* is arguably more direct—especially in the presence of wage rigidities.

Even though the empirical setup makes a causal interpretation plausible, we employ two complementary approaches to address the question of causality more directly: We estimate

[13] Because retrospective wage growth overlaps with four quarters of reported expected inflation, it is difficult to link the time variation in expected inflation to the time variation in wage growth. The results for estimations that add firm-level fixed effects are thus omitted.

pass-through for firms using a shift-share instrument for inflation expectations, and we compute pass-through of both firms and employees from hypothetical scenarios in which we elicit expected wage growth given different outlooks for future inflation.

Instrumental variable approach The instrumental variable (IV) strategy exploits the strong fluctuations in energy prices during the sample period in a shift-share design. The idea is that firms with more energy-intensive production pay higher attention to these fluctuations than low energy-intensive firms, leading to differential extrapolations from the energy cost dynamics to expected inflation dynamics (see Wehrhöfer, 2023, for a similar argument).

We measure energy prices via the energy component of the producer price index ("PPI Energy"). The PPI Energy tripled between late 2020 and September 2022, following the recovery from the Covid-19 recession and the Russian invasion of Ukraine, before substantially declining again. Firms' exposure to this shock is represented by the energy-intensity of production—defined as ratio of energy costs to revenues—prior to the Russian invasion of Ukraine, elicited in the April 2022 wave of the regular IBS. According to this measure, the median firm spent 3 percent of its revenues on energy before the war.

Figure B.1 in Appendix Section B.2 graphically verifies the hypothesized first stage: firms that were more strongly affected by the energy price shock expected higher inflation. The difference in inflation expectations between firms with above- and below-median energy cost shares closely tracks the dynamics of the PPI Energy. At the peak of energy prices in September 2022, the inflation expectations of more exposed firms were, on average, 0.8 percentage points higher than those of firms with energy costs below the median.

Columns 1 and 2 of Table 2 report the IV estimates of the baseline specification using the shift-share $\textit{energy cost share}_i \times \textit{PPI Energy}_t$ as an instrument for expected inflation $\pi^e_{i,t}$.[14] In Column 1, we control for firms' energy cost share to account for its general association with inflation expectations (see the aforementioned Figure B.1) as well as the usual firm-specific and time-invariant controls. In Column 2 we control for firm fixed effects.[15]

The IV estimates of pass-through are 0.25 and 0.28, respectively, which is somewhat larger than the corresponding baseline estimates. Nevertheless, our main conclusion remains unchanged: inflation expectations only weakly influence the magnitude of wage growth.

[14] The first stage is omitted, as Figure B.2 already displays the strong association over time. The high F-statistics (>1000) reflect this strong association.

[15] The 2SLS regressions further control for respondents' expected unemployment rate and their assessment of their firms' current and expected future business conditions. The latter controls mitigate endogeneity concerns regarding the instrument stemming from potential differential effects of the energy crisis on business outlooks.

Table 2: Pass-through Estimates from Shift-Share IV and Hypothetical Scenarios

	Expected Wage Growth next 12 Months			
	Shift-Share IV		Hypothetical Scenarios	
	Firms		Firms	Employees
	(1)	(2)	(3)	(4)
Expected Inflation next 12m (IV)	0.252***	0.280***		
	(0.034)	(0.029)		
Energy Cost Share	0.013***			
	(0.003)			
Expected Inflation next 12m (Scenarios)			0.448***	0.165***
			(0.022)	(0.027)
First Stage F	1599	1885		
Observations	15532	15446	1052	628
R2	0.023	0.002	0.170	0.030
Expectation Controls	yes	yes	no	no
Firm-specifics/ Demographics	yes	no	no	no
Firm/Empl. FE	no	yes	no	no
Survey Wave FE	no	no	no	no

Notes: The dependent variable is expected wage growth over the next 12 months for firms (Columns 1–3) and employees (Column 4). In Columns 1 and 2, expected inflation for the next 12 months is instrumented by a shift-share instrument based on the energy intensity of a firm's production (the "share") and the energy component of the PPI at the time of the survey (the "shift"). Firms' energy intensity is the ratio of energy costs to revenues prior to the Russian invasion of Ukraine elicited in the April 2022 wave of the regular IBS. The 2SLS regressions control for respondents' expected unemployment rate and their assessment of current and expected future business conditions. In Column 1 we further control for the firm-specific energy cost share and the time-invariant firm-specific controls listed in Footnote 12, while in Column 2 we control for firm fixed effects. Columns 3 and 4 estimate pass-through based on hypothetical scenarios conducted in the December 2023 wave, when a random subset of respondents in the firm and employee surveys was asked to provide their wage growth expectations for the next 12 months for two scenarios: if they expected consumer prices to increase (i) by either 2 percent or (ii) by 8 percent over the same horizon. Each respondent answered the questions under both scenarios. Standard errors are clustered at the levels of firms and employees. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Hypothetical inflation scenarios We also compute pass-through based on hypothetical scenarios in which we ask employees and firms to state their expected wage growth when considering different counterfactual outlooks for future inflation (for other recent uses of hypothetical scenarios in the literature, see, e.g., Andre, Pizzinelli, Roth and Wohlfart, 2022, Coibion, Gorodnichenko, Knotek and Schoenle 2023, or Pilossoph and Ryngaert, 2022). Specifically, in the December 2023 wave, we asked a random subset of respondents in the firm and employee surveys to provide their wage growth expectations for the next 12 months for two scenarios: if they expected consumer prices to increase (i) by either 2 percent or (ii) by 8 percent over the same horizon. Each respondent answered the questions under both scenarios. This holds a respondent's remaining information set constant and thus mechanically eliminates any potential channel of reverse causality from expected wages to inflation.

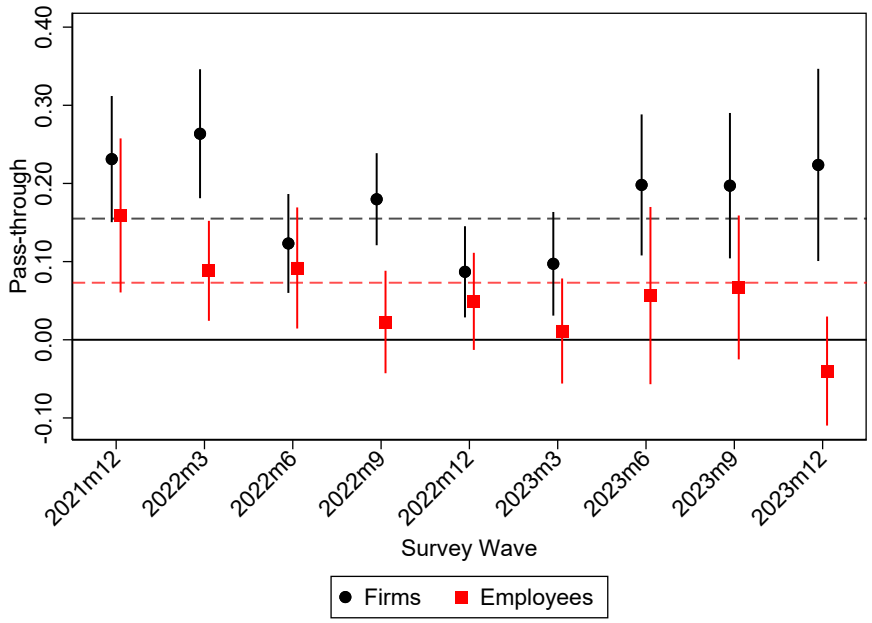
For direct comparability with the main results, we estimate pass-through based on the exogenously given and hypothetical inflation expectations of 2% and 8%. Columns 3 and 4 of Table 2 show the results. We find a positive effect of the hypothetical inflation expectations on wage growth, indicating that both firms and employees perceive expected future inflation as a driver of wage growth—the causal channel we are interested in. With point estimates of 0.45 for firms and 0.17 for employees, we again find that pass-through is clearly below 1. Yet, the estimates are larger than the previous estimates. Part of this difference may arise because the hypothetical scenarios strongly prime respondents to consider the potential role of expected inflation for their future wage growth. In addition, the hypothetical scenario may be prone to experimenter demand effects. Both of these issues are thus no concern for the main estimates, but rather highlight that pass-through is far below one *despite* these potential sources of upward bias.[16]

3.4. State-dependence of Pass-through

Next, we analyze how the pass-through of expected inflation to wage growth varies over the sample period. To this end, we include interaction terms of expected inflation with indicators for each survey wave in Equation (1) and report the respective pass-through coefficients in Figure 3. The estimated pass-through of inflation expectations is consistently small in all periods. For firms, it ranges from 0.09 to 0.26, and is thus small in economic terms throughout the entire sample period. For employees, pass-through estimates range from -0.04 to 0.16,

[16] More detailed results in Appendix Section B.2 corroborate this notion by showing that more than 20 percent of firms and more than 50 percent of employees anticipate the exact same pay increase irrespective of the hypothetical scenario of expected inflation.

Figure 3: Pass-through of Expected Inflation into Expected Wage Growth by Survey Wave



Notes: The figure plots the conditional association between expected inflation and expected wage growth for each survey wave among firms (black dots) and employees (red squares), estimated by including interaction terms $\textit{Expected Inflation}_{it} \times \mathbb{I}_t(\textit{survey wave} = t)$ in the empirical model (1). Both regressions control for respondents' expected unemployment rate, their assessment of their firms' current and expected future business conditions, and for the firm- and employee-specific controls listed in Footnote 12. Standard errors are clustered at the firm/employee level. Confidence intervals are displayed at the 95% level. For comparison, the dashed horizontal lines indicate the average pass-through across all survey waves, as shown in the top row of Figure 2.

with point estimates that are smaller than those estimated for firms in all periods. In general, the differences between wave-specific pass-through estimates and their overall average are relatively minor and statistically significant in only a few cases, suggesting that the degree of pass-through has been relatively stable and low throughout the sample period.

These results are informative about hypotheses regarding the potential state-dependence of pass-through that have (informally) been proposed in the literature. For instance, one argument is that inflation expectations need to become unanchored before they influence decision making (e.g., Rudd, 2022, or Jorda and Nechio, 2023). Given that inflation began rising in late 2020 after a long period of low and stable rates, this would imply that pass-through increases with the duration of the higher-than-usual inflationary period. However, this hypothesis is not supported in our data, where pass-through is relatively stable over time and, if anything, tends to be lowest when current inflation rates are highest by the end of 2022.

An alternative hypothesis is that pass-through might be low due to the presence of stagfla-

tionary views, particularly following the Russian attack on Ukraine (e.g., Andre et al., 2022). Arguably, the subsequent decline in natural resources available to the European market, particularly natural gas and oil, might have limited the scope for wage increases despite higher realized and expected inflation, thereby reducing the magnitude of pass-through. Although the estimated pass-through appears to have declined somewhat after the Russian invasion, the magnitude of the pass-through has been already small in economic terms before the invasion. Additionally, Section B.3 in the appendix examines heterogeneity in firms' exposure to the shock of the Russo-Ukrainian war and provides further evidence supporting the conclusion that stagflationary views resulting from the war alone are unlikely to explain the consistently low pass-through observed in the data.

3.5. Additional Robustness Checks

Appendix B.4 describes additional robustness checks for the results derived thus far. First, we verify that the pass-through of inflation expectations is low for other possible forecasting windows of inflation. In fact, in our data, medium-run inflation expectations (3 or 5 years ahead) do not exert any effect on expected wage growth for the next 12 months over and above the effect of short-run inflation.[17] This holds for both firms and employees.

Second, we verify that changing the sample composition by choosing other trimming parameters does not alter the main conclusions. In our main sample, we trim observations when stated beliefs, including expectations regarding inflation, wage growth, and the unemployment rate, fall outside the interval between 0 and 20 percent. Appendix Figure B.4 shows that the pass-through estimates change little when the upper bound is set to other values between 15 and 40 percent: the maximum estimated expected pass-through is 0.11 for employees and 0.17 for firms, compared to baseline findings of 0.07 and 0.16, respectively.

Third and finally, we confirm that observed differences in pass-through between firms and employees are not attributable to the different industry compositions of the firm and employee samples. Table B.4 replicates the main regressions depicted in Figure 2 based on a reweighted firm sample that mimics the industry composition of employees and vice versa (at the 2-digit industry level). The differences between the pass-through coefficients estimated based on these samples and the baseline results are below 0.04 across all specifications.

[17] Note that this result is in line with a theoretical prediction by Werning (2022), who notes that pass-through of medium-run inflation expectations with forecast horizon h should be zero if all current wage spells are expected to be renegotiated before h. See Appendix B.4 for details.

3.6. External Validity: Evidence from Other Countries and Other Time Periods

The panel estimates of pass-through in our study are unique in the literature in several respects: First, our novel surveys on inflation and wage expectations are designed to be as analogous as possible for firms and employees, thus enabling a direct comparison of the pass-through estimates between the wage bargaining partners. Second, the panel structure of our data allows us to leverage various sources of variation to estimate pass-through and to construct a shift-share instrument for causal identification. Third, the panel covers the majority of the recent high-inflation period that commenced in mid-2021, allowing us to estimate pass-through based on more than two years of data and to compare pass-through across different survey waves. Fourth, and finally, our study is the only one that compares pass-through into expected wage growth with pass-through into ex-post realized wage growth.

In terms of magnitude, our panel estimates of low pass-through for firms and employees are consistent with recent evidence from other countries and across different time periods. For firms, there is only cross-sectional evidence, either from French observational survey data (Savignac et al., 2024) prior to the recent surge in inflation, or from RCTs conducted among firms in Switzerland (Abberger et al., 2024) and the Euro-area (Baumann et al., 2024) at the height of the inflationary shock in late 2022/first half of 2023. Quantitatively, our findings are most comparable to those of Abberger et al. (2024) and Baumann et al. (2024), who report pass-through estimates of between 0.1 and 0.3, and 0.15 and 0.17, respectively. Savignac et al. (2024) document an even lower pass-through of 0.08.

For households, Hajdini et al. (2023) estimate the pass-through from expected inflation to expected total household income to be approximately 0.2 using a one-time survey experiment conducted in early 2022. Jain et al. (2024) present pass-through estimates between 0.15 and 0.20 for repeated cross-sections of Canadian consumers, focusing on a longer sample period between 2014 and early 2022. This is considerably higher than the pass-through for employees in our sample, which ranges from 0.03 to 0.07.

We complement and confirm these patterns with US panel data from the New York Fed's Survey of Consumer Expectations (SCE) in Appendix B.5. For the period between 2013 and 2023, we find a low average pass-through ranging from 0.05 to 0.12, which is very close to our findings. Given the long time span covered by the SCE data, we can confirm that pass-through has been low and remarkably stable during both high and low inflation episodes.

Taken together, these findings suggest that a low pass-through of expected inflation into wage growth is neither a phenomenon limited to the recent period of high inflation nor specific to the German context, and that inflation expectations are only marginally reflected

in expected wage growth, regardless of the general economic conditions, country-specific labor market institutions, or the prevailing inflation rate at the time of the survey.

4. The Role of Wage Rigidity for Pass-through

Inflation expectations should only affect wage growth if wages are rigid and cannot continuously adjust to the state of the economy. Then, standard models of wage setting predict that nominal wages are set to minimize the average distance to the expected real target wage over the duration of the expected wage spell.

While wage rigidities are fundamental for the existence of the pass-through, Werning (2022) shows that the specific type of wage rigidity determines its magnitude. Before evaluating the general implications of wage rigidities for pass-through in this section, it is thus worthwhile to briefly interpret our results so far through the lens of Werning's theoretical considerations.

Within a wage-posting framework in partial equilibrium, Werning (2022) shows that Calvo-type wage rigidities imply a pass-through of 1 for reasonable parameter values, while Taylor pricing results in a pass-through of 1/2.[18] While Calvo pricing is probably an unrealistic assumption for wage setting in Germany, where wages are often determined through regular instances of industry-wide unionized bargaining, our estimates for pass-through are also well below the theoretically plausible values for Taylor pricing.[19]

The essence of this brief discussion is that Werning (2022) provides theoretical guidance for the partial equilibrium empirical analyses conducted in this paper, showing that the magnitude of pass-through can be informative about the type of wage-setting frictions present in the economy. On the empirical side, however, the results in this (and other) papers are not yet conclusive regarding how we should best think about the pass-through of expected inflation into wages within theoretical models of rigid wages.

To make more progress, this section investigates two general implications of wage ridigities for pass-through. First, if wages are rigid, the average pass-through is the product of pass-through along the intensive and extensive margins. Pass-through along the intensive margin arises in our data if agents expect to reset wages within the 12-month forecast horizon for expected wage growth. In this case, theory predicts that the reset wages should reflect expected inflation to some degree, depending on the type of the wage setting friction. Conversely, if

[18] Appendix C.1 illustrates Werning's arguments with Taylor pricing.

[19] Our findings of average pass-through are more consistent with a Sheshinski-Weiss-type menu cost model with additional short-run frictions that allow for adjusting the wage setting frequency only with a lag. Werning shows that in this specific model, pass-through should be between 0 and 1/2. Still, other menu cost models can deliver any pass-through between zero and infinity.

agents do not expect to adjust wages within the next 12 months, pass-through should be zero. This is unless the extensive margin of pass-through changes, meaning that the frequency of wage bargaining reacts to the magnitude of inflation expectations. In this section, we study pass-through along the intensive margin, while Section 5 examines pass-through along the extensive margin along with examining how bargaining power affects pass-through.

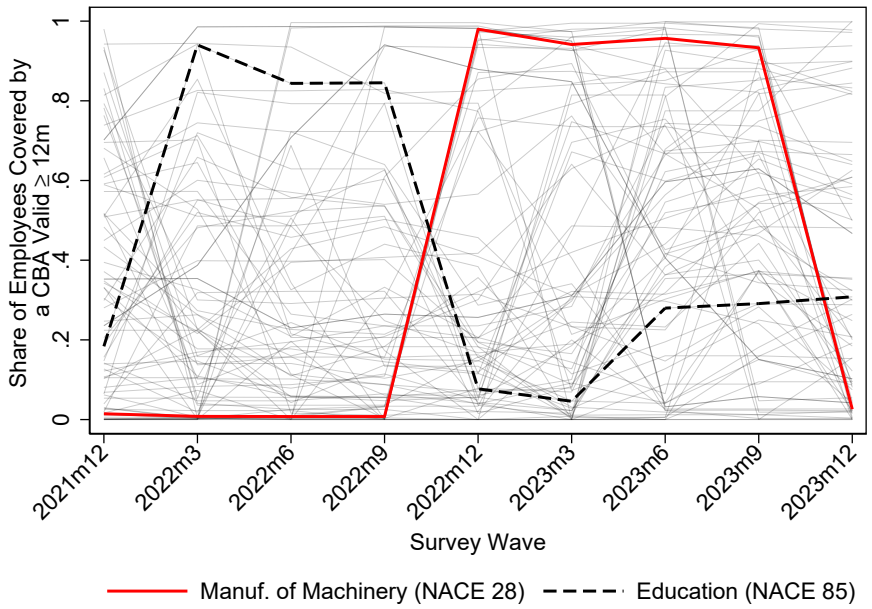
Second, wage rigidities imply that future expected wage growth should be correlated with past inflation accumulated during the previous wage spell. This reflects either past forecast errors at the time of the previous wage adjustments and/or catch-up with inflation if the implied pass-through of expected inflation is below one. In this section, we proxy accumulated inflation during a wage spell by using realized inflation over different time spans and utilize the panel structure of our data to test the role of realized inflation for pass-through into expected wage growth.

4.1. Pass-through at the Intensive Margin of Wage Setting

To investigate the magnitude of pass-through at the intensive margin, i.e., when wage adjustments take place, we utilize exogenous variation in the expiring dates of collective bargaining agreements (CBA) across time and industries. In Germany, CBAs are typically in place for an average of 24 months (Schulten, 2022), resulting in variation across time and industries in whether wage bargaining will occur during the 12-month forecast horizon. If a CBA has expired or will expire within the next 12 months, the parties involved may understand that a significant portion of wage negotiations will take place during this period. Therefore, they may anticipate that some of the expected inflation will lead to increased wage growth. In contrast, firms and employees covered by a CBA that does not expire within the next 12 months should expect less scope for wage adjustments when expecting higher inflation, resulting in lower pass-through.

CBA-based measure for the timing of wage adjustment To evaluate the importance of this channel, we merge the survey data with external information on the timing of collective agreements at the two-digit NACE industry level, as provided by the German Federal Statistical Office (Statistisches Bundesamt, 2021-2023). This data allows us to measure the share of employees covered by collective bargaining in a given industry whose current agreement is valid for at least 12 months after the survey date. Since industries may be governed by multiple CBAs, each applying to different subsets of firms and employees, the measure ranges from 0 to 1. A value of 0 means that all CBAs in the industry will expire and need to be renegotiated within the next 12 months. Conversely, a value of 1 indicates

Figure 4: CBA-based Measure of Short-run Wage Rigidity: Illustration



Notes: The figure illustrates the CBA-based measure of short-run wage rigidity for all 2-digit NACE industries (thin lines), along with two specific examples: the industries "Manufacture of Machinery" (NACE 28, red solid line) and "Education" (NACE 85, black dashed line). The measure captures the share of employment relationships within each industry that will continue to be covered by an existing CBA 12 months after the specific survey date. As industries can be governed by multiple CBAs, each applicable to different subset of firms, the measure ranges from 0 to 1. A value of 0 indicates that all CBAs in the industry will expire and need to be renegotiated within 12 months. Conversely, a value of 1 means that all CBAs will remain valid for 12 months after the survey date.

that all CBAs in the industry will remain valid for at least 12 months following the survey date, implying that the wage (or the wage component defined by a CBA) is likely to remain fixed for at least one year. Hence, this measure captures the degree to which wages are fixed over the 12-months time window of the expected wage growth in our data. For conciseness, we will refer to the CBA coverage share as a measure for the (short-run) wage rigidity in an industry. The extensive margin of wage setting—the degree to which wages are scheduled to be reset in an industry and within the 12-month expectation window—is given by 1 minus the CBA coverage share.

Figure 4 illustrates the CBA-based measure for the short-run wage rigidity for all 2-digit NACE industries over the survey period. The measure varies significantly over time within industries and the timing of these patterns differs across industries. As an example, the red line represents the "Manufacture of Machinery" industry (NACE 28), where the majority of CBA-eligible employees are covered by one of the many CBAs in the "Metal and Electronics

Industry."[20] At the start of our sample period in December 2021, the current CBA in this industry was set to expire by the end of September 2022. Therefore, our measure for the short-run wage rigidity is close to zero during the first four survey waves, meaning that the wage bargaining partners should have expected to reset wages within the next 12 months (they were at the extensive margin of wage setting). In fact, in November 2022 they agreed on a new CBA with a term extending until the end of September 2024. Consequently, during the survey waves between December 2022 and September 2023, almost all CBA-eligible employees in this industry were covered by a CBA that was still in force for at least 12 more months. This share dropped to zero again in the December 2023 wave. While the overall pattern is similar, the exact timing varies significantly across other industries, such as the "Education" industry (NACE 85, black line).

Since the timing of wage negotiations largely depends on the duration of the CBAs initially in place at the beginning of the sample period, the CBA-based measure for the short-run wage rigidity exhibits exogenous variation across and within industries over time. Importantly, agents typically know when wages are scheduled to be reset: In Appendix C.2 we show that the CBA-based measure of short-run wage rigidity is strongly correlated with a survey-based measure that elicits firms' expectations regarding the share of employees that will be subject to wage negotiations or collective bargaining rounds in the next 12 months.

Pass-through is larger when wage adjustments are scheduled We now investigate pass-through of expected inflation into wage growth at the intensive margin, i.e., at a time when wage adjustments are scheduled for the next 12 months. Pass-through at the intensive margin should be larger than average pass-through, because average pass-through includes both employment relationships for which re-setting wages is expected (with potentially positive pass-through along the intensive margin) and those for which wages are fixed in the short term (with a pass-through near zero).

We test this hypothesis and measure pass-through along the intensive margin by adding an interaction term between the CBA-based measure of short-run wage rigidity and the expected inflation to the main empirical model (1).[21] Note that in this empirical specification, the coefficient of *expected inflation* measures pass-through at the intensive margin: This coefficient represents the estimated pass-through when the measure of short-run wage rigidity

[20] As is common in other industries, the "Metal and Electronics Industry" has many different CBAs that apply to specific regions or larger firms. CBAs are typically negotiated in a designated pilot district and then are quickly adopted in the other districts, resulting in synchronized expiration dates. Due to this synchronization of CBAs within industries, the measure for the extensive margin often tends to be either close to zero or one.

[21] We also add the plain measure of short-run wage rigidity as an additional covariate.

equals 0, indicating that wage renegotiations are expected within the next 12 months. The sum of the coefficients of *expected inflation* and the interaction term reflects pass-through when the collective bargaining component of wages is expected to be fixed (that is, if the CBA-based measure of short-run wage rigidity equals 1).

We restrict the samples to firms and employees who report that they are covered by a CBA. Table 3 displays the regression results. In the pooled cross-section of firms in Column 1, pass-through at the intensive margin is estimated to equal 0.167, while it is 0.034—statistically and economically indistinguishable from zero—if the collective bargaining component of wages is fixed for the next year. Moreover, the ratio of pass-through at the intensive margin to average pass-through for the estimation sample is 1.7, indicating that pass-through at the intensive margin is substantially larger than average pass-through, as predicted.[22] With Taylor pricing, this ratio also represents the average length of a wage spell. A spell length of 1.7 years aligns well with the typical collective agreement being valid for about 2 years, with some agreements valid for shorter periods.

Column 2 adds survey wave fixed effects to the specification from Column 1, with the results remaining essentially the same. In Columns 3 and 4, we perform the same empirical analyses as in Columns 1 and 2, but for the sample of CBA-covered employees. Again, pass-through is 1.4 to 1.9 times larger at the intensive margin than average pass-through, and pass-through is 0 if union wages are fixed in the short-run. Consistent with the findings in Section 3, estimated pass-through at the intensive margin for employees is generally lower than for firms.

Appendix C.2 provides several results that support and extend the above evidence. First, in Table C.1, we add firm and employee fixed effects, respectively, to the empirical specifications in Table 3. With pass-through at the intensive margin estimated to be between 1.5 and 2 times larger than average pass-through, these results leave the general conclusions unchanged.

Second, a placebo test presented in Table C.2 shows that pass-through of those firms and employees that are *not* covered by a collective agreement is unaffected by the CBA-based measure of short-run wage rigidity in their industry. This demonstrates the importance of the collective bargaining schedule for the magnitude of pass-through for agents covered by these agreements, and rules out the possibility that the previous results are driven by unobserved industry-level variation.

Third, as in Section 3.2 we use the panel dimension of the data to estimate pass-through at

[22] For conciseness, we do not report the average pass-through for the subsample of firms covered by collective agreements, which is somewhat smaller than average pass-through for all firms in our sample.

Table 3: Pass-through at the Intensive Margin Based on Timing of Collective Bargaining

	Expected Wage Growth next 12 Months			
	Firms		Employees	
	(1)	(2)	(3)	(4)
Expected Inflation next 12m	0.167***	0.212***	0.125***	0.083**
	(0.028)	(0.034)	(0.031)	(0.035)
× Share Valid CBA in 12m	-0.133***	-0.183***	-0.154***	-0.059
	(0.041)	(0.041)	(0.055)	(0.056)
Share Valid CBA in 12m	0.350	0.735***	1.195***	0.267
	(0.266)	(0.263)	(0.397)	(0.407)
Observations	5916	5916	4677	4677
R2	0.034	0.094	0.068	0.130
Ratio Intensive Margin/Average P.T.	1.72	1.71	1.88	1.36
Expectation Controls	yes	yes	yes	yes
Firm-specifics/ Demographics	yes	yes	yes	yes
Firm/Empl. FE	no	no	no	no
Survey Wave FE	no	yes	no	yes

Notes: This table shows the results of regressions of expected wage growth (in percent) on the industry-specific share of valid collective bargaining agreements (CBA) in 12 months, the expected inflation rate, and the interaction term between these two variables. The sample is restricted to firms (Columns 1 and 2) and employees (Columns 3 and 4) whose (typical) employment relationship is covered by collective bargaining. The share of valid CBAs measures short-run wage rigidty and is defined between 0 and 1, where 1 indicates that in the respondent's industry, all CBA-eligible employees are covered by a CBA valid at least 12 months. A measure of 0 means that all CBAs in a given industry expire and are expected to be renegotiated within the next 12 months (the forecast window of expected wage growth). All regressions control for the expected unemployment rate, the respondent's assessment of their firms' current and expected future business conditions, and for the firm- and employee-specific controls listed in Footnote 12, respectively. The metric "Ratio Intensive Margin/Average P.T." refers to the ratio between the estimated pass-through for respondents at the intensive margin (i.e., those with "Share Valid CBA in 12m"= 0) and the average pass-through of all respondents in each specification. Standard errors are clustered at the firm-/employee-level. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

the intensive margin into realized (instead of expected) wage growth. The findings for firms in Table C.3 are very similar to the corresponding results for expected wage growth.

Finally, using an alternative survey-based measure of expected wage negotiations for all firms, Table C.4 confirms that pass-through of expected inflation is substantially larger when firms expect wage adjustments for more than half of their employees, compared with firms expecting fewer adjustments.

4.2. Backward-looking Pass-through

The second implication of wage rigidities in partial equilibrium models of wage setting is that wage growth is predicted to be associated with past inflation. More specifically, at the time of wage setting, wages are predicted to adjust for the component of accumulated inflation over the past wage spell that was not accounted for by forward-looking pass-through at the last instance of wage setting.[23]

To test this hypothesis, we would ideally have access to data on accumulated inflation between the most recent and the next wage adjustments. However, this information is not available in our data. Instead, we use the panel dimension of our data and several proxies to capture accumulated past price changes. One proxy is the average CPI inflation rate, as published by the Federal Statistical Office, over the 3 months preceding the survey.[24] While the official inflation rate is defined as the price change over the past 12 months, we also consider the 3-month average of the accumulated change in the CPI over the past 24 months, as wage negotiations often occur less frequently than annually. Additionally, we rely on respondents' perceptions of the current inflation rate at the time of the survey, which is collected only from employees. By definition, the CPI-based measures are constant across participants at a given point in time, whereas the perceived inflation rate varies among survey respondents.

Table 4 shows the results of including the measures for accumulated inflation in the pooled OLS variant of the empirical specification (1). The results show that past inflation is indeed associated with higher wage growth. Columns 2 and 5 show that the actual CPI inflation rate prevailing at the time of the survey is positively reflected in expected wage growth: In both samples, a 1 percentage point higher realized inflation rate is associated with a 0.09 percentage point increase in expected wage growth over the next 12 months. The relationship between past inflation and expected wage growth is even stronger when considering

[23] See Appendix C.1 for more details about this argument.

[24] We use the average CPI inflation rates over the 3 months preceding the survey because this provides a better approximation of the overall price dynamics compared to using the rate for a specific month. It also smoothes out statistical base effects from the same month in the previous year.

Table 4: Pass-through of Expected and Realized Inflation

	Expected Wage Growth next 12 Months						
	Firms			Employees			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Expected Inflation next 12m	0.154***	0.120***	0.132***	0.073***	0.051***	0.041***	0.024*
	(0.012)	(0.016)	(0.013)	(0.014)	(0.016)	(0.014)	(0.014)
Realized Inflation past 12m		0.092***			0.085***		
		(0.015)			(0.018)		
Realized Inflation past 24m			0.141***			0.115***	
			(0.006)			(0.009)	
Perceived Realized Infl. past 12m							0.122***
							(0.014)
Observations	21412	21412	21412	10976	10976	10976	10930
R2	0.027	0.029	0.052	0.058	0.060	0.076	0.069
Expectation Controls	yes	yes	yes	yes	yes	yes	yes
Firm-specifics/ Demographics	yes	yes	yes	yes	yes	yes	yes
Firm/Empl. FE	no	no	no	no	no	no	no
Survey Wave FE	no	no	no	no	no	no	no

Notes: This table shows the results of regressions of expected wage growth (in percent) on respondents' expected inflation rate for the next 12 months and different measures of realized past inflation: the average (12 month) CPI inflation rate over the 3 months prior to the survey (Columns 2 and 5), the 3 month average accumulated CPI inflation over the past 24 months (Columns 3 and 6), and respondents' perceived current inflation rate (only elicited in the household survey; Column 7). Columns 1 and 4 replicate the baseline specification shown in the top panel of Figure 2. All regressions control for the expected unemployment rate, respondents' assessment of their firms' current and expected future business conditions, and the firm- and employee-specific controls listed in Footnote 12, respectively. Standard errors are clustered at the level of firms or employees, respectively. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

accumulated inflation over longer horizons (see Columns 3 and 6). Notably, for employees, the estimated pass-through of expected inflation decreases when we account for inflation over the past 2 years (compare Columns 4 and 6), whereas estimated pass-through remains almost constant for firms. Finally, Column 7 shows that employees' perceived 1 year inflation realization is strongly reflected in their expected wage growth, with pass-through of expected inflation being the smallest in this empirical specification.

Overall, the results suggest that past inflation has explanatory power beyond its effect on expected inflation—in line with wage rigidities playing a crucial role for the magnitude of the pass-through of (expected) inflation into wages. In addition, the results in this section suggest that, at least for employees, pass-through of realized inflation is perceived to be more important compared to pass-through of expected inflation. As a consequence, wage setting may lag behind inflation, with employees apparently seeking compensation for past (perceived) decreases in real wages rather than for expected future inflation.

5. The Role of Wage Bargaining for Pass-through

We next investigate the role of wage bargaining for pass-through along two separate dimensions. We first link the issues of wage rigidities and bargaining by studying whether the extensive margin of wage setting contributes to the pass-through of expected inflation into wage growth: Employees who expect higher inflation may seek to increase their wages by initiating additional wage bargaining rounds with their employers. Second, we investigate whether the distribution of bargaining power among firms and employees explains heterogeneity in pass-through.

5.1. Expected Inflation and Initiation of Wage Bargaining

Our data allows us to evaluate two possible actions that employees can take to initiate wage negotiations with their employer in response to elevated inflation expectations. First, employees may attempt to initiate bargaining by directly requesting pay rises from their current employer. We investigate this channel by means of an additional survey question in our household survey, asking employees whether or not they plan to ask for an additional pay rise within the next 12 months.[25]

Second, employees may engage in more on-the-job search activities to improve their bargaining position with their current employer (e.g., Cahuc, Postel-Vinay and Robin, 2006), if they expect higher inflation and hence a steeper decline in the real value of their current jobs. In line with this idea, Pilossoph and Ryngaert (2022) find that US employees who anticipate higher inflation are more likely to search for other jobs and experience more job-to-job transitions in the short term.[26] To determine if this pattern is also present in the German data, we utilize information from our household survey on whether employees are currently searching for another job.[27]

The estimation results presented in Panel A of Table 5 do not indicate a strong relationship between expected inflation and employees' attempts to initiate wage negotiations with their employers. However, the estimated effect sizes strongly depend on the empirical specification,

[25] This information is elicited in all survey waves except for the first wave in December 2021.

[26] Pilossoph and Ryngaert (2022) argue that their findings are consistent with a search model in which wages are set in nominal terms and workers' search effort endogenously depends on their inflation expectations.

[27] We construct this indicator variable from a survey question that elicits the number of job applications employees have submitted to other potential employers within the last month. Given that, on average, only 7 percent of respondents report to currently search for a job, we have too little statistical power to investigate the intensity of job search.

Table 5: Initiation of Wage Bargaining and Pass-Through (Employees)

Panel A: Expected Inflation and Initiation of Wage Bargaining				
	1[Asking for a Pay Rise]*100		1[Applying for Another Job]*100	
	(1)	(2)	(3)	(4)
Expected Inflation next 12m	0.367**	-0.147	0.254**	-0.045
	(0.172)	(0.167)	(0.104)	(0.105)
Mean Dep. Variable	25.7	25.7	7.2	7.2
Observations	9503	9503	10976	10976
R2	0.027	0.623	0.036	0.554
Panel B: Bargaining and Pass-through				
	Expected Wage Growth next 12 Months			
	(1)	(2)	(3)	(4)
Exp. Inflation next 12m				
× 1[Asking for a Pay Rise]	0.073**	0.063*		
	(0.030)	(0.033)		
× 1[Not Asking for a Pay Rise]	0.030**	0.008		
	(0.015)	(0.016)		
× 1[Applying for Another Job]			0.216***	0.160**
			(0.057)	(0.066)
× 1[Not Applying for Another Job]			0.053***	0.041***
			(0.013)	(0.012)
1[Asking for a Pay Rise]	0.445*	-0.133		
	(0.238)	(0.280)		
1[Applying for Another Job]			-0.116	-1.012**
			(0.392)	(0.445)
H0: Coefficients Equal: p-value	0.185	0.119	0.005	0.071
Observations	9503	9503	10976	10976
R2	0.066	0.566	0.069	0.538
Expectation Controls	yes	yes	yes	yes
Demographic Controls	yes	no	yes	no
Employee FE	no	yes	no	yes
Survey Wave FE	no	no	no	no

Notes: Panel A shows the results of regressions of employees' attempts to initiate wage negotiations with their employers, either by asking for a pay rise (Columns 1 and 2) or by applying for another job (Columns 3 and 4), on the expected inflation rate for the next 12 months. Panel B reports the results of regressions of expected wage growth (in percent) on the expected inflation rate separately for those employees that do or do not take these actions by applying the respective interaction terms. The p-values for the hypothesis that the coefficients of the interaction terms are identical at the bottom refer to Panel B. All regressions control for the expected unemployment rate and employees' assessment of their firms' current and expected future business conditions. Columns 1 and 3 control for the employee-specific controls listed in Footnote 12. Columns 2 and 4 purge for individual fixed effects. Appendix Table D.1 reports the same set of results with survey fixed effects as additional covariates. Standard errors are clustered at the individual level. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

particularly on whether or not we control for individual fixed effects.[28] Using cross-sectional variation, the estimations deliver positive effects that are statistically significant: *Ceteris paribus*, an employee expecting one percentage point higher inflation is 0.4 percentage points more likely to plan to ask for a pay rise during the next 12 months (Column 1) and 0.3 percentage points more likely to have recently applied for a job at another firm (Column 3). These effects are comparable in magnitude to Pilossoph and Ryngaert (2022)'s cross-sectional evidence for the US. Still, the effect sizes are arguably small in economic terms, given that, on average, roughly 26 percent of employees report to plan to ask for a pay rise and 7 percent report searching for another job.

This small positive association vanishes, however, when we control for individual fixed effects in Columns 2 and 4. The positive effects in Columns 1 and 2 thus seem to be driven solely by general level differences in inflation expectations and/or the likelihood of taking action *between* employees, or by other sources of time-invariant unobserved heterogeneity. As shown in Appendix Table D.2, higher expected inflation is also not associated with a higher likelihood of employees subsequently switching jobs.

Taken together, these results suggest that the role of the extensive margin for pass-through is limited, at least in the German labor market, where collective bargaining plays a more prominent role in wage setting than in the US.

5.2. Bargaining Power and Pass-through

We next explore whether the magnitude of employees' expected pass-through is a function of their willingness to ask for a pay rise or to apply for new jobs. The idea is that these actions may either signal or result in higher bargaining power for employees, which, in turn, might enable them to better offset future expected real wage losses due to inflation.

Generally, the empirical results reported in Panel B of Table 5 are consistent with this hypothesis. Columns 1 and 2 show that employees who plan to ask for a pay rise tend to expect a higher pass-through of their inflation expectations into wage growth. However, while the difference in pass-through is economically significant, it is not statistically significant at conventional levels (with p-values of 0.19 and 0.12, respectively). The difference in pass-through is more pronounced when depending on on-the-job search: When estimated via pooled OLS in Column 3, pass-through is very small for those not searching for a job (0.05), but considerably larger for those who report looking for jobs (0.22). This difference is only

[28] Appendix Table D.1 shows that adding survey wave fixed effects to both specifications does not alter the general results.

slightly less pronounced once we control for individual fixed effects in Column 4.[29]

On the firms' side, we proxy the distribution of bargaining power using two measures of labor market tightness. The first measure relies on a survey question from the regular IBS, in which firms report whether they "lack skilled labor."[30] The second measure is labor market tightness in 2022, defined as the average ratio of vacancies to unemployed individuals in the county where the firm is located (Bundesagentur für Arbeit, 2022a,2). Based on both measures, we sort firms into 3 time-constant groups either conditional on whether they never, sometimes, or always reported a lack of skilled labor, or conditional on the tercile of local labor market tightness.

Table 6 shows that firms' expected pass-through varies strongly with both measures of labor market tightness. Columns 1 and 2 indicate that the magnitude of pass-though is twice as large for firms facing strong difficulties in recruiting or retaining workers compared to those firms that do not, regardless of whether we control for survey wave fixed effects. Columns 3 and 4 show a similar, though slightly less pronounced, pattern when conditioning on local labor market tightness. We conclude that firms' bargaining power (or the lack thereof) seems to be an important determinant of the magnitude of pass-through.

6. Conclusion

In this paper, we make progress in measuring pass-through of expected inflation into wage growth using new panel data for firms and employees. We document that average pass-through is low across a wide range of empirical specifications: For firms, a one percentage point change in expected inflation is associated with a 0.11 to 0.17 percentage point change in wage growth, while for employees pass-through is between 0.03 and 0.07. This holds regardless whether we estimate pass-through into expected or realized wage growth.

We also study the roles of wage rigidity and bargaining in determining the magnitude of pass-through. Specifically, we are the first to measure pass-through at the intensive margin of

[29] One interpretation is that whether or not employees ask for a pay rise or search of a job reflects their bargaining power. An alternative interpretation of these results is that those measures are again a proxy for the likelihood of wage renegotiations taking place, as in Section 4.1. Then, the difference in pass-through reflects that wages are more likely to be reset for those asking for a rise/searching for a job.

[30] The regular IBS elicits information on obstacles to firms' current business activity, including a lack of skilled workers, during the first month of each quarter, which is not concurrent with our questions on expected inflation and wage growth. Still, this information is useful to capture the general degree of slack in the labor market that firms face during the sample period. Firms are sorted into 3 groups: (i) those reporting being constrained by a lack of skilled workers across all survey waves in the sample (16% of firms), (ii) those never reporting labor shortages as an obstacle to business activity (32%), and (iii) those reporting these obstacles in some, but not throughout the entire sample period (52%).

Table 6: Labor Market Tightness and Pass-through (Firms)

	Expected Wage Growth next 12 Months			
	(1)	(2)	(3)	(4)
Expected Inflation next 12m				
× 1[Never Constrained by Lack of Skilled Workers]	0.107***	0.122***		
	(0.020)	(0.023)		
× 1[Sometimes Constrained by Lack of Skilled Workers]	0.157***	0.170***		
	(0.018)	(0.022)		
× 1[Always Constrained by Lack of Skilled Workers]	0.210***	0.220***		
	(0.034)	(0.036)		
× 1[First Tertile Local Labor Market Tightness]			0.124***	0.130***
			(0.020)	(0.023)
× 1[Second Tertile Local Labor Market Tightness]			0.137***	0.147***
			(0.023)	(0.027)
× 1[Third Tertile Local Labor Market Tightness]			0.181***	0.198***
			(0.022)	(0.025)
Observations	21177	21177	21255	21255
R2	0.035	0.068	0.027	0.060
Dummies for Lack of Skilled Labor	yes	yes	no	no
Dummies for Labor Market Tightness Tertiles	no	no	yes	yes
Expectation Controls	yes	yes	yes	yes
Firm-specifics	yes	yes	yes	yes
Firm FE	no	no	no	no
Survey Wave FE	no	yes	no	yes

Notes: This table shows the results of regressions of firms' expected wage growth (in percent) on the expected inflation rate separately for different groups of firms. In Columns 1 and 2, firms are sorted into 3 groups according to how often they report labor shortages to the IBS: those reporting to be constrained by a lack of skilled workers across all survey waves in the sample, those never reporting labor shortages as an obstacle to business activity, and those reporting these obstacles in some waves, but not throughout the entire sample period. In Columns 3 and 4, firms are grouped according to the labor market tightness in the county they are located in, defined as the average ratio of vacancies over the number of unemployed over the course of 2022. Each specification further controls for indicators for the respective groups of labor market tightness, the expected unemployment rate, firms' current and expected future business conditions, and for the firm-specific controls listed in Footnote 12. Columns 2 and 4 purge for survey wave fixed effects. Standard errors are clustered at the firm level. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

wage setting, i.e., when wages are expected to be re-set. Werning (2022) shows theoretically that this statistic, which he calls "overshooting", can vary significantly depending on the model of wage rigidities in place. In this paper, we show that pass-through at the intensive margin is 1.4 to 2 times larger than average pass-through, which matches well with the typical wage setting frequencies predicted by theory. Still, pass-through at the intensive margin is small relative to the theoretical predictions for the most common models of wage rigidities, including Taylor pricing.

The evidence of pass-through being low may mitigate concerns about potential wage-price spirals emanating solely from inflation expectations. However, before this conclusion can be drawn with certainty, our findings need to be confirmed in other empirical settings. Another challenge is to reconcile the finding of low pass-through with theory. Our evidence suggests that bargaining power—and, hence, wage bargaining *per se*—is an important determinant for the magnitude of pass-through. Theoretically, though, it is an open question how inflation expectations affect wage bargaining in the presence of wage rigidities.

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Inflation and Wage Expectations of Firms and Employees: Supplemental Appendices

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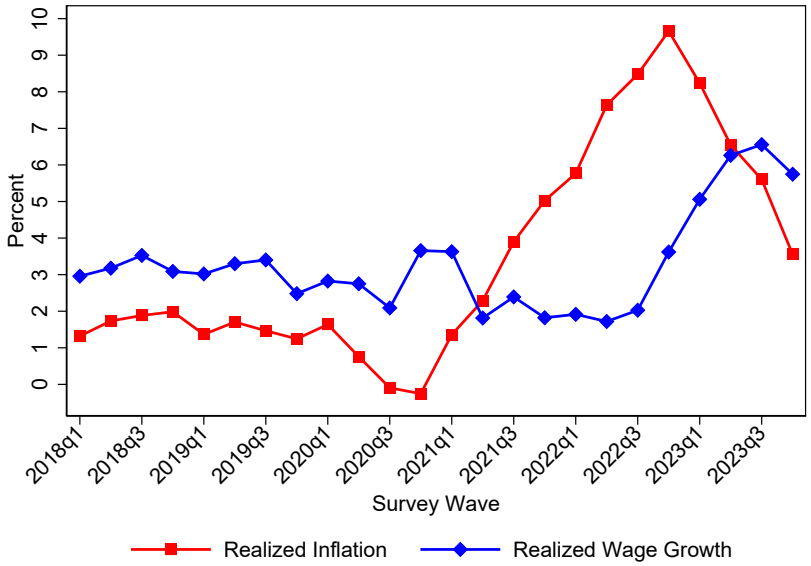
A. Appendix to Section 2

This section provides supplementary material to Section 2 of the main text. Figure A.1 presents aggregate inflation and wage dynamics before and during our sample period. Table A.1 shows summary statistics of the surveys of firms and employees (Table A.1).

Moreover, we include additional material corroborating the high quality of our expectations data, such as a binscatter plot showing the relationship between ex-ante expected and ex-post realized wage growth at the employee and firm levels (Figure A.2) and a comparison of the development of average expected CPI inflation in our surveys over time with mean expectations from the representative Bundesbank Online Panels of Firms (BOP-F) and Households (BOP-HH) (Figure A.3).

Figure A.1: Inflation and Wage Growth in Germany since 2018



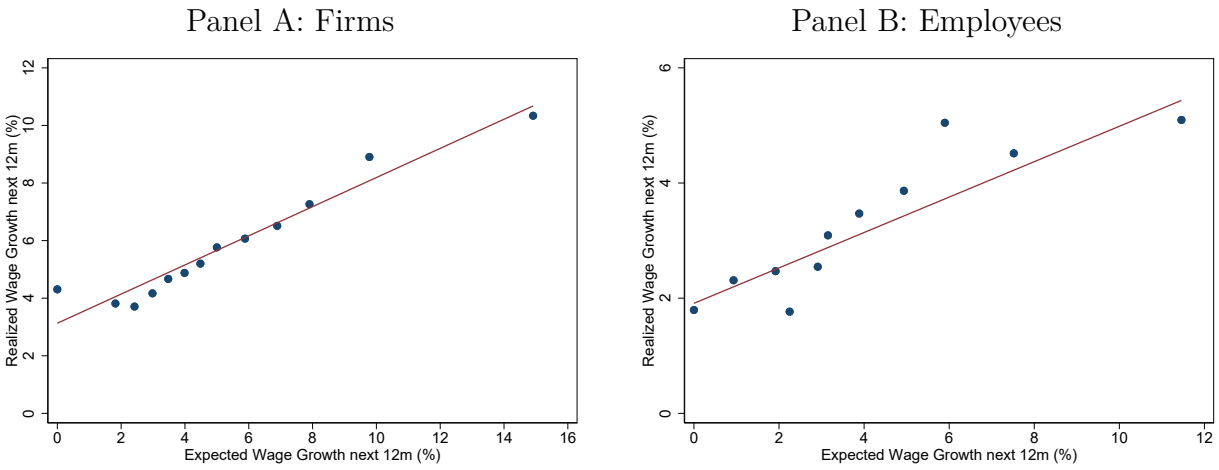
Notes: This figure plots quarterly CPI inflation (red squares) and realized year-over-year wage growth (blue diamonds) in Germany, based on administrative data from the German Federal Statistical Office. The wage series refers to gross wages per employee as reported in the quarterly national accounts data released in February 2024. The data is manually adjusted to account for the impact of short-time work, which reduced both working hours and monthly gross wages, particularly in 2020 and 2021 due to the Covid-19 pandemic.

Table A.1: Summary Statistics of Survey Data

	GSOEP	Survey Samples					
	(1) Mean	(2) Mean	(3) p25	(4) Median	(5) p75	(6) SD	(7) N
Panel A: Firms							
Expected Inflation next 12m		6.18	4.50	6.00	7.90	2.50	21,412
Expected Wage Growth next 12m		4.98	3.00	5.00	6.00	3.09	21,412
Realized Wage Growth over past 12m		5.51	3.00	5.00	7.30	3.54	5,673
Expected Unemployment Rate next 12m		5.74	5.00	5.60	6.20	1.65	21,412
Expected Business Conditions (0-100)		43.62	30.00	47.00	54.00	19.64	21,412
Current Business Conditions (0-100)		50.14	35.00	49.00	67.00	22.85	21,412
Number of Employees		335.36	21.00	52.00	150.00	2015.85	21,412
Export Share		0.16	0.00	0.03	0.25	0.24	10,815
1[High Influence on Decisions in Firm]		0.77	1.00	1.00	1.00	0.42	13,196
1[Covered by Collective Agreement]		0.31	0.00	0.00	1.00	0.46	18,903
Energy Cost Share		5.76	1.20	3.00	7.00	7.55	15,532
1[Reported Lack of Skilled Labor]		0.41	0.00	0.00	1.00	0.49	19,213
Panel B: Employees							
Expected Inflation next 12m		6.96	5.00	6.20	8.50	3.32	10,976
Expected Wage Growth next 12m		2.55	0.00	2.00	4.00	3.09	10,976
Realized Wage Growth over past 12 Months		2.60	0.00	2.00	4.00	3.21	1,655
Expected Unemployment Rate next 12m		6.40	5.00	5.80	7.00	3.18	10,976
Expected Business Conditions (0-100)		62.64	51.00	59.50	77.00	19.04	10,976
Current Business Conditions (0-100)		68.49	51.00	70.00	87.50	21.68	10,976
1[Female]	0.46	0.44	0.00	0.00	1.00	0.50	10,976
Age	44.60	48.84	40.00	50.00	60.00	10.74	10,976
1[Living in Eastern Germany]	0.17	0.18	0.00	0.00	0.00	0.38	10,976
Log(Households Net Income)	8.19	8.01	7.60	8.01	8.36	0.55	10,976
1[At least Highschool]	0.51	0.57	0.00	1.00	1.00	0.50	10,976
1[Employed Full-time]	0.75	0.78	1.00	1.00	1.00	0.41	10,976
1[Covered by Collective Agreement]	0.47	0.46	0.00	0.00	1.00	0.50	10,081
1[High Numeracy]		0.52	0.00	1.00	1.00	0.50	10,976
1[Asking for a Pay Rise]		0.26	0.00	0.00	1.00	0.44	9,503
1[Applying for Another Job]		0.07	0.00	0.00	0.00	0.26	10,976

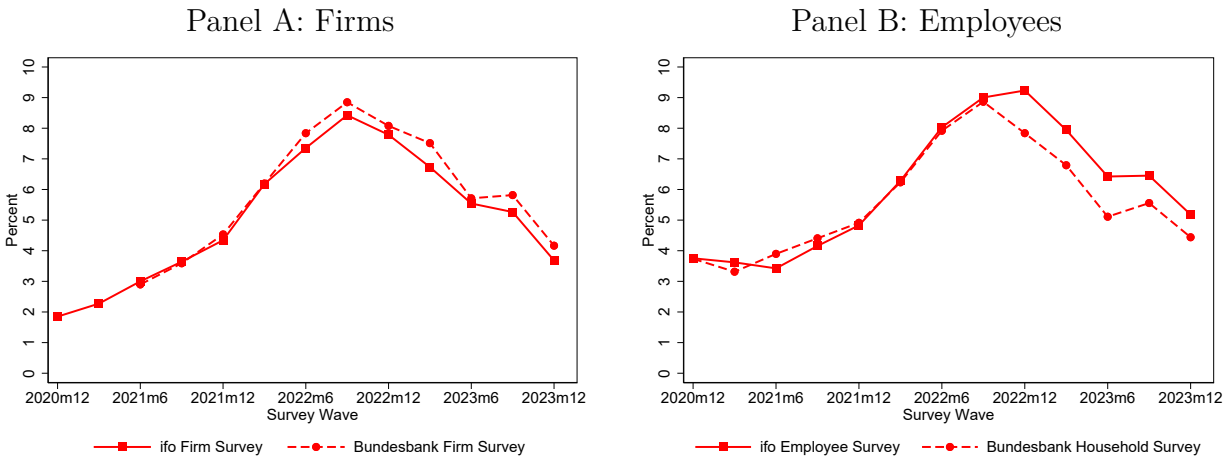
Notes: This table provides summary statistics for the firm sample (Panel A) and the employee sample (Panel B). Column 1 shows population benchmarks from the 2021 wave of the German Socioeconomic Panel, which is representative of the German population. Column 7 indicates for how many observations in our panel dataset (covering the period between December 2021 and December 2023) a particular variable is available, counting repeat respondents multiple times. Appendix E lists all survey questions elicited during our sample period except standard demographics. In addition, we use information from earlier waves of the IBS, i.e., firms' export share from September 2018 and "High influence on decisions in firm" capturing whether respondents stated to personally have "very large influence" (highest category on a 5-point Likert scale) on their firm's decisions regarding investment, production, personnel, or pricing elicited in June 2021.

Figure A.2: Expected and Ex-post Realized Wage Growth



Notes: The figures show, for bins of expected wage growth, the average ex-post realized wage growth over the past 12 months reported in the survey 12 months later. By construction, the sample is restricted to observations referring to wage growth over the same period, i.e., expectations elicited between December 2021 and December 2022 and ex-post realizations reported between December 2022 and December 2023.

Figure A.3: Mean Expected Inflation in Our Surveys Compared to Bundesbank Surveys



Notes: This figure compares the development of average expected CPI inflation (12 months ahead) in Germany in our firm and household surveys over time to the development of average expectations in the representative Bundesbank Online Panels of Firms (BOP-F) and of Households (BOP-HH).

B. Appendix to Section 3

This section collects and describes additional evidence to further substantiate the findings described in Section 3 of the main text.

B.1. Baseline Results

Table B.1: Average Pass-through for All Specifications

	Expected Wage Growth next 12 Months							
	Firms				Employees			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Expected Inflation next 12m	0.154***	0.169***	0.136***	0.106***	0.073***	0.059***	0.051***	0.027*
	(0.012)	(0.018)	(0.012)	(0.017)	(0.014)	(0.016)	(0.013)	(0.017)
Expected Unemployment Rate next 12m	0.008	-0.023	0.042**	0.000	0.025*	0.018	0.051***	0.039**
	(0.021)	(0.021)	(0.020)	(0.021)	(0.014)	(0.014)	(0.015)	(0.015)
Current Business Conditions (z)	0.101***	0.129***	0.116***	0.181***	0.057	0.069	0.005	0.031
	(0.035)	(0.035)	(0.044)	(0.043)	(0.052)	(0.052)	(0.062)	(0.062)
Expected Business Conditions (z)	0.021	0.043	0.042	0.085**	0.371***	0.355***	0.127**	0.099*
	(0.031)	(0.032)	(0.034)	(0.034)	(0.050)	(0.050)	(0.054)	(0.053)
Observations	21412	21412	21412	21412	10976	10976	10976	10976
R2	0.027	0.060	0.468	0.493	0.058	0.080	0.537	0.554
Firm-specifics/ Demographics	yes	yes	no	no	yes	yes	no	no
Firm/Empl. FE	no	no	yes	yes	no	no	yes	yes
Survey Wave FE	no	yes	no	yes	no	yes	no	yes

Notes: This table presents the regression output underlying Figure 2. The dependent variable is expected wage growth over the next 12 months for the sample of firms (Columns 1 through 4) and employees (Columns 5 through 8). Each estimation controls for respondents' expected inflation rate, the expected unemployment rate, and their assessment of their firms' current and expected future business conditions (expressed in standard deviations). Columns 1, 2, 5, and 6 control for the firm- and employee-specific controls listed in Footnote 12, respectively. The regressions further purge for survey wave fixed effects in Columns 2 and 6, for firm/employee fixed effects in Columns 3 and 7, and both fixed effects in Columns 4 and 8. Standard errors are clustered at the level of firms or employees, respectively. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Pass-through into expected wage growth: complete results Table B.1 shows the complete regression output underlying the coefficients plotted in Figure 2 in the main text, along with the coefficient estimates for the time varying determinants of the real wage—the expected unemployment rate as well as how firms assess their own and employees assess their employers current and future business conditions. While the latter results are not at the heart of the paper, they may be of interest to some readers. Here, the estimates indicate that, contrary to theory, more pessimistic expectations about the unemployment rate are not generally associated with lower expected wage growth. For interpreting this result, though, it should be noted that the German unemployment rate exhibited little variation during the

Table B.2: Pass-through of Expected Inflation into Realized Wage Growth (Employees)

	Realized Wage Growth over next 12 Months	
	(1)	(2)
Expected Inflation next 12m	0.024	0.035
	(0.028)	(0.034)
Observations	1655	1655
R2	0.022	0.024
Expectation Controls	yes	yes
Demographics	yes	yes
Empl. FE	no	no
Survey Wave FE	no	yes

Notes: This table shows the regression results of ex-post realized wage growth (in percent) over the past 12 months (lagged by 12 months) on ex-ante expected inflation over the same period for the sample of employees. Realized wage growth is elicited between September 2022 and December 2023, so the sample is restricted to the period between December 2021 (start date of our sample) and December 2022. All regressions control for the expected unemployment rate, employees' assessments on their employers' current and expected future business conditions, and the time-invariant demographics listed in Footnote 12. Standard errors are clustered at the employee level. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

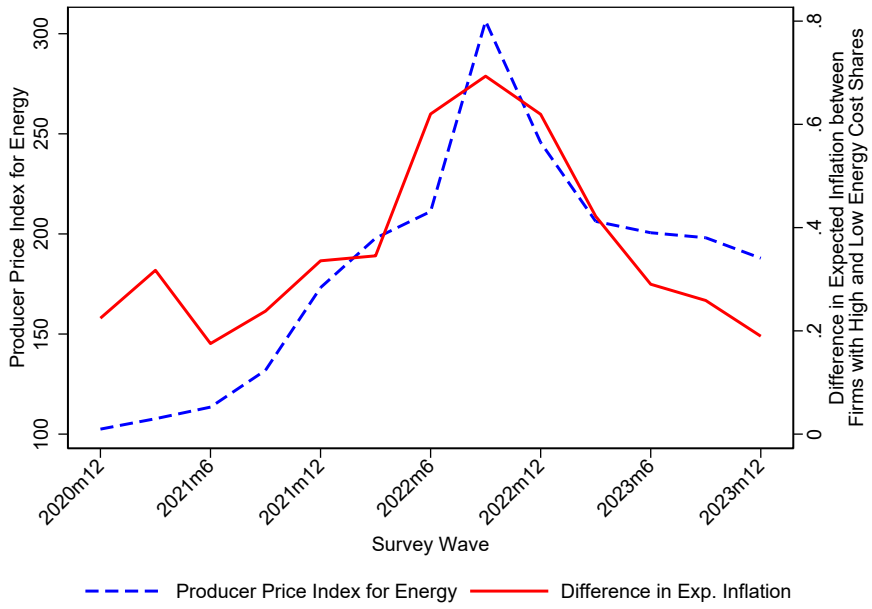
sample period, which is reflected in relatively little variation in the expected unemployment rate. In line with theory, though, respondents who assess their firms' current and expected future business conditions more favorably also expect higher wage growth.

Pass-through into realized wage growth for employees Table B.2 shows the estimates for the pass-through of inflation expectations into realized wage growth for employees. The point estimates of average pass-through are between 0.025 (for pooled OLS) and 0.036 (for the specification with survey wave fixed effects). While these estimates are—most likely due to the much smaller sample size—considerably less precise than the pass-through estimates for expected wage growth in Table B.1, they are still within the same range as the latter findings. Similar to firms, employees' expected pass-through thus seems to closely match the pass-through of expected inflation into realized wage growth, which are both small.

B.2. Causality

Shift-share IV The first stage of the IV specification relates the shift-share instrument $\textit{Energy Cost Share}_i \times \textit{PPI Energy}_t$ for firm i and survey wave t to the expected inflation of firm i at t. Figure B.1 illustrates the time dimension of this association during the

Figure B.1: Shift-Share IV: Illustration of the First Stage



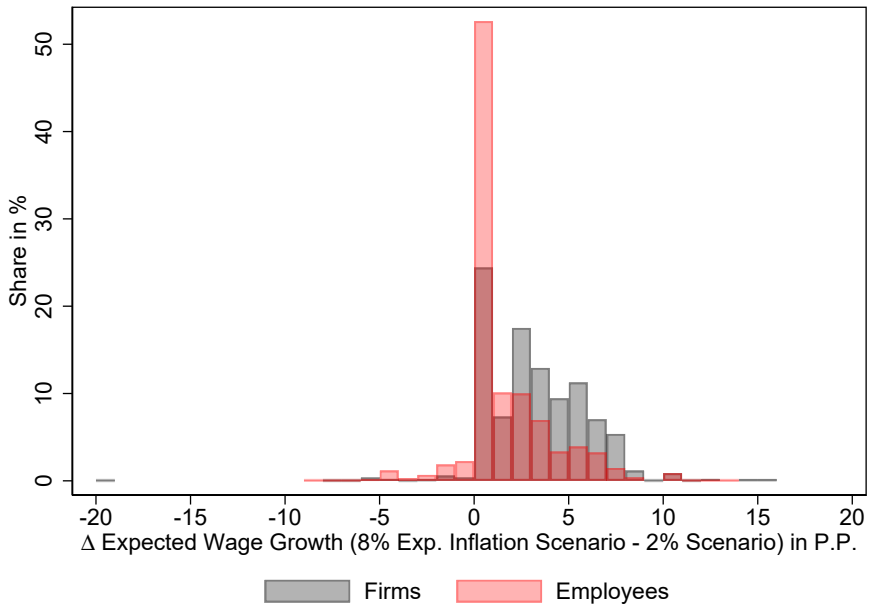
Notes: The figure plots the dynamics of the energy component of the German producer price index (blue dashed line, left axis) and the difference in expected inflation (in percentage points) between firms with energy cost shares (relative to revenues) above and below the median (red solid line, right axis).

sample period by plotting the dynamics of $PPI\ Energy_t$ (with values depicted on the left axis) against the *difference in average expected inflation at t between firms with energy cost shares above and below the median* ($\Delta Expected\ Inflation_t$; values depicted on the right axis). $PPI\ Energy_t$ sharply increased following the Russian attack of Ukraine in February 2022 and the subsequent destruction of the Nord Stream pipelines for natural gas in the summer of 2022. Energy prices peaked in the fall of 2022, followed by a steady decline.

The dynamics of $\Delta Expected\ Inflation_t$ show that more exposed firms initially expected 0.2 percentage points higher inflation on average than firms with low energy cost shares at the beginning of the sample period. This difference increased in parallel with the rise in the $PPI\ Energy_t$; the peaks of both series exactly coincided in the fall of 2022.

Overall, the figure strongly suggests that firms with very energy-intensive production extrapolate more from energy price dynamics when forming inflation expectations compared to less exposed firms. Using this extrapolation as an instrument thus, at the very least, fixes the direction of causation in the main estimates as follows: energy price dynamics $\rightarrow$ inflation expectations $\rightarrow$ wage growth expectations (and not vice versa).

Figure B.2: Hypothetical Inflation Scenarios: Difference in Expected Wage Growth



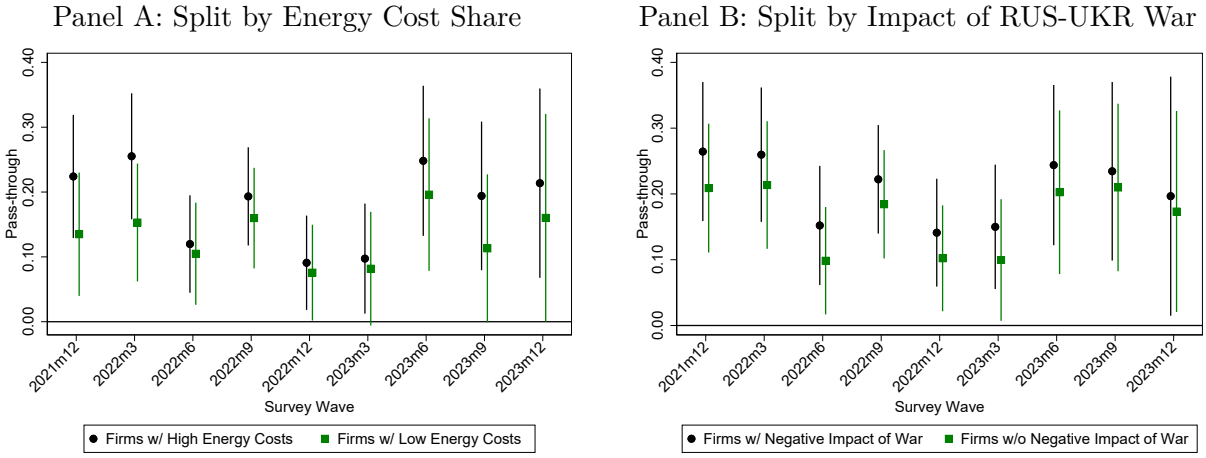
Notes: This figure displays the distribution of differences in firms' (grey) and employees' (red) expected wage growth over the next 12 months between two hypothetical inflation scenarios that were added at the very end of the questionnaires of our December 2023 surveys. Here, we asked a random subset of half (two-thirds) of respondents in the firm (employee) survey to provide wage growth expectations for the next 12 months if they expected consumer prices to increase by 2 percent (scenario 1) and 8 percent (scenario 2) over the same horizon, respectively. Each respondent answered the question under both scenarios.

Hypothetical scenarios Figure B.2 provides a more detailed picture of the effect of the hypothetical inflation expectations on expected wage growth. Specifically, it displays the distribution of the difference in expected wage growth between the hypothetical 2 percent expected inflation scenario and the hypothetical 8 percent expected inflation scenario, both for firms and employees.

Notably, 50 percent of employees and 23 percent of firms anticipate exactly the same wage growth under both scenarios. Hence, many firms and the majority of employees see no link between expected inflation and wage growth. Moreover, the difference in the average change in expected wage growth between firms (2.8 percentage points) and employees (1 percentage point) is mostly due to the difference in the fractions of firms and employees who expect zero wage growth.

B.3. State-dependence of Pass-through: Additional Evidence

Figure B.3: Pass-through by Survey Wave and by Exposure to the Russo-Ukrainian War



Notes: The figure plots the time variation in pass-through of expected inflation into expected wage growth, conditional on two measures of firms' exposure to the Russian invasion of Ukraine and the subsequent increase in energy prices, which are both elicited in the April 2022 wave of the regular IBS: Panel (a) splits firms based on whether their pre-war share of revenues spent on energy is above or below the median, and Panel (b) groups firms according to their assessment of whether or not the war in Ukraine will negatively impact their annual revenues in 2022. The conditional pass-through estimates are obtained by including additional interaction terms in the specification underlying Figure 3 in the main text. Standard errors are clustered at the firm level; confidence intervals are displayed at the 95% level.

Figure 3 in the main text shows the estimated magnitude of pass-through has been already small in economic terms before the Russian invasion of Ukraine, and, if anything, appears to have declined only somewhat further thereafter. This section explores further whether this drop can be plausibly linked to stagflationary views, according to which the war (and the resulting energy shortages) could be interpreted as a supply shock to the European economy, leading to real wage losses, and, consequently, low expected pass-through.

Specifically, we investigate whether pass-through varies among firms based on their exposure to the shock of the Russo-Ukrainian war. The April 2022 wave of the regular ifo Business Survey included two questions that measure firm-specific exposure to the shock. Firms reported both their pre-war share of energy costs relative to revenue (which we also use for constructing the shift-share instrument in Section 3.3) as well as their assessment of whether or not their revenues in 2022 would be negatively affected by the war.

Panel A of Figure B.3 displays the estimated pass-through across survey waves conditional on whether firms' pre-war energy cost shares were above or below the median, and Panel B plots these estimates conditional on whether or not firms expected a negative effect of the

war on revenues. The hypothesis that pass-through is independent of firms' exposure to the Russo-Ukraine war cannot be rejected for either measure across all survey waves. In terms of magnitudes, we estimate higher pass-through for firms with greater exposure to the shock throughout. However, these differences in pass-through are economically meaningful (but statistically insignificant) at best in the first and last two quarters of Panel A, where more exposed firms (as measured by the energy cost share) expect pass-through to be up to 0.1 percentage points higher than less exposed firms. We conclude that these findings confirm the assessment in Section 3.4 of the main text, suggesting that potential stagflationary views are unlikely to be the major explanation for the generally low estimates of pass-through from expected inflation to wage growth.

B.4. Additional Robustness Checks: Tables and Figures

This section entails a detailed description of the additional robustness checks mentioned in Section 3.5 of the main text.

Pass-through of medium-term inflation expectations We test whether pass-through of expected inflation into wage growth is larger than in our baseline results in Table B.1 overall when allowing for additional pass-through of medium-run inflation expectations (3 or 5 years ahead) in addition to short-run (12 months ahead) inflation expectations. The 3-year ahead inflation expectations refer to the expected one-year inflation rate in 3 years, i.e., between 24 and 36 months from the time of the survey. These expectations were elicited in the survey waves between June 2023 and December 2023 from both firms and employees. The 5-year ahead inflation expectations refer to the anticipated one-year inflation rate in 5 years and were elicited in the survey waves between June 2022 and March 2023 for employees, and in the two survey waves of June 2022 and December 2022 for firms. To facilitate readability and increase the sample size, we combine the two measures of medium-run inflation expectations in a single variable that takes the value of either the 3-year or 5-year ahead inflation expectations, depending on which measure is available in the respective survey wave.

Table B.3 shows the results of adding the medium-run inflation expectations to the main specifications. We focus on the specifications that identify pass-through via cross-sectional variation in inflation expectations because the varying forecast horizons of the medium-term expectations complicate the interpretation of time variation in this variable. In Column 2, we estimate pass-through using the pooled OLS specification for firms, including medium-term inflation expectations. Column 6 presents the corresponding results for employees. In both cases, pass-through of medium-term inflation expectations is economically and statistically

Table B.3: (No) Pass-through of Medium-term Inflation Expectations

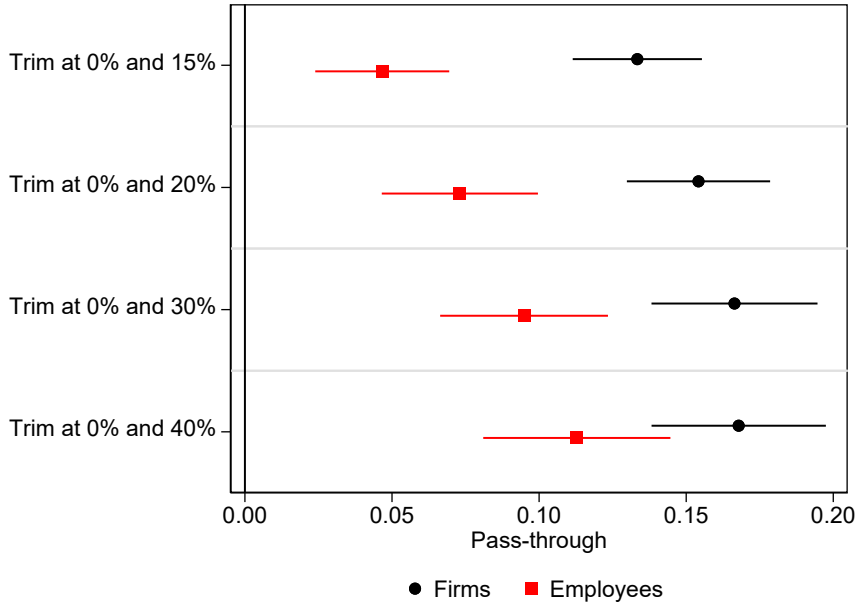
	Expected Wage Growth next 12 Months							
	Firms				Employees			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Expected Inflation next 12m	0.061***	0.065***	0.137***	0.147***	0.018	0.014	0.048***	0.049**
	(0.016)	(0.016)	(0.023)	(0.022)	(0.015)	(0.016)	(0.018)	(0.019)
Expected Inflation 3y/5y ahead		-0.008		-0.015		0.007		-0.002
		(0.016)		(0.016)		(0.015)		(0.016)
Observations	11514	11514	11514	11514	7637	7637	7637	7637
R2	0.015	0.015	0.028	0.028	0.059	0.059	0.065	0.065
Expectation Controls	yes	yes	yes	yes	yes	yes	yes	yes
Firm-specifics/ Demographics	yes	yes	yes	yes	yes	yes	yes	yes
Firm/Empl. FE	no	no	no	no	no	no	no	no
Survey Wave FE	no	no	yes	yes	no	no	yes	yes

Notes: This table shows the regression results of expected wage growth over the next 12 months on respondents' expected inflation rate over the next 12 months, as well as their inflation expectations over the medium term. The 5-year ahead inflation expectations were elicited in the June 2022 and December 2022 waves among firms, and in the four waves between June 2022 and March 2023 among employees. In both samples, 3-year ahead inflation expectations were elicited in the 3 waves between June 2023 and December 2023. The regression sample is restricted to observations for which one of these medium-term inflation expectations is available. Each estimation further controls for the expected unemployment rate, their assessment of their firms' current and expected future business conditions, and for the firm- and employee-specific controls listed in Footnote 12. The regressions further purge for survey wave fixed effects in Columns 3, 4, 7, and 8. Standard errors are clustered at the level of firms or employees, respectively. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

indistinguishable from zero. For comparison, Columns 1 and 5 show the results from the standard specification (without the inclusion of medium-term inflation) but using the same sample of observations. The results indicate that the pass-through estimate for short-run inflation is unaffected by the inclusion of medium-term expectations. The same is true for the specification with survey wave fixed effects displayed in Columns 3 and 4 for firms and in Columns 7 and 8 for employees.

Note that this result can be interpreted as a test of a theoretical prediction by Werning (2022), who notes that pass-through of inflation expectations for a given horizon h should be zero if the mass of today's wage spells that are expected to be renegotiated after h equals zero (meaning that the forecast horizon is longer than the expected period until all current wage spells are renegotiated). In our data, this would imply that the current wage spells of our respondents last up to 2-3 years at most. This is likely true in the German context, where a large share of wage contracts are directly or indirectly adjusted through collective bargaining agreements (CBAs), which typically take place every two years or less, and where wages of workers not covered by CBAs are usually adjusted even more frequently.

Figure B.4: Average Pass-through for Different Trimming Parameters



Notes: The figure plots the coefficients for the effect of expected inflation over the next 12 months on expected wage growth over the same time horizon, as estimated using the pooled OLS specification (top row of Figure 2), but for different samples. These samples are defined based on varying the upper bound for trimming the expectations variables (expected inflation, expected wage growth, expected unemployment); see Section 2.2 for details. For comparison, the second row shows the estimates for the baseline sample, which trims the expectations variables at 0% and 20%. Each estimation controls for the expected unemployment rate, their assessment of their firms' current and expected future business conditions, and for the firm- and employee-specific controls listed in Footnote 12. Standard errors are clustered at the level of firms or employees, respectively. Confidence intervals are displayed at the 95% level.

Table B.4: Average Pass-through, Reweighted by Industry

	Expected Wage Growth next 12 Months							
	Firms (Weights: Employees' Ind. Distribution)				Employees (Weights: Firms' Ind. Distribution)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Expected Inflation next 12m	0.184***	0.209***	0.141***	0.115***	0.057**	0.027	0.055**	0.014
	(0.023)	(0.029)	(0.019)	(0.024)	(0.024)	(0.031)	(0.024)	(0.032)
Observations	20861	20861	20861	20861	5867	5867	5867	5867
R2	0.049	0.078	0.510	0.534	0.070	0.101	0.544	0.567
Expectation controls	yes	yes	yes	yes	yes	yes	yes	yes
Firm-specifics/ Demographics	yes	yes	no	no	yes	yes	no	no
Firm/Empl. FE	no	no	yes	yes	no	no	yes	yes
Survey Wave FE	no	yes	no	yes	no	yes	no	yes

Notes: This table reports pass-through estimates for the same empirical specifications as in the baseline results of Table B.1, with two modifications: The firm and employee samples consist of all two-digit industry codes which overlap between the two samples (NACE Rev. 2 codes between 10 and 82). Furthermore, the firm sample in Columns 1 to 4 is reweighted to mirror the industry composition of employees in Table B.1, while the employee sample in Columns 5 to 8 is reweighted to mimic the industry composition of firms in Table B.1.

Robustness to selection of trimming parameters We also verify that the main conclusions are robust to the choice of trimming parameters. In the baseline specification, we exclude observations if any of the three expectation variables (expected inflation, expected wage growth, expected unemployment rate) fall outside of the interval between 0 and 20 percent. This ensures that our results are not driven by agents that provide implausible survey replies.

Figure B.4 shows the pass-through estimates of the pooled OLS specification with different trimming parameters. Generally, less restrictive trimming leads to a slight increase in estimated pass-through, particularly for employees. Still, even for the most lenient choice of trimming parameters (interval $[0\%, 40\%]$), the pass-through for employees is relatively small at 0.11, and still well below the estimate for firms, which is 0.17. These estimates remain economically close to the baseline estimates (trimming interval $[0\%, 20\%]$) of 0.07 and 0.15, respectively.

Robustness to industry composition Finally, we check whether the persistent finding that pass-through is larger for firms than for employees can be explained by differences in industry composition between the firm and employee samples. To this end, we restrict our analysis to firms and employees with industry affiliation within the common support of industries (2-digit industries between 10 and 82 of the NACE Rev. 2 industry classification). We then reweight the firm sample to mimic the industry distribution of the employee sample, and vice versa. For the reweighted samples, we estimate pass-through using the baseline

empirical specifications shown in Figure 2 and Table B.1.

Table B.4 presents the estimated pass-through for the reweighted firm and employee samples. In general, estimated pass-through for the reweighted firm sample, shown in Columns 1 to 4, is very close to the corresponding baseline results in Table B.1, with the maximum difference between pass-through coefficients being 0.04 (in the specification with survey wave fixed effects in Column 2). Similarly, the pass-through estimates for the reweighted employee sample, displayed in Columns 5 to 8 of Table B.4, closely match the baseline estimates in Table B.1. We conclude that the observed differences in pass-through between firms and employees are not attributable to the different industry compositions of the firm and employee samples.

B.5. External Validity: Pass-through of Expected Inflation among US Households

To assess the external validity of our findings in a different setting, we examine how inflation expectations are reflected in wage expectations using household panel data from the US.

Data We leverage the New York Fed's Survey of Consumer Expectations (SCE), a high-quality monthly panel dataset of the US population that is widely used in economics research (see Armantier, Topa, van der Klaauw and Zafar, 2017, for an overview). Similar to our surveys, the SCE comprises comprehensive data on respondents' expectations of inflation over the next 12 months, as well as their expected growth in earnings in their current position.[1] The sample period spans from June 2013 to August 2023, encompassing the most recent available panel wave at the time of writing. Analogous to the analysis based on our German survey data, we restrict the sample to employed respondents who participated in the survey at least twice and trim inflation and wage growth expectations at values of 0% and 20%. Our final sample comprises an average of approximately 580 employees per month.

Results Columns 1 to 4 of Table B.5 estimate the average pass-through of expected inflation to earnings growth for the entire sample period, analogous to our analysis of German employees. We control for a set of usual demographic variables as well as the expected job loss probability, the expected job finding rate in case of job loss, and the expected probability of an increase in the aggregate unemployment rate. The results corroborate the patterns

[1] The SCE has a rotating panel structure: every month, a set of new respondents enter the survey and stay in the panel for a maximum of 12 months.

Table B.5: Average Pass-through of Expected Inflation: Evidence from the US (SCE)

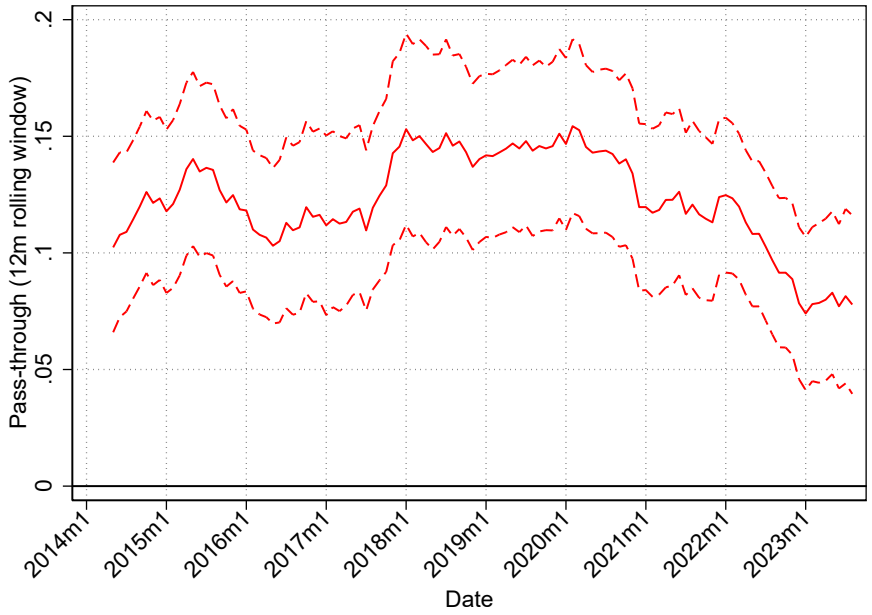
	Expected Earnings Growth next 12m							
	Full Sample since 2013				Sample 2021m12-2023m8			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Expected Inflation next 12m	0.124***	0.121***	0.057***	0.052***	0.086***	0.088***	0.056***	0.054***
	(0.006)	(0.006)	(0.005)	(0.005)	(0.014)	(0.014)	(0.012)	(0.013)
Observations	70486	70486	70486	70486	11610	11610	11610	11610
R2	0.057	0.060	0.631	0.633	0.057	0.058	0.658	0.659
Expectation Controls	yes	yes	yes	yes	yes	yes	yes	yes
Demographics	yes	yes	no	no	yes	yes	no	no
Empl. FE	no	no	yes	yes	no	no	yes	yes
Survey Wave FE	no	yes	no	yes	no	yes	no	yes

Notes: This table replicates the regression results of the German data using the New York Fed's Survey of Consumer Expectations. The dependent variable is US employees' expected earnings growth over the next 12 months elicited in the survey waves between June 2013 to August 2023 in Columns 1 to 4 and between December 2021 and August 2023 in Columns 5 to 8. Each estimation controls for respondents' expected inflation, the expected job loss probability, the expected job finding rate in case of job loss, and the expected probability of an increase in the unemployment rate. Columns 1, 2, 5, and 6 control for demographic controls listed in Footnote 12. The regressions purge survey wave fixed effects in Columns 2 and 6, at the employee fixed effects in Columns 3 and 7, and for both fixed effects in Columns 4 and 8. Standard errors are clustered at the employee level. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

observed in Germany with US data, documenting comparably low estimates of pass-through, which range between 0.05 and 0.12 depending on the dimension of fixed effects applied in the estimation. Restricting the sample period to commence in December 2021, the start date of our German sample, yields slightly smaller, yet not substantially different estimates, as documented in Columns 5 to 8 of Table B.5.

Notably, the estimated magnitude of pass-through exhibits remarkable stability over time. Figure B.5 illustrates the pass-through coefficients estimated on rolling 12-month windows over time. The degree of pass-through varies only between 0.08 and 0.15 over the entire sample, indicating that a low pass-through of expected inflation is not a phenomenon exclusive to the recent period of high inflation. Instead, it suggests that inflation expectations are only marginally reflected in expected wage growth even during periods of low inflation.

Figure B.5: Pass-through of Expected Inflation among US Employees over Time (SCE)



Notes: The figure depicts the pass-through coefficient of expected inflation into 12-month-ahead earnings growth expectations among US employees (SCE), estimated using rolling 12-month windows over time. The solid line represents the estimated coefficient, while the dashed lines display confidence intervals at the 95%-level. As the survey data commenced in June 2013, the rolling window estimates are available from May 2014 onwards. The regressions further control for the expected job loss probability, the expected job finding rate in the event of job loss, the expected probability of an increase in the aggregate unemployment rate, and demographic controls listed in Footnote 12. Standard errors are clustered at the level of employees.

C. Appendix to Section 4

C.1. Wage Rigidities and Pass-through: Theoretical Considerations

This section provides a brief description of the arguments in Werning (2022) for the case of Taylor pricing. Werning establishes the quantitatively plausible pass-through of expected inflation into aggregate (price or wage) inflation for an exogenous shock to expected inflation in a partial equilibrium framework (or, in his terminology, "temporal equilibrium"). "Temporal equilibrium" means that inflation expectations do not need to be consistent with the implied future inflation and, thus, future real marginal costs. Prices (or wages) are set via price (or wage) posting, and the fundamentals determining real prices are assumed to be constant. These assumptions allow Werning to focus on how shocks to inflation expectations affect inflation for different models of price or wage rigidities (most prominently Calvo and Taylor pricing).

We now present a simplified version of Werning's model to illustrate his argument. Assume that wages are posted (e.g., by firms or by unions), and that, at time t, the optimal *log real wage* is determined by some function of fundamentals a_t, $f(a_t)$. Further, we assume that the influence of the price level and the fundamentals a_t on the *frictionless log nominal wage* w_t^* is additive separable. Then, the growth rate of the frictionless nominal wage is given by the sum of inflation π_t and the effect of changes in fundamentals:

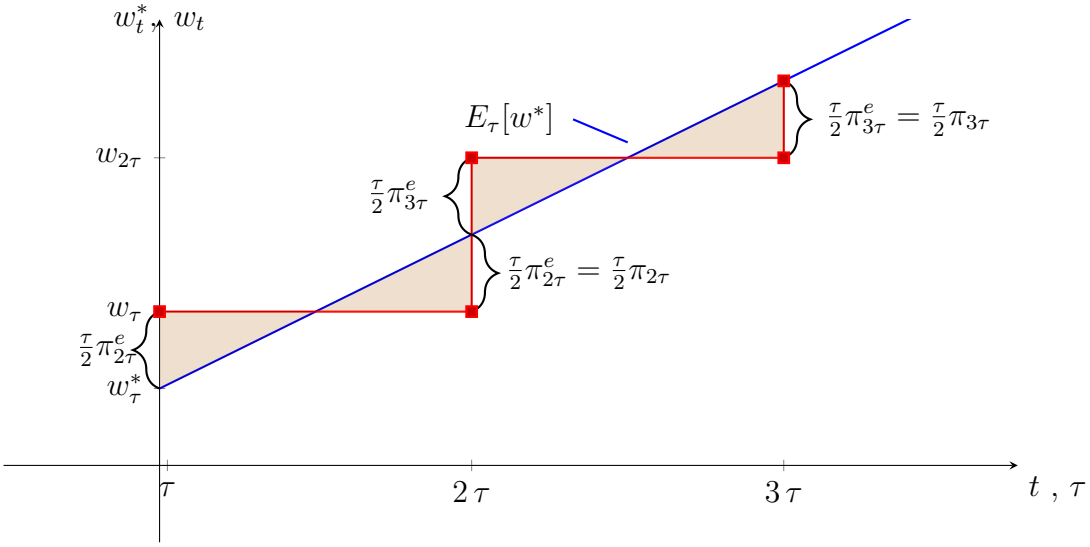
$$w_t^* - w_{t-1}^* = \pi_t + f(a_t) - f(a_{t-1}).$$

For constant fundamentals this directly implies that the frictionless nominal wage grows with inflation.

The presence of wage rigidities means that the observed nominal wages w_t cannot be reset every period. Instead, we will assume here that nominal wages can only be adjusted every τ periods, i.e., Taylor pricing with wage spells of length τ. Then, the wage w_t set at $t \in \{0, \tau, 2\tau, ...\}$ will take into account expected inflation π_t^e of the wage-setting agent in order to minimize the average distance between the evolving target wage w^* and the fixed wage w_t.

The specific way how π_t^e influences w_t depends, in general, on the agent's objective function. Here, we will assume that the wage setting agent minimizes a quadratic loss function around the target wage w_t^* in continuous time with no discounting. If fundamentals a_t and expected

Figure C.1: Pass-through with Taylor Pricing: Illustration



inflation π_t^e are expected to be constant for $t \in [0, \tau]$, the objective function is given by

$$\min_w \int_0^\tau (w_t^* - w)^2 \, dt = \min_w \int_0^\tau ((\pi_0^e t + w_0^*) - w)^2 \, dt.$$

The solution to this problem delivers wage growth of

$$w - w_0^* = \frac{\tau}{2}\pi_0^e.$$

Since at $t = 0$, the optimal wage w_0^* can adjust to past realized inflation, *pass-through at the intensive margin*—i.e., for wages that can be re-set at $t = 0$, equals $\tau/2$.

Assuming that at each instance $1/\tau$ agents can re-set their wage, *average pass-through* is given by $1/2$.

Figure C.1 illustrates this argument. The increasing linear function represents the expected target nominal wage $E_0[w_t^*]$ when expected inflation π_0^e is constant. The jumps represent the fixed nominal wages w_t that are re-set every τ periods with intensive-margin pass-through of $\tau/2$, thereby minimizing the average distance to the flexible target nominal wage.

In addition to the magnitude of pass-through at the intensive margin, Figure C.1 reveals two additional predictions following from wage setting in the presence of wage rigidities:

1. At each instance when wages can be re-set (at $t = \tau, t = 2\tau$, etc.), wages "catch-up" to the target wage w_t^*. The magnitude of "catch-up" is a function of the accumulated inflation between the last and the current instance of wage setting. In the figure, we assume that expectations are correct, so that past inflation enters wages as the difference

of accumulated inflation and the intensive margin pass-through: $\tau\,\pi_\tau - \tau/2\,\pi_0^e = \tau/2\,\pi_\tau$. Obviously, if expectations turn out to be incorrect, "catch-up" will be a function of the forecast error $\pi_\tau - \pi_0^e$. It is easy to see that this general argument is true for virtually any model of wage rigidity. Section 4.2 in the main text provides evidence for this prediction.

2. With Taylor pricing, only short-run inflation expectations affect wage setting: Inflation expectations with a forecast horizon greater than τ are irrelevant, because agents know that they can re-set wages in at most τ periods. The magnitude of the future wage reset depends on the *future* inflation expectations with a forecast horizon of up to τ periods. We mention this fact in Footnote 17 and provide evidence for this prediction in Appendix Section B.4.

   Note, however, that long-run inflation expectations are only irrelevant if agents know the maximum duration of their current wage spell. This is the case for Taylor pricing considered here, but not for Calvo pricing, where there is a positive probability attachted to spells of any duration.

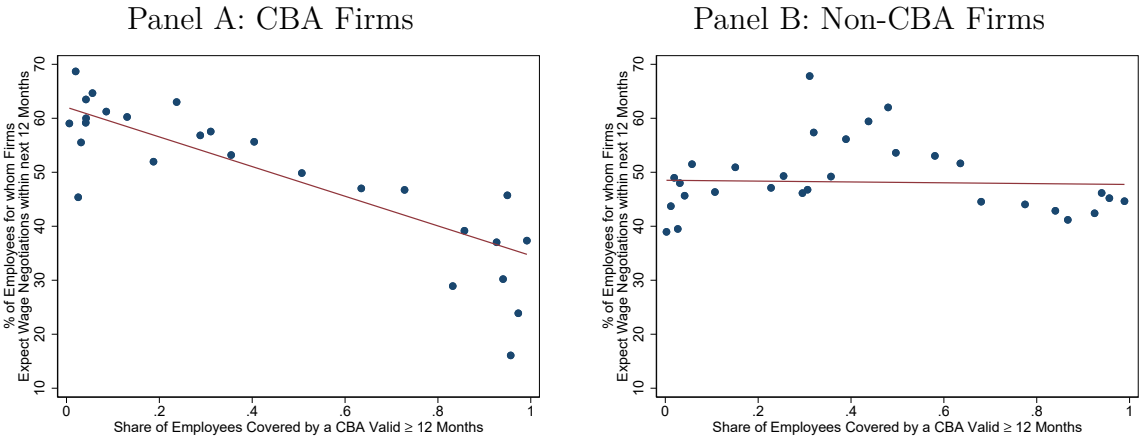
Werning (2022) derives pass-through for other types of wage rigidities following the same general idea as above. Two results are worth mentioning for our empirical context: First, for Calvo pricing Werning predicts an intensive-margin pass-through of greater than 1 and average pass-through of 1. Second, with no discounting, pass-through may plausibly be smaller than 1/2 (as derived for Taylor pricing) only for models in which agents can adjust the wage setting frequency (e.g., menu cost models). See Werning's paper for details.

C.2. Pass-through at the Intensive Margin of Wage Setting: Additional Analyses

Validation of the CBA-based measure for the timing of wage adjustments We validate the industry-level CBA-based measure for short-run wage rigidity introduced in Section 4.1 using a survey-based measure for the expected intensity of firms' future wage negotiations. Specifically, starting in March 2023 we elicited firms' expectations regarding the share of employees who will be subject to wage negotiations or collective bargaining rounds in the next 12 months.

Comparing the CBA-based measure of wage rigidity with the survey-based measure for the subsample of firms that are covered by collective bargaining, Panel A of Figure C.2 shows that there is a strong negative correlation of both measures. This should be expected, because the CBA-based measure captures the share of employees covered by a CBA valid for more than

Figure C.2: Coverage of CBAs and Survey-based Measure of Wage Negotiations



Notes: The figures show, for bins of the industry-level CBA-based measure for wage rigidity introduced in Section 4.1, the average of a survey-based measure that elicits firms' expected share of employees who will be subject to wage negotiations or collective bargaining rounds in the next 12 months. The sample period is restricted to those survey waves for which the latter measure is available (March 2023 to December 2023). Panel A restricts the sample to firms that indicate that their "typical" employee is covered by a CBA, Panel B to those not covered by a CBA.

12 months—which do not have to be renegotiated within the next year—, while the survey-based measure captures the share of employees subject to wage negotiations within the next year. Panel B shows the same relationship for the subsample of firms that are not covered by collective bargaining and whose wage bargaining intensity should thus be independent of the coverage duration of CBAs in their industries. For these firms, the figure reassuringly shows that there is no correlation between the CBA-based measure of wage rigidity and the survey-based wage bargaining intensity. Overall, the evidence shown in Figure C.2 validates that the industry-level variation in expiring dates of CBAs indeed reflects relevant variation in the intensity of wage negotiations that is known and anticipated by the firms.

Additional results We now present supporting evidence for the results in Section 4.1. Table C.1 shows the estimates of regressions that add fixed effects at the firm or employee level to the specifications presented in Table 3 in the main paper. For firms and employees covered by collective bargaining, pass-through at the intensive margin (when the CBA-based measure of short-run wage rigidity equals 0) is between 1.5 and 2 times larger than average pass-through, matching the respective ratios in the main text. Moreover, if the collective bargaining component of wages is fixed for the next year—meaning that the CBA coverage share equals 1—pass-through is close to zero in all specifications and for firms and employees alike.

Table C.1: Pass-through at the Intensive Margin Based on Timing of Collective Bargaining: Additional Specifications

	Expected Wage Growth next 12 Months			
	Firms		Employees	
	(1)	(2)	(3)	(4)
Expected Inflation next 12m	0.097***	0.113***	0.085***	0.037
	(0.032)	(0.038)	(0.028)	(0.035)
× Share Valid CBA in 12m	-0.053	-0.092*	-0.107**	-0.024
	(0.044)	(0.047)	(0.050)	(0.051)
Share Valid CBA in 12m	-0.023	0.298	1.035***	0.221
	(0.289)	(0.296)	(0.374)	(0.388)
Observations	5916	5916	4677	4677
R2	0.412	0.468	0.510	0.554
Ratio Intensive Margin/Average P.T.	1.55	1.67	1.99	1.47
Expectation Controls	yes	yes	yes	yes
Firm-specifics/ Demographics	no	no	no	no
Firm/Empl. FE	yes	yes	yes	yes
Survey Wave FE	no	yes	no	yes

This table shows the results of the same regressions as Table 3 in the main text, but with firm/employee fixed effects as additional control variables. The sample is restricted to firms (Columns 1 and 2) and employees (Columns 3 and 4) whose (typical) employment relationship is covered by collective bargaining. The metric "Ratio Intensive Margin/Average P.T." refers to the ratio between estimated pass-through for respondents at the intensive margin, i.e., those with "Share Valid CBA in 12m"= 0, and average pass-through of all respondents in each specification. Standard errors are clustered at the firm-/employee-level. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C.2: Pass-through at the Intensive Margin Based on Timing of Collective Bargaining: Placebo

	Expected Wage Growth next 12 Months			
	Firms		Employees	
	(1)	(2)	(3)	(4)
Expected Inflation next 12m	0.165***	0.172***	0.077***	0.050
	(0.021)	(0.028)	(0.028)	(0.031)
× Share Valid CBA in 12m	0.086*	0.073	-0.008	0.015
	(0.047)	(0.048)	(0.063)	(0.064)
Share Valid CBA in 12m	-0.500*	-0.503*	0.227	-0.053
	(0.287)	(0.292)	(0.430)	(0.434)
Observations	12987	12987	5404	5404
R2	0.035	0.061	0.054	0.063
Expectation Controls	yes	yes	yes	yes
Firm-specifics/ Demographics	yes	yes	yes	yes
Firm/Empl. FE	no	no	no	no
Survey Wave FE	no	yes	no	yes

Notes: This table shows the results of regressions of expected wage growth (in percent) on the share of valid collective bargaining agreements (CBA) in 12 months in the firm's 2-digit industry, the expected inflation rate, and the interaction term of these two variables. In contrast to Table 3, the sample is restricted to firms (Columns 1 and 2) and employees (Columns 3 and 4) whose (typical) employment relationship is *not* covered by a CBA. The share of valid CBAs is defined between 0 and 1, where 0 means that all CBAs in a given industry expire and have to be renegotiated within the 12 month forecast horizon, while 1 indicates that all CBA eligible employees are still covered by a valid CBA in 12 months. All regressions control for the expected unemployment rate and the respondent's assessment of their firms' current and expected future business conditions, and for the firm- and employee-specific controls listed in Footnote 12, respectively. Columns 2 and 4 purge for survey wave fixed effects. The metric "Ratio Intensive Margin/Average P.T." refers to the ratio between estimated pass-through for respondents at the intensive margin, i.e., those with "Share Valid CBA in 12m"= 0, and average pass-through of all respondents in each specification. Standard errors are clustered at the firm-/employee-level. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C.2 presents the results of a placebo test that conducts the same analyses as in Table 3, but for different samples of firms and employees, namely those that report *not* being covered by collective bargaining. For firms and employees in these samples, the CBA-based measure of short-run wage rigidities should be uninformative for the future wage bargaining intensity (as validated for firms in Panel B of Figure C.2 above). Hence, absent general equilibrium effects in the labor market, pass-through for those firms and employees not covered by collective bargaining should be independent of the CBA-based measure for wage rigidity in their respective industries. The results in Table C.2 confirm this hypothesis: Most coefficients of the interaction term of expected inflation and the industry-specific CBA coverage share are statistically indistinguishable from zero. The exception is the interaction term in Column 1, but here the coefficient is positive instead of negative, as predicted by theory and as consistently estimated in Tables 3 and C.1. This placebo check thus supports the interpretation of the empirical results in Tables 3 and C.1 as measures for pass-through at the intensive margin.

Next, Table C.3 investigates pass-through at the intensive margin into *realized* wage growth for firms.[2] Recall from Section 3.2 that realized wage growth is elicited between December 2022 and December 2023. As in Table 1 we thus relate the forward-looking inflation expectations from the five waves between December 2021 and December 2022 to the realized wage growth reported in the survey waves between December 2022 and December 2023, but here we estimate how pass-through varies with the CBA-based measure for short-run wage rigidity. Columns 1 and 2 show the results of this exercise for the subsample of firms covered by collective bargaining. As with expected wage growth as the dependent variable, the interaction term of expected inflation and the CBA-based measure of short-run wage rigidity is significantly negative. In addition, pass-through at the intensive margin continues to be 1.5 and 2.1 times larger than average pass-through. Columns 3 and 4 show that these effects are absent among firms that are not covered by collective bargaining, as in Table C.2 above.

Lastly, we confirm that pass-through is larger at the intensive margin than on average using the alternative survey-based measure of firms' expected wage bargaining intensity introduced for Figure C.2 above. We do so by interacting expected inflation with an indicator variable that equals 1 when a firm expects wage adjustments for more than half of their workforce within the next year. The results presented in Table C.4 show a strong and statistically significant positive interaction effect, indicating that pass-through of expected inflation is much larger when firms expect wage adjustments for more than half of their employees, compared to firms expecting fewer adjustments.

[2]The subsample of CBA-covered employees with data on both realized wage growth and corresponding inflation expectations is too small to conduct the same analysis for employees.

Table C.3: Pass-through at the Intensive Margin into Realized Wage Growth

	Realized Wage Growth over next 12 Months			
	CBA Firms		Non-CBA Firms (Placebo)	
	(1)	(2)	(3)	(4)
Expected Inflation next 12m	0.246***	0.159**	0.181***	0.111**
	(0.058)	(0.064)	(0.039)	(0.046)
× Share Valid CBA in 12m	-0.189**	-0.181*	-0.042	-0.070
	(0.093)	(0.094)	(0.085)	(0.086)
Share Valid CBA in 12m	0.947	0.800	0.615	0.944
	(0.681)	(0.682)	(0.575)	(0.576)
Observations	1736	1736	3856	3856
R2	0.053	0.065	0.032	0.042
Ratio Intensive Margin/Average P.T.	1.54	2.14	1.13	1.33
Expectation Controls	yes	yes	yes	yes
Firm-specifics	yes	yes	yes	yes
Firm FE	no	no	no	no
Survey Wave FE	no	yes	no	yes

Notes: This table shows results of regressions of ex-post realized wage growth over the next 12 months on the ex-ante expected inflation over the same period for the sample of firms, the share of valid collective bargaining agreements (CBA) in 12 months in the firm's 2-digit industry, and the interaction term between these two variables. The sample is restricted to firms whose (typical) employment relationship is covered by a CBA (Columns 1 and 2) and those not (Columns 3 and 4). The share of valid CBAs is defined between 0 and 1, where 0 means that all CBAs in a given industry expire and have to be renegotiated within the 12 month forecast horizon, while 1 indicates that all CBA eligible employees are still covered by a valid CBA in 12 months. All regressions control for the ex-ante expected unemployment rate, the ex-ante realized and expected future business conditions, and for the firm-specific controls listed in Footnote 12, respectively. Columns 2 and 4 purge for survey wave fixed effects. The metric "Ratio Intensive Margin/Average P.T." refers to the ratio between estimated pass-through for respondents at the intensive margin, i.e., those with "Share Valid CBA in 12m"= 0, and average pass-through of all respondents in each specification. Realized wage growth is elicited between December 2022 and December 2023 (and then lagged by 12 months), so that the sample is restricted to the periods between December 2021 and December 2022. Standard errors are clustered at the firm-level. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C.4: Pass-through at Intensive Margin based on Survey-based Measure of Wage Negotiations

	Expected Wage Growth next 12 Months			
	(1)	(2)	(3)	(4)
1[% Wage Negotiations >50%]	1.009***	0.592***	1.002***	0.605***
	(0.068)	(0.193)	(0.068)	(0.192)
Expected Inflation next 12m	0.149***	0.116***	0.159***	0.127***
	(0.020)	(0.026)	(0.027)	(0.032)
× 1[% Wage Negotiations >50%]		0.078**		0.074**
		(0.036)		(0.036)
Observations	9447	9447	9447	9447
R2	0.051	0.051	0.054	0.054
Expectation Controls	yes	yes	yes	yes
Firm-specifics	yes	yes	yes	yes
Firm FE	no	no	no	no
Survey Wave FE	no	no	yes	yes

Notes: This table shows the results of regressions of expected wage growth (in percent) on the expected inflation rate for the next 12 months, an indicator that equals 1 if firms expect wage adjustments for more than half of their workforce within the next 12 months, and the interaction term of these two variables. The sample is restricted to survey waves from March 2023 onwards, when we started to elicit firms' expected share of employees who will be subject to wage negotiations or collective bargaining rounds in the next 12 months. Each specification controls for respondents' expected unemployment rate, their assessment of their firms' current and expected future business conditions, and for the firm-specific controls listed in Footnote 12. The regressions also purge for fixed effects for the survey wave in Columns 3 and 4. Standard errors are clustered at the firm level. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

D. Appendix to Section 5

This section collects and describes additional evidence to further substantiate the findings described in Section 5 of the main text.

First, Table D.1 demonstrates that the results presented in Table 5 in the main part of the paper are not altered considerably once we additionally purge for survey wave fixed effects in all estimations. In Panel A, the estimations again deliver statistically positive effects when relying on cross-sectional variation: *Ceteris paribus*, an employee expecting one percentage point higher inflation is 0.5 percentage points more likely to plan to ask for a pay rise during the next 12 months (Column 1) and 0.4 percentage points more likely to recently having applied for a job at another firm (Column 3). These results are, if anything, slightly more pronounced compared to the baseline specification in Table 5 that delivered estimates of 0.4 and 0.3, respectively. Again, this small positive association vanishes, when we control for individual heterogeneity in Columns 2 and 4. Furthermore, Panel B again shows that employees who ask for a pay rise or apply for new jobs expect an economically significant higher pass-through than those employees who do not take measures to initiate wage bargaining. While all point estimates are of similar magnitude, the estimates presented in Column 2 are now significantly different from each other at the 10% level, which they are not in the main specification of Table 5.

Second, Table D.2 provides evidence that higher expected inflation is not associated with a higher likelihood that employees subsequently switch jobs. To this end, we regress an indicator that is one if employees' took up a new job at a new employer during the previous 12 months on the expected inflation rate for the next 12 months elicited at different points in time during this period, i.e., in the month of the survey (Column 1) as well as 3, 6, 9, and 12 months prior to the survey (Columns 2 through 5, respectively). All these regressions deliver coefficients that are very small in economic terms and statistically insignificant.

Table D.1: Initiation of Wage Bargaining and Pass-Through (Employees): Additional Specifications

Panel A: Expected Inflation and Initiation of Wage Bargaining				
	1[Asking for a Pay Rise]*100		1[Applying for Another Job]*100	
	(1)	(2)	(3)	(4)
Expected Inflation next 12m	0.526***	-0.217	0.405***	0.100
	(0.200)	(0.203)	(0.126)	(0.137)
Mean Dep. Variable	25.7	25.7	7.2	7.2
Observations	9503	9503	10976	10976
R2	0.031	0.625	0.039	0.556
Panel B: Bargaining and Pass-through				
	Expected Wage Growth next 12 Months			
	(1)	(2)	(3)	(4)
Exp. Inflation next 12m				
× 1[Asking for a Pay Rise]	0.083***	0.075**		
	(0.031)	(0.035)		
× 1[Not Asking for a Pay Rise]	0.037**	0.013		
	(0.017)	(0.019)		
× 1[Applying for Another Job]			0.208***	0.144**
			(0.057)	(0.067)
× 1[Not Applying for Another Job]			0.035**	0.014
			(0.015)	(0.015)
1[Asking for a Pay Rise]	0.381	-0.262		
	(0.240)	(0.278)		
1[Applying for Another Job]			-0.188	-1.089**
			(0.390)	(0.442)
H0: Coefficients Equal: p-value	0.162	0.080	0.003	0.048
Observations	9503	9503	10976	10976
R2	0.081	0.578	0.091	0.555
Expectation Controls	yes	yes	yes	yes
Demographic Controls	yes	no	yes	no
Employee FE	no	yes	no	yes
Survey Wave FE	yes	yes	yes	yes

Notes: This table shows the results of the same regressions as Table 5 in the main text, but with survey fixed effects as additional control variables. Standard errors are clustered at the individual level. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table D.2: Job-to-job Transitions and (Previous) Inflation Expectations

	1[Employee Switched Job last 12m] × 100				
	(1)	(2)	(3)	(4)	(5)
Expected Inflation next 12m	0.009				
	(0.089)				
Exp. Inflation (Lagged by 3 Months)		-0.092			
		(0.105)			
Exp. Inflation (Lagged by 6 Months)			-0.034		
			(0.112)		
Exp. Inflation (Lagged by 9 Months)				-0.100	
				(0.122)	
Exp. Inflation (Lagged by 12 Months)					-0.088
					(0.151)
Mean Dep. Variable	4.56	4.56	4.56	4.56	4.56
Observations	6314	4310	3215	2407	1828
R2	0.014	0.015	0.017	0.017	0.018
Expectation Controls	no	no	no	no	no
Demographics	yes	yes	yes	yes	yes
Employee FE	no	no	no	no	no
Survey Wave FE	yes	yes	yes	yes	yes

Notes: This table shows the results of regressions of an indicator that is one if employees' took up a new job at a new employer during the previous 12 months (expressed in percent) on the expected inflation rate for the next 12 months elicited at different points in time: in the month of the survey (Column 1) and 3, 6, 9, and 12 months earlier (Columns 2 through 5, respectively). All regressions control for the employee-specific controls listed in Footnote 12 and survey wave fixed effects. Standard errors are clustered at the individual level. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

E. Survey Questions Translated into English

This appendix provides an overview of the translated survey instructions of the key questions in the household and firm surveys. There are three sets of questions: The first block is dedicated to questions about the macroeconomy. The second block lists questions about expected and realized wage growth as well as other wage related questions. The last block summarizes questions regarding other topics. We specify when a question was elicited in a particular wave or asked only in the household or firm panel.

E.1. Questions Regarding the Macroeconomy (Firm and Employee Surveys)

Expected Unemployment Rate (12 months ahead):

> What do you think, what will the unemployment rate likely be in Germany in 12 months (i.e., in month MM/YYYY)? ____%

Expected Inflation (12 months ahead):

> What do you think, what will the inflation rate (measured by the consumer price index) likely be in Germany over the next 12 months (i.e., until month MM/YYYY)? ___%

Expected Inflation (2 and 3 years ahead) [2023m6 - 2023m12]:

> What do you think, what will the inflation rate (measured by the consumer price index) likely be in Germany in two and three years' time (i.e., in months MM/YYYY and MM/YYYY)?
>
> In two years: ___%
>
> In three years: ___%

Expected Inflation (5 years ahead) [Firms: 2021m6 & 2021m12; Employees: 2022m6 - 2023m3]:

> What do you think, what will the inflation rate (measured by the consumer price index, relative to the previous year) likely be in Germany in five years' time (i.e., in year YYYY)? ___%

Perceived Current Inflation [Employees only]**:**

> What do you think was the inflation rate in Germany over the last 12 months (i.e., over the period from MM/YYYY to MM/YYYY)? ____%

E.2. Wage-related Questions

The survey questions on expected and realized wage growth as well as other wage related questions slightly differ between the firm and employees survey. The firm survey usually refers to the "typical employee" at the organization, while the employee survey refers to the own job.

E.2.1. Firm Survey:

General Introduction:

> We would like to request your assessment of the expected evolution of gross wages in your firm over the next 12 months. Please differentiate between the gross wage change that has already been agreed upon today and the overall expected gross wage change. Please refer to a "typical employee" (average qualification, average job tenure, and medium job requirements) within your organization. Additionally, please assume that the working hours and other job profile characteristics remain constant over the next 12 months.

Agreed Wage Growth:

> For your typical employee: What is the projected growth in gross wages over the next 12 months (i.e., until MM/YYYY) that has already been agreed upon today (e.g., due to an existing collective agreement, an agreement with employees, or similar)? Please enter 0 if no wage change has yet been agreed upon.
> ____%

Expected Wage Growth:

> For your typical employee: What is your estimation of the total gross wage growth over the next 12 months (i.e., until MM/YYYY) (including any potential new collective agreements, upcoming wage negotiations with employees, or similar)? Please enter your answer from the previous question if you do not expect any additional wage changes beyond those already agreed upon today.
> ____%

Realized Wage Growth [starting 2022m12]:

> For your typical employee: What is your estimation of the total gross wage growth over the past 12 months (i.e., since MM/YYYY)? ____%

Demand for Wage Increases [starting 2022m3]:

Do you expect your employees to ask for wage increases with greater frequency than usual over the next 12 months?

☐ Yes ☐ No

Expected Share of Employees to Bargain with [starting 2023m3]:

What proportion of your typical employees do you anticipate will engage in individual wage negotiations or collective bargaining rounds over the next 12 months?

____%

Collective Bargaining Agreement (2021m12 & 2022m12)

Is the employment relationship in your company typically subject to a collective agreement?

☐ Yes ☐ No

Hypothetical Scenarios: [December 2023; random subset of 50% of firms; questions placed at the end of the questionnaire]

Please consider the following two hypothetical scenarios for the further course of inflation (measured by the consumer price index) over the next 12 months (i.e., until December 2024).

Scenario 1: Suppose that you expect an inflation rate of 2% for the next 12 months. What would be your estimation of the gross wage growth over the next 12 months for your typical employee in this scenario (including any potential new collective agreements, upcoming wage negotiations with employees, or similar)?

____%

Scenario 2: Now suppose that you expect an inflation rate of 8% for the next 12 months. What would be your estimation of the gross wage growth over the next 12 months for your typical employee in this scenario (including any potential new collective agreements, upcoming wage negotiations with employees, or similar)?

____%

E.2.2. Employees Survey:

General Introduction:

We would like to request your assessment of the expected evolution of your gross wage over the next 12 months. Please differentiate between the gross wage change that has already been agreed upon today and the overall expected gross wage

change. Please refer to your current employment relationship. Additionally, please assume that the working hours and other job profile characteristics remain constant over the next 12 months.

Agreed Wage Growth:

In your current job: What is the projected growth in gross wages over the next 12 months (i.e., until MM/YYYY) that has already been agreed upon today (e.g., due to an existing collective agreement, an agreement with employer, or similar)? Please enter 0 if no wage change has yet been agreed upon.

____%

Expected Wage Growth:

In your current job: What is your estimation of the total gross wage growth over the next 12 months (i.e., until MM/YYYY) (including any potential new collective agreements, upcoming wage negotiations with employer, or similar)? Please enter your answer from the previous question if you do not expect any additional wage changes beyond those already agreed upon today.

____%

Realized Wage Growth [starting 2022m12]:

What is your estimation of your total gross wage growth over the past 12 months (i.e., since MM/YYYY)? ____%

,

Demand for Wage Increases [starting 2022m3]:

Do you plan to ask for a wage increase over the next 12 months?

☐ Yes ☐ No

Collective Bargaining Agreement [starting 2022m6]:

Is your current employment relationship subject to a collective agreement?

☐ Yes ☐ No

Hypothetical Scenarios: [December 2023; random subset of 2/3 of employees; questions placed at the end of the questionnaire]

Please consider the following two hypothetical scenarios for the further course of inflation (measured by the consumer price index) over the next 12 months (i.e., until December 2024).

Scenario 1: Suppose that you expect an inflation rate of 2% for the next 12 months. What would be your estimation of your gross wage growth over the next 12 months in your current job in this scenario (including any potential new collective agreements, upcoming wage negotiations with employers, or similar)? ____%

Scenario 2: Now suppose that you expect an inflation rate of 8% for the next 12 months. What would be your estimation of your gross wage growth over the next 12 months in your current job in this scenario (including any potential new collective agreements, upcoming wage negotiations with employers, or similar)? ____%

E.3. Additional Survey Questions

E.3.1. Firms

Current Business Conditions:

Current situation: We evaluate our current business condition (latest business trends) as ... (quantitative scale between 0 and 100, where [0] is bad, [50] satisfactory, and [100] good.)

Expected Business Conditions:

Expectations for the next six months: After elimination of purely seasonal fluctuations the development of our business will be ... (quantitative scale between 0 and 100, where [0] more unfavorable, [50] about the same, and [100] more favorable.)

Lack of Skilled Labor:

Our domestic production/business activity is currently constrained: ☐ Yes ☐ No
If yes: the constraint is due to a lack of skilled workers: ☐ Yes

Energy Cost Share [2022m4]:

What share of revenue do you estimate your company had to spend on energy expenses in 2021 (energy intensity)? ____%

Impact by War in Ukraine [2022m4]:

Has your company's expected sales volume for the current year changed as a result of the war in Ukraine?

☐ Increase by____% ☐ No change ☐ Decrease by____%

E.3.2. Employees

Current Business Conditions [starting 2022m3]**:**

> How do you evaluate the current business condition of the company where you are currently employed? The current business situation is ... (quantitative scale between 0 and 100, where [0] is bad, [50] satisfactory, and [100] good.)

Expected Business Conditions (6 months ahead) [starting 2022m3, random subset of 20% of employees in each wave]**:**

> How do you assess the future development of business conditions of the company where you are currently employed? During the next six months, the development of business conditions will be ... (quantitative scale between 0 and 100, where [0] more unfavorable, [50] about the same, and [100] more favorable.)

Expected Business Conditions (12 months ahead) [starting 2022m3, random subset of 80% of employees in each wave]**:**

> How do you assess the future development of business conditions of the company where you are currently employed? During the next twelve months, the development of business conditions will be ... (quantitative scale between 0 and 100, where [0] more unfavorable, [50] about the same, and [100] more favorable.)

On-the-job Search:

> How many job applications for a new position did you submit in the previous four weeks? Please exclude applications for positions in your current company.
>
> ☐ None
> ☐ One application
> ☐ Two applications
> ☐ Three applications
> ☐ Four applications
> ☐ Five or more applications

Numeracy [first survey wave employee participated]**:**

> A) Let's say you have 200 euros in a savings account. The account earns ten per cent interest per year. Interest accrues at each anniversary of the account. If you never withdraw money or interest payments, how much will you have in the account at the end of two years?
>
> _____ Euros

B) Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After one year, how much would you be able to buy with the money in this account?

☐ More than today

☐ Exactly the same amount

☐ Less than today