

Inflation and Wage Expectations of Firms and Employees

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PRELIMINARY

We study the link between inflation and wage expectations on both sides of the negotiating table using new and extensive panel data of German firms and employees. In the data, a one percentage increase in inflation expectations is associated with 0.23 percentage points higher own wage growth for firms, and 0.07 to 0.1 higher expected wage growth for employees. Our surveys allow to investigate several mechanisms for why the average pass-through may be so low. In line with theory, the intensive margin of pass-through—i.e., pass-through conditional on negotiations taking place—is considerably higher than average pass-through. Similarly, employees searching for a new job anticipate higher pass-through. Finally, for employees’ wage growth expectations are more strongly driven by realized than by expected inflation, while past and expected inflation appear equally important in determining firms’ wage growth expectations.

Keywords: Wage expectations, inflation, pass-through, bargaining, firms, employees.

JEL Classification: E24, E31, D84

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1. Introduction

In light of the recent surge in inflation and tight labor markets, the dynamics of wages have gained renewed attention, not least because politicians and economists alike are increasingly concerned about a potential wage-price spiral. Yet, it is currently little known how (expected) inflation influences the planned wage setting of the wage bargaining partners, firms and employees.

This paper makes progress in understanding the link between inflation and wage expectations by means of new and extensive panel data. Starting in December 2021, we ask, on a quarterly basis, a representative set of approximately 3,500 German firms and 2,000 employees about the expected growth of their own wage and their inflation expectations, both for a one year horizon. To cleanly identify the relation between expected inflation and wages, we furthermore collect data on other potential determinants of wage growth. These variables are meant to proxy the joint surplus of the match, the expected outside option, or the relative strength of the bargaining position. In order to be able to compare findings for firms and employees, all survey respondents are asked identical set of questions, addressing the importance of wording choices (Bruine de Bruin et al., 2012).

Our data shows a low pass-through of expected inflation into expected own wage growth, both for firms and employees. For firms, one percentage point higher inflation expectations are associated with 0.23 percentage point higher wage growth expectations, as identified from the time variation in the data. For employees, the average pass-through is between 0.07 and 0.1, i.e., less than half of the pass-through found in the sample of firms. While these magnitudes are small, they are at the upper end of other recent evidence (Hajdini et al., 2022; Jain et al., 2022; Savignac et al., 2021). We discuss these works in more detail below.

The data also suggests that the extensive margin—that is, the likelihood that wages are renegotiated—contributes at best mildly to the pass-through of inflation expectations on expected wage growth: Firms with higher inflation expectations expect to bargain over wages more often, but the magnitude of this effect is economically small. For employees, we do not find a statistically robust relation between inflation expectations and bargaining intentions.

We extend the literature on the pass-through of inflation expectations on wage growth by investigating several mechanisms for why the average pass-through may be so low. First and foremost, we employ two distinct empirical strategies to estimate the intensive margin of pass-through, i.e., the effect of inflation expectations on wage growth conditional on wage negotiations taking place. This is an important statistic, as in models of sticky wages the

effect of inflation expectations on wages may be low either due to a low frequency of wage setting or to a low intensive margin (Werning, 2022, provides an extensive quantitative discussion of these channels for the effect of inflation expectations on price setting). In our data, firms that expect to negotiate wages show slightly higher-pass through of 0.25. For employees, pass-through rises to 0.13 for those workers who expect to negotiate, a strong difference compared to a pass-through of 0.08 for those who do not expect to negotiate.

We also exploit the widespread presence of collective bargaining agreements in Germany to learn more about the intensive margin of pass-through. Firms and employees whose current collective agreements are valid for 12 months or more know that there is little scope for new bargaining within the next year. In contrast, firms and employees with collective agreements valid less than 12 months know that they (or their industry associations and unions, respectively) will very likely engage in wage negotiations during the next twelve months. For the latter firms, the data shows a maximum pass-through of 0.3, most likely representing the intensive margin of wage setting. In contrast, firms that are covered by agreements valid for more than 12 months only show a pass-through of 0.15. As a placebo check, we also confirm that the expected pass-through of those firms that are not covered by collective bargaining is independent of the validity of collective agreements affecting other firms in the same industry.

Second, we investigate, whether the pass-through of inflation into wages operates primarily via on-the-job search behavior of employees, so that the average pass-through is low because only parts of the labor force search for alternative jobs. Pilossoph and Ryngaert (2022) investigate this channel and show that U.S. employees are more likely to search for alternative job offers if they expect higher inflation. This may spur expected wage growth either via the alternative wage offer or via wage renegotiations in the current job (as in Cahuc et al., 2006). There is evidence for the latter part of the argument in our data, as expected pass-through is significantly higher for those employees who search for new jobs compared to those who do not. In contrast to the findings of Pilossoph and Ryngaert (2022), however, German employees' job search behavior is independent of their inflation expectations.

Third, we document that the degree of pass-through appears to be relatively stable over the sample period. This is remarkable given the fact that realized CPI inflation as well as inflation expectations have increased considerably over the sample period, making unanchoring of medium-term price expectations more likely, which in turn could result in agents putting more weight on inflation expectations when making decisions (e.g., Rudd, 2022 and Jorda and Nechio, 2022). Moreover, we do not find evidence that the degree of pass-through varies across firms reporting different exposure to the economic consequences of the Russian-Ukrainian war and the resulting surge in energy prices.

Fourth, we consider that wage growth expectations over the next 12 months might be not only determined by one-year ahead inflation expectations, but might also be affected by inflation dynamics in the past or the expected price evolution far in the future. Regarding the latter, we do not find evidence that long-run inflation expectations affect one-year ahead expected wage growth over and above the effect of short-run inflation expectations. In contrast, horse-race regressions between the respondents' expected inflation rates and several measures of the current inflation rate deliver that pass-through seems to be rather backward-looking than forward-looking for employees, while for firms the coefficient of inflation expectations is of comparable order of magnitude as the coefficient of the current CPI inflation rate. These results could suggest that past inflation has explanatory power beyond their effect on inflation expectations, which might indicate that wage setting lags behind inflation and employees want to be compensated for past (perceived) decreases in real wages rather than for expected future inflation.

We contribute to a very recent literature studying the role of expected inflation in determining wage growth expectations. Closest to our paper and in line with our findings, Savignac et al. (2021) document a very low correlation between wage growth expectations and inflation expectations using a survey of French firms in 2021. Moreover, Hajdini et al. (2022) use a randomized information treatment to explore the causal effect of inflation expectations on income growth expectations among US consumers in early 2022, finding a relatively low rate of pass-through from expected inflation to expected income growth in the order of 0.2. Comparably, Jain et al. (2022) find a positive pass-through coefficient of 0.1 to 0.2 when investigating cross-sectional variation in wage and inflation expectations obtained in Canadian household survey data. We complement these studies by simultaneously investigating this link among both households and firms using almost identical surveys conducted simultaneously and repeatedly over several survey waves. While the other studies rely on survey data elicited at a specific point in time, we are hence able to exploit the panel dimension to control for unobserved heterogeneity and to examine the state-dependence in these relationships with respect to changes in the macroeconomic environment and local/industry-specific shocks, e.g., in consequence of the Russian invasion of Ukraine. Moreover, we are able to shed light on potential channels behind the weak link between wage and inflation expectations by exploiting additional information on wage negotiations, the timing of collective bargaining agreements, on-the-job search, and (perceptions of) the realized past inflation rate.

The remainder of the paper is organized as follows. In Section 2, we present the samples and the survey design. Section 3 provides descriptive results on the distribution and evolution of expected wage growth and inflation expectations. Section 4 presents the main results on

the pass-through of expected inflation to wage growth expectations. Section 5 investigates several potential mechanisms that might explain why pass-through is low. Finally, Section 6 concludes.

2. Data

2.1. Household and Firm Panel

Our analysis relies on survey data among German firms and households from the novel “Attention and Macroeconomic Beliefs Panel (AMBP)” (Link et al., 2022). The surveys are conducted simultaneously on a quarterly basis and the wording of the survey questions is identical whenever applicable. While the AMBP is running since December 2020, we have started to add additional questions about wage growth expectations in the December 2021 wave. While the data collection of this project is ongoing, the subsequent analysis is based on the five survey waves until December 2022. As respondents participate repeatedly in the survey, we can track individual firms and households over time. The panel structure is of key importance for our research design for several reasons: First, it allows us to control for unobserved individual- and firm-specific heterogeneity. Second, we can look at different phases of the business cycle and evaluate the potential role of state-dependence in the role specific variables are associated with wage growth expectations. Third, we can link ex-ante reported expectations to ex-post realized wage growth during the same period of time at the individual level.

Firm Survey The quarterly firm survey of the “Attention and Macroeconomic Beliefs Panel” is conducted among the firms participating in the ifo Business Survey (IBS), a long-standing monthly survey of a large and representative panel of German firms.¹ Given the different focus of our surveys and due to space constraints in the regular survey, the respondents of the online portion of the IBS were provided with a separate link to our survey in the invitation email to the regular IBS of the last month in each quarter. Our surveys were completed by approximately 3,500 respondents by wave, which corresponds to roughly two thirds of the overall participants in the regular online portion of the IBS. We restrict the analysis to respondents who answered the surveys in at least two waves.

¹Hiersemenzel et al. (2022) show that the sample of the IBS is representative of the German economy according to various criteria. The IBS provides the basis for the ifo Business Climate Index, the most recognized leading indicator of the German business cycle. The vast majority of respondents to the regular IBS are in an upper management position such as owner, CEO, or department head. See Sauer and Wohlrabe (2020) for further details on the IBS. The IBS micro data have been used extensively in previous research in economics (e.g., Bachmann et al., 2019, 2013, 2021; Buchheim et al., 2022; Link et al., 2023).

Household Survey In parallel to the firm surveys, we conduct surveys containing mostly identical questions among German households in collaboration with the online panel provider Dynata, which is widely used in the social sciences (Haaland et al., 2022). The survey waves in December 2021 and March 2022 were answered by approximately 4,500 participants, the waves in June, September and December 2022 by approximately 2,500. As the sample is largely representative of the German population, approximately half of the participants is employed, while the remaining sample comprises of retirees, students, and other individuals without employment. In our analysis, we focus on those participants that are employed and thus potentially bargain over their wages. In each wave, we exclude 5% of the sample that completed the questionnaire in the shortest time. Again, we restrict respondents who answered the surveys in at least two waves.

2.2. Survey Design

Since the December 2021 wave, the survey of the “Attention and Macroeconomic Beliefs Panel” consists of three main blocks: 1) Information acquisition, 2) Macroeconomic expectations, 3) Wage growth and other local expectations. The following description of the survey focuses on questions used in the subsequent analysis.²

Our analysis mainly focuses on the questions in the latter two blocks. Our main outcomes of interest relate to wages and wage negotiations: First, we ask participants by how much they think their gross wage will change over the next 12 months in percentage points. For firms, we refer to the gross wage growth of a “typical” employee in the firm with average qualification, tenure, and job profile. Starting in the December 2022 wave, we also elicit employees’ and firms’ ex-post realized wage growth during the last 12 months. Second, we aim at the extensive margin of adjustment by asking employees whether they plan to ask for an additional, unscheduled salary increase in the next 12 months. Comparably, firms are asked whether they expect their employees to ask for pay raises more often than usual in the next 12 months. In order to investigate potential effects on the job search behavior, we further ask employees about the number of applications they have sent to other potential employers during the last month. Lastly, we elicit whether the (typical) employment relationship is subject to a collective bargaining agreement, which should, to a large degree, capture whether agents negotiate over wages themselves or not.

The survey contains several measures related to respondents’ expected and perceived CPI inflation rate. We elicit respondents’ inflation expectations by asking them about the expected inflation rate over the next 12 months. In the waves of June 2022 and December

²See Link et al. (2022) for an extensive description of the survey.

2022, respondents were also asked about their long-term (5-year ahead) inflation expectations. Moreover, we measure beliefs about past inflation over the last 12 months in the household survey.

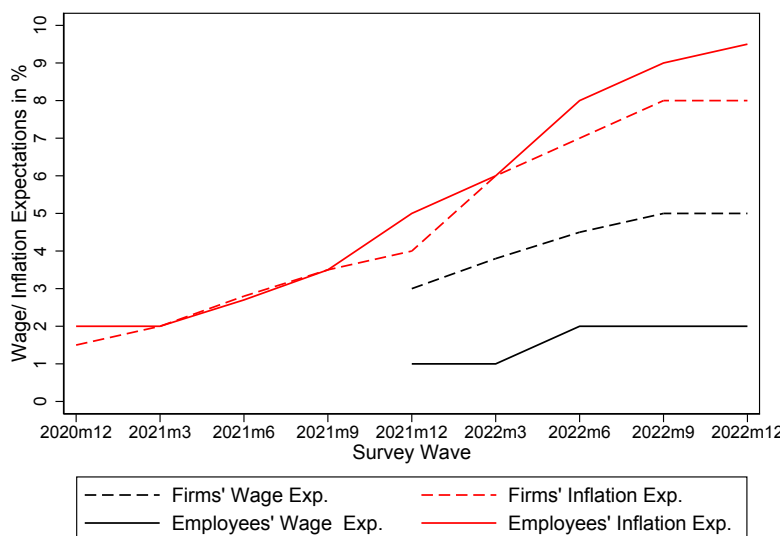
The surveys also cover several other variables that might play an important role for the determination of wage growth expectations and that might interact with inflation pass-through. First, the regular IBS elicits firms' current business conditions as well as their expectations regarding the future development of these *business conditions* for an expectation window of six months on a *quantitative* scale ranging between “[0] deteriorating” and “[100] improving,” which we express in standard deviations in the regressions below for the purpose of interpretability. Starting in the March 2022 wave, we elicit the corresponding perceptions of households regarding the current and expected business condition of the company they are employed at.³ Given that firms mostly refer to their expected profits and sales when they answer the questions of the IBS (Abberger et al., 2009), these variables should be a good proxy for the current and expected surplus of the match and the scope of wage negotiations. Second, the survey contWohlfart, Maik Wolters, and participants of the ifo Macro Seminar, the LMU JF Retreat, the EMMMC Conference in Frankfurt, TU Dortmund and the University of Kiel. We are grateful to the survey department of the ifo Institute, in particular Felix Leiss, Agnesa Nimanaj, and Klaus Wohlrabe for their help and the opportunity to obtain macroeconomic expectations regarding the unemployment rate in 12 months after the survey. Third, we can rely on several measures that capture the degree of firms' exposure to the energy crisis resulting from the Russian invasion of Ukraine that were elicited in the April 2022 wave of the IBS. These measures include the pre-crisis share of energy costs and the expected effect of the crisis on firms' output in 2022. Lastly, the surveys contain information on firms' characteristics such as number of employees, industry of operation, export share, or the influence of the responding manager on decisions taken in the firm as well as information on the individuals' gender, age, level of education, household income, and information on employment, i.e., whether employed or not, whether working full-time or part-time, and the industry of operation of the company the respondent is employed at.

In order to make sure that outliers do not drive our results, we winsorize the beliefs about the relevant variables, including expected wage growth, expected and past perceived inflation rates, and the expected unemployment rate at values of 0% and 20%.⁴ While the lower restriction barely binds, the upper threshold corresponds to between the 95th (for

³In the household sample, we ask 20% of individuals regarding their expectations for the next six months, while the remaining were asked to refer to the next twelve months. Importantly, the responses are not significantly different from each other.

⁴Winsorizing at other cutoff values or trimming observations above and below these thresholds does not change the results substantially.

Figure 1: Median Expected Inflation and Wage Growth over Time



Notes: This figure depicts the median expected CPI inflation rate in Germany over the next 12 months (red lines) and expected wage growth over the next 12 months (black lines) among the respondents in the firm survey (dashed lines) and household survey (solid lines). For firms, expected gross wage growth refers to a “typical” employee in the firm with average qualification, tenure, and job profile.

inflation expectations) and 98th (for expected wage growth) percentiles in the household sample and to above the 98th percentile for all variables in the firm sample.

3. Descriptive Results

Distribution and Evolution of Expectations We first present descriptive evidence about wage growth expectations and inflation expectations from our simultaneous surveys among firms and employees. Figure 1 depicts the median expected wage growth and expected inflation rates among both samples over time. Tables A.1 and A.2 as well as Figure A.1 in the Appendix summarize the evolution of the distributions of these expectations across survey waves.

The expected (nominal) growth of gross wages has increased between December 2021 and December 2022 for both firms and employees, albeit the rise in expectations was a bit stronger among firms than among employees (see Figure 1). While the median firm expected that the wage of their “typical” employee will increase by 3% (mean: 3.5%) over the next 12 months in December 2021, the same number grew to 5% (mean: 5%) in December 2022. Similarly, the median employee’s wage growth expectations increased from 1% (mean: 2%) in December 2021 to 2% (mean: 3.2%) in December 2022. Across all survey waves, employees

in the household panel expect lower wage growth over the next 12 months than firms. In line with this, on average only 24% of employees intended to ask for an additional, unscheduled salary increase during the next 12 months across all survey waves. In contrast, 73% of firms expected that their employees will ask for additional pay rises more often than usual. Overall, there seems hence to be large disagreement over future wage growth between firms and employees.

In comparison to the moderate rise in wage growth expectations, firms' and employees' expected inflation have skyrocketed over the sample period. While the median firm expected inflation rates approximately corresponding to the ECB's target rate of 2% in late 2020 and early 2021, these expectations monotonically increased to rates of 4% in December 2021 and 8% in December 2022. Remarkably, the evolution of aggregate inflation expectations of employees was largely comparable. The median employee expected 2% inflation over the next 12 months in December 2021, 5% in September 2022 and 9.5% in December 2022. Taking into account the findings about nominal wage growth above, employees seem to expect significantly worse development of real wages compared to firms.

While both groups of agents thus largely agree on future inflation, these expectations are more dispersed in the sample of employees than among firms; see Tables A.1 and A.2 in the Appendix. For instance, the survey wave-specific standard deviation of inflation expectations ranges between 2.0 and 2.9 percentage points in the firm sample and between 3.4 and 4.4 percentage points among employees. Consistent with recent evidence documented by Link et al. (2023), this could reflect that information frictions are smaller among firms than among employees.

Overall, the descriptive results are quite striking: While there is a positive correlation between time series of aggregate inflation and wage growth expectations, the relationship is rather small, as expected wage growth has lagged behind inflation expectations. The link appears to be somewhat stronger among firms than among employees. Across all survey waves, employees are more pessimistic about the development of real wages compared to firms.

Validation of Expected Wage Growth Variable Expected wage growth rates are strongly associated with and informative for ex-post realized changes. Specifically, Figure A.2 in the Appendix demonstrates that expected wage growth for the next 12 months elicited in the December 2021 wave are strongly positively correlated with ex-post realized wage growth during the same period of time reported by the same firms and employees in the December 2022 wave. This provides strong evidence that survey respondents report accurate and informative expectations to our surveys.

4. Inflation Pass-through to Wage Expectations: Baseline Results

How are firms' and employees' wage growth expectations associated with their beliefs about future inflation after controlling for other potential bargaining factors? We shed light on this question by analyzing the panel variation in these expectations. The panel dimension allows us i) to look at changes in these relations over time and ii) to control for unobserved individual or firm-specific heterogeneity by purging for fixed effects. Specifically, we estimate the following panel regression model:

$$w_{i,t}^e = \beta_1 \pi_{i,t}^e + \mathbf{X}_{i,t}' \boldsymbol{\gamma} + \alpha_i + \varepsilon_{i,t}, \quad (1)$$

where $y_{i,t}$ denotes wage growth expectations (12-months ahead) of employee or firm i in quarter t , and $\pi_{i,t}^e$ represents expected inflation (12-months ahead), the main explanatory variable of interest. $\mathbf{X}_{i,t}$ captures a varying set of potential other determinants, including macroeconomic (e.g., unemployment) or local expectations (e.g., business expectations) as well as realizations such as the current business condition. α_i controls for fixed effects at the level of individuals or firms and $\varepsilon_{i,t}$ is the error term.

We start by investigating the relationship between firms' and employees' wage growth expectations and their inflation expectations, their unemployment rate expectations, and current realizations of firms'/employers' business conditions as well as expectations regarding the future development of these conditions. Columns (1) through (3) of Table 1 present the results based on the five survey waves between December 2021 and December 2022, while Columns (4) and (5) are based on the four waves since March 2022 for which information on business conditions and expectations is elicited in the household survey.

The results indicate a significantly positive, albeit incomplete, relationship between wage growth expectations and the expected inflation rate among both firms and employees, see Columns (1) and (3) of Table 1. The coefficient is more than twice as large for firms compared to households. However, for both groups of agents the pass-through is small in economic terms, as 1 percentage point higher inflation expectations is associated with 0.23 percentage point higher wage growth expectations for firms (0.1 p.p. for employees). Moreover, the coefficients are largely unaffected by controlling for potential confounders of pass-through, namely the expected unemployment rate as well as the realized and expected business conditions in Columns (2) and (5). Overall, respondents expect that the surge in inflation will be only partially reflected in nominal wage growth, implying a substantial dampening of real wages.

As a robustness test, we use the intention to bargain over wages in the next twelve months as an alternative measure that captures the extensive margin of wage adjustment. As de-

Table 1: Pass-through of Inflation to Wage Growth Expectations: Baseline Results

| | Expected Wage Growth next 12 Months | | | | |
|-----------------------|-------------------------------------|---------------------|---------------------|---------------------|---------------------|
| | (1) | (2) | (3) | (4) | (5) |
| | Firms | | Employees | | |
| Expected infl. rate | 0.233*** (0.012) | 0.238*** (0.012) | 0.100*** (0.013) | 0.071*** (0.017) | 0.065*** (0.017) |
| Expected unempl. rate | | 0.017 (0.019) | | | 0.038* (0.020) |
| Business conditions | | 0.213*** (0.048) | | | 0.011 (0.095) |
| Business expectations | | 0.086** (0.037) | | | 0.119 (0.085) |
| Constant | 2.934*** (0.084) | 2.811*** (0.128) | 1.853*** (0.105) | 2.191*** (0.149) | 1.982*** (0.183) |
| Observations | 13056 | 13056 | 6764 | 5294 | 5294 |
| R. sq. (within) | 0.042 | 0.045 | 0.013 | 0.006 | 0.008 |
| Firm/Ind. FE | yes | yes | yes | yes | yes |

Notes: This table shows the panel regression results of expected wage growth (in percent) on the expected inflation rate, the expected unemployment rate, and the current and expected future development of business conditions. The current and expected business situation are expressed in standard deviations. For employees, current and expected business conditions refer to their firm of employment and are available from the March 2022 wave onwards. All specifications include fixed effects at the firm or individual level, respectively. Standard errors in parentheses. p-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

scribed in Section 2.2, we ask employees whether they plan to ask for an additional, unscheduled salary increase in the next 12 months or not. Comparably, firms are asked whether they expect their employees to ask for pay raises more often than usual in the next twelve months. The results in Table A.3 in the Appendix point at a positive relationship between inflation expectations and the intention to bargain over wages during the next twelve months. Again, this correlation appears to be stronger among firms than among households: The share of firms that expect their employees to ask for additional pay rises more often than usual is about 1 percentage points higher if they expect a one percentage point higher inflation rate, see Columns (1) or (2). However, this figure is rather low compared to the overall share of firms that expect additional pay demands across waves (73%). Among households, the share of employees that plan to ask for an additional, unscheduled salary is not statistically significantly related to variation in expected inflation rates. Overall, the alternative measure about the extensive margin of wage adjustment confirms the previous results about the intensive

margin: there is a positive link between expected inflation and the intention to bargain over wages, but the relationship is small and stronger among firms than among employees.

Other Determinants of Wage Expectations Moreover, the surplus of the match proxied by the current and expected business conditions appear to be positively associated with higher wage growth expectations. An increase in firms' current business conditions of one standard deviation is associated with an increase in wage growth expectations of 0.21 percentage points as depicted in Column (2) of Table 1. Remarkably, the firms' expectations regarding the future development of business conditions are less strongly associated with expected wage growth after controlling for current business conditions, with which they are strongly correlated themselves, and the expected inflation and unemployment rates. Given that we started to ask asking households about the current and expected business conditions of their employer in the March 2022 wave, we can only rely on four survey waves and hence smaller within-individual variation to provide panel estimates for employees. Despite yet delivering insignificant results, the point estimates presented in Column (5) point into a comparable direction: Business expectations that are more optimistic by one standard deviation are associated with wage growth expectations that are alleviated by 0.12 percentage points. Hence, our results are consistent with the notion that both firms and employees expect higher wages if the scope for pay rises perceived to be larger due to higher (expected) surplus of the employment relationship.

Further, the results based on the first five survey waves of do not provide evidence that expected wage growth is not strongly associated with various proxies of the expected value of the outside option. For instance, the relationship between the expected unemployment rate and wage growth expectations is economically small among both samples; see Columns (2) and (5) of Table 1. Moreover, unreported results do not point at a negative relationship between employees' perceived unemployment risk and their wage growth expectations. In both cases, however, the weak relationships might just be due to the fact that there is very little variation in expected unemployment rates and perceived unemployment risk over time at the individual level.

5. Why is Pass-through so Low?

Our setting allows us to investigate several potentials mechanisms that might explain why pass-through is low. These include the role of wage negotiations and collective bargaining agreements and the question whether pass-through differs between those employees that currently search for a new job and those who do not search. Moreover, we investigate the

strength of pass-through over time and the role of (perceived) realized past inflation.

5.1. Pass-Through Conditioning on Bargaining Taking Place

One potential explanation why pass-through is low on average might be the presence of wage stickiness which might, e.g., result from the fact that some firms and employees do not bargain over their wages, e.g., because they are price takers, or the fact that collective bargaining agreements are typically in place for on average 24 months (Schulten, 2022). In consequence, some firms and employees in the sample might not expect to bargain over wages within the next 12 months and, as wages are fixed over this period, do not expect that alleviated inflation expectations result in pay rises. With sticky wages, the degree of pass-through for one year ahead inflation expectations might thus depend on the expected duration of wage settlements. We infer the relevance of this mechanism by exploiting (i) information about the intention to bargain over wages at the individual- and firm-level, and (ii) by using external information about the expiration of collective agreements at the level of the industry the firm is operating in.

Likelihood of Wage Negotiations First, we investigate whether the degree of expected pass-through is lower among those participants that are less likely to bargain over wages at all, e.g., because employees on these jobs are price takers. For this purpose, we split the sample to job relationships in which wage negotiations are more likely to take place and those employer-employee matches which are less likely to bargain over wages. For this purpose, we use a proxy “1(Bargained wage)” that is one if the respective firm or employees stated to intend to bargain during the next 12 months in at least one of the five survey waves and vice versa. Specifically, firms are asked whether they expect their employees to ask for pay raises more often than usual in the next twelve months and employees whether they plan to ask for an additional, unscheduled salary increase in the next 12 months or not.

The results depicted in Table 2 indicate that the degree of expected pass-through is indeed lower among those participants that are less likely to bargain over wages at all. Specifically, firms that, according to our proxy, are less likely to offer jobs that pay bargained wages expect a degree of pass-through that is only half the size compared to those firms that regularly bargain over wages (expected degree of pass-through of 0.13 vs. 0.25). Similarly, pass-through is larger among those employees who consider themselves in a position to negotiate wages (0.13) than among those who did not indicate at any time that they would ask for raises (0.08).

Table 2: Heterogeneity in Pass-through: Likelihood of Wage Negotiation

| | Expected Wage Growth next 12 Months | |
|--|--|---------------------|
| | (1) Firms | (2) Employees |
| Exp. infl. \times 1(Bargained wage) | 0.247*** (0.012) | 0.131*** (0.020) |
| Exp. infl. \times 1(No bargained wage) | 0.127*** (0.034) | 0.080*** (0.016) |
| Constant | 2.939*** (0.084) | 1.856*** (0.105) |
| Observations | 13052 | 6764 |
| R. sq. (within) | 0.043 | 0.014 |
| Firm/Ind. FE | yes | yes |

Notes: This table shows the panel regression results of expected wage growth during the next 12 months (in percent) on the expected 12 month-ahead inflation rate, distinguishing between participants who are likely to bargain over wages and those employer-employee matches which are less likely to bargain over wages. For this purpose, the proxy “1(Bargained wage)” is one if the respective firm or employees stated to bargain over the next 12 months in at least one survey wave and vice versa. Specifically, firms are asked whether they expect their employees to ask for pay raises more often than usual in the next twelve months and employees whether they plan to ask for an additional, unscheduled salary increase in the next 12 months or not. All specifications include fixed effects at the firm or individual level, respectively. Standard errors in parentheses. p-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Variation in Expiration Dates of Collective Bargaining Agreements Second, we examine the role of expiring collective agreements at the industry level for the expected pass-through of firms. The underlying idea is as follows: If a firms’ typical employee’s job is covered by a collective bargaining agreement and their current industry agreement is valid for less than twelve months, firms know that a substantial part of wage negotiations will take place within the next twelve months. Thus, these firms may expect that at least part of expected inflation will result in higher wage growth. In turn, those firms that are covered by a collective bargaining agreement that does not expire during the next twelve months should know the future path of wage growth and might realize that their current inflation expectations might not enter wage negotiations. If the timing in expiration dates of collective bargaining agreements mattered for the degree of expected pass-through, firms in industries with (a high share of) expiring collective agreements should report a relatively high inflation pass-through, while firms in industries with (a high share of) valid collective agreement might perceive a low pass-through. In contrast to that, firms not covered by collective agreements should bargain as they see fit. Hence, pass-through should be largely independent of duration

Table 3: The Role of Expiration Dates of Collective Bargaining Agreements for Pass-through

| | Expected Wage Growth next 12 Months | | | |
|--|-------------------------------------|----------------------|-----------------------------------|---------------------|
| | (1) Firms w/ coll. agreem. | (2) | (3) Firms w/o coll. aggrement. | (4) |
| Expected infl. rate | 0.236*** (0.019) | 0.302*** (0.030) | 0.236*** (0.015) | 0.236*** (0.021) |
| Valid coll. agreem. $t + 12$ | -0.088 (0.156) | 0.974** (0.395) | 0.015 (0.122) | 0.030 (0.324) |
| Exp. infl. \times coll. agreem. $t + 12$ | | -0.154*** (0.053) | | -0.002 (0.044) |
| Constant | 2.990*** (0.153) | 2.541*** (0.217) | 2.989*** (0.123) | 2.984*** (0.158) |
| Observations | 3408 | 3408 | 8234 | 8234 |
| R. sq. (within) | 0.057 | 0.060 | 0.040 | 0.040 |
| Firm FE | yes | yes | yes | yes |

Notes: This table shows the panel regression results of expected wage growth (in percent) on the share of valid collective agreements in 12 months in the firms' industries, the expected inflation rate and the interaction term between share of valid collective agreements and inflation expectations. The share of valid collective agreements is a measure defined between 0 and 1, where 0 means that all collective agreements in a given 2-digit industry code are expired (and have to be renegotiated) in 12 months from now, while 1 indicates that all jobs in a given industry are still covered by a valid collective agreement in 12 months. Columns (1) and (2) reports results for firms covered by collective agreement, Columns (3) and (4) for firms that are not. For all specifications include fixed effects at the firm or individual level, respectively. Standard errors in parentheses. p-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

of collective agreements in their industries.

In order to investigate the relevance of this channel, we merge the survey data with external information on the time structure of collective bargaining agreements at the level of the two-digit NACE industries provided by the German Federal Statistical Office. For each industry, this measure captures the share of employment relationships that in twelve months after the survey will be covered by a collective agreement that has already been in place at the time of the survey. Given the fact that most industries are covered by a multitude of different collective agreements, which themselves only cover a subgroup of firms, this measure is defined between "0" and "1", where "0" means that all collective agreements in a given industry are expired in 12 months. In turn, full coverage ("1") indicates that all collective agreements in a given industry are valid in twelve months after the survey date and that all of these agreements are known at the time of the survey.

The results on the role of the duration of collective agreements are reported in Table 3.

Columns (1) and (2) present the results for firms covered by a collective agreement. Column (1) shows that the share of valid agreements in 12 months from now has no statistically significant effect on wage growth expectations of firms. However, Column (2) reports a strongly negative and highly significant interaction effect between expected inflation and the share of valid collective agreements over the next 12 months implying that the pass-through of expected inflation is substantially lower for firms that are still covered by a industry agreement in 12 months. While expected pass-through is only half the size (0.15) among firms in industries with full coverage in 12 months, the firms for which the industry agreement expires within the next 12 months (meaning that the share of valid collective agreements drop to 0) expect a degree of pass-through of 0.3. Even though the coefficient is substantially larger for those firms with expiring collective agreements, pass-through is thus still incomplete and well below 1.

Columns (3) and (4) report the results for firms that are not covered by a collective agreement. In line with our conjecture, the industry-specific share of valid collective agreements does not matter for the pass-through of inflation expectations and the interaction term is statistically insignificant. This implies that pass-through is independent of the duration of industry agreements once firms are not covered by these.

Taken together, our results suggest that the questions whether wages are bargained over at all and, if so, the when these negotiations take place appear to be strongly associated with the degree to which agents expect considerations about future inflation to enter wage growth. Still, pass-through is well below 1 even for those agents that are most likely to actually bargain over wages during the expectation window.

5.2. Pass-through via Job Applications

Next, we investigate potential effects of inflation on-the-job search behavior of employees and how this may interact with pass-through of inflation. The idea is that (the threat of) job-to-job transitions in the spirit of Cahuc et al. (2006) spurs wage growth. Thus, workers thus need a credible outside option in order to bargain for wage increases with their current employer. Using data from the Survey of Consumer Expectations, Pilossoph and Ryngaert (2022) document that currently employed US households who expect higher inflation are more likely to search for jobs and are more likely to have a job-to-job transition over the short term. Pilossoph and Ryngaert (2022) show that their findings are consistent with a search model with search on the job in which wages are set in nominal terms and workers endogenously search for outside offers. To investigate whether a similar effect on job search can also be documented among German employees, we draw on an additional survey question that asks employees about the number of applications they have sent to

other potential employers during the last month.

In contrast to Pilossoph and Ryngaert (2022), we do not find evidence in favor of a positive relationship between employees' inflation expectations and their likelihood to search for a another job among the participants of our surveys. Columns (1) and (2) of Table 4 present the results of a panel estimation, where the dependent variable is a dummy that is one if the employee applied for another job during the previous month. This indicator of on-the-job search is regressed on the expected inflation rate for the next 12 months and the expected unemployment rate in 12 months. Columns (2) through (5) further control for current and expected business conditions of the employer that is elicited from the March 2022 wave onward. Apparently, neither of the two specifications delivers a significantly positive relationship between inflation and on-the-job search. The difference to the evidence of Pilossoph and Ryngaert (2022) from the US could potentially be explained by the fact that the German labor market is more sclerotic and job transition rates are in general much smaller compared to the US.

However, we find that applicants expect substantially higher pass-through of inflation into wage growth. While those participants who have recently applied for another job only expect slightly higher wage growth (+0.4 percentage points), the direct effect depicted in Column (3) of Table 4 is only close to approaching statistical significance ($p < 0.2$). Still, the fact whether an employee has currently applied for another job or not appears to be strongly related to the expected pass-through: those who have recently applied for another job expect a relatively high degree of pass-through of 0.27, which is almost seven times larger than among those who have not searched recently (0.04).

5.3. Evolution of Pass-through over Time

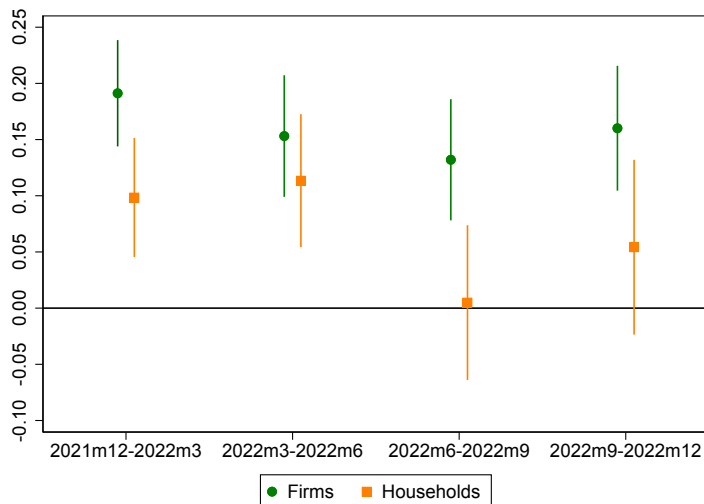
Another potential explanation why pass-through of expected inflation to wages is low among our samples could be related to the specific time period covered by our surveys. There are different arguments why the degree of pass-through could be state-dependent and hence may change over time. For example, Rudd (2022) and Jorda and Nechio (2022) argue that expectations may need to become unanchored, before they influence decision making. Germany, as many other developed countries, has witnessed low and stable inflation rates for various decades, hence the recent surge in inflation might take some time to affect economic decisions, especially if it was perceived as a temporary phenomenon. In addition, our sample period covers the outbreak of the Russian-Ukrainian war, which may have changed participants' mental model of the macroeconomy (e.g., Andre et al., 2022) and may have induced stagflationary views. As Germany is a net importer of energy products, the surge in energy prices caused a strong drop in the terms-of-trade of the German economy (Nierhaus and

Table 4: Pass-through for Employees: The Role of on-the-Job Search

| | (1) | (2) | (3) | (4) |
|--------------------------------------|---------------------|---------------------|----------------------|----------------------|
| | 1(Job Search) | | Expected Wage Growth | |
| Exp. infl. rate | 0.039 (0.057) | -0.142 (0.110) | 0.065*** (0.017) | |
| Exp. infl. \times 1(Job search) | | | | 0.265*** (0.043) |
| Exp. infl. \times 1(No job search) | | | | 0.039** (0.018) |
| 1(Job search) | | | 0.411 (0.278) | -1.715*** (0.505) |
| Expected unempl. rate | 0.052 (0.069) | 0.073 (0.127) | 0.038* (0.020) | 0.036* (0.020) |
| Business conditions | | -0.429 (0.613) | 0.012 (0.095) | 0.010 (0.095) |
| Business expectations | | -0.062 (0.549) | 0.119 (0.085) | 0.112 (0.085) |
| Constant | 6.930*** (0.603) | 8.632*** (1.179) | 1.946*** (0.185) | 2.166*** (0.189) |
| Observations | 11006 | 5294 | 5294 | 5294 |
| R. sq. (within) | 0.000 | 0.001 | 0.009 | 0.016 |
| Ind. FE | yes | yes | yes | yes |
| Sample period | 12/20 - 12/22 | 03/22 - 12/22 | 03/22 - 12/22 | 03/22 - 12/22 |

Notes: The dependent variable is an indicator for on-the-job search that is one if the employee applied for another job during the previous month in Columns (1) and (2) and expected wage growth during the next twelve months (in percent) in Columns (3) and (4). These variables are regressed on the expected inflation rate for the next 12 months and the expected unemployment rate in 12 months. Columns (2) through (5) further control for current and expected business conditions of the employer that is elicited from the March 2022 wave onward. Columns (3) and (4) control for the indicator for on-the-job search, which is also interacted with the expected inflation rate in Column (4). All specifications include fixed effects at the individual level. Standard errors in parentheses. Levels of significance : * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure 2: Evolution of Degree of Pass-through over Time



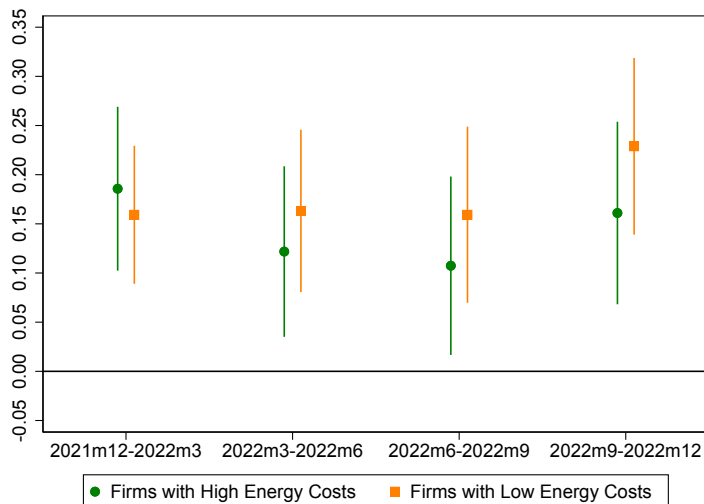
Notes: This coefficient plot presents the coefficient of a first-difference estimation for the pass-through of inflation expectations to wage growth expectations between any two consecutive survey waves estimated among firms (green dots) and employees (orange squares). The vertical lines correspond to the 95% confidence intervals.

Wollmershäuser, 2022). In this environment, negotiators on both sides of the bargaining table might agree that there is online limited scope for wage increases, hence lowering the degree of pass-through of expected inflation.

Both arguments suggest that the degree of pass-through could have become stronger over the sample period of our survey. Related to the first argument, realized CPI inflation as well as inflation expectations have increased over the sample period (c.f., Figure 1), making unanchoring of price expectations more likely. Moreover, the outbreak of the Ukrainian war in February 2022 corresponds to the earlier phase of our sample period. Towards the end of 2022, the economic consequences of the war on the German economy were much clearer and the resulting economic downturn materialized to be much softer than previously expected by many experts in spring/summer 2022.

Evolution of Pass-Through across Survey Waves For this purpose, we investigate how the relationship between inflation and wage growth expectations evolves over the sample period. Conceptually in line with the fixed effects estimator presented in Columns (1) and (3) of Table 1, we regress the first-difference in wage growth expectations on the first difference in inflation expectations separately for each pair of consecutive survey waves. Figure 2 plots the respective pass-through coefficients. The results suggest that the relationship between inflation and wage growth expectations has not become stronger over time. For firms, the

Figure 3: Evolution of Degree of Pass-through over Time by Share of Energy Costs



Notes: This coefficient plot presents the coefficient of a first-difference estimation for the pass-through of inflation expectations to wage growth expectations between any two consecutive survey waves estimated among firms with a high share of energy costs (green dots) and a low share of energy costs (orange squares) to revenues. The vertical lines correspond to the 95% confidence intervals.

coefficient is largely the same over the sample period. For employees, if anything, the relationship got weaker over time. Hence, pass-through appears not to have become stronger over time once the surge in inflation became more salient and the economic consequences of the Russian invasion of Ukraine turned out to be less adverse.

Effect of Adverse Economic Shocks due to Ukrainian-Russian War Moreover, we investigate the influence of the adverse economic shocks in consequence of the Russian invasion of Ukraine in February 2022 and the resulting energy crisis on the degree of expected pass-through among firms. For this purpose, we exploit several measures that capture the degree of firms' exposure to the crisis that were elicited in the April 2022 wave of the IBS. These measures include the pre-crisis share of energy costs to revenues and the expected effect of the crisis on firms' output in 2022.

The results suggest that pass-through does not strongly vary across firms reporting different exposure to the crisis. Similar to Figure 2 above, Figure 3 plots the pass-through coefficients for each pair of consecutive survey waves, distinguishing between firms with a high share and a low share of energy costs. We do not find statistically significant differences in the expected pass-through coefficient for firms more exposed to the surge in energy prices over time. Similarly, Figure A.3 in the Appendix shows that firms reporting negative economic consequences of the Russian-Ukrainian war on their sales exhibit a similar pass-

through coefficient as firms that do not. Taken together these findings, the adverse economic shocks in the course of 2022 are unlikely to have dampened the pass-through of expected inflation to wages in an economically significant way.

5.4. The Role of Past Inflation and the Horizon of Inflation Expectations

Time might play an alternative role in how agents perceive the “need” for adjusting wages. Wage growth expectations over the next 12 months might be not only determined by one-year ahead inflation expectations, but might also be affected by inflation dynamics in the past or the expected price evolution far in the future. On the one hand, agents’ perceived link between prices and wages might be backward-looking, i.e., wage changes may correct for realized real wage losses induced by past inflation instead of expected real wage losses. This might be particularly relevant if realized inflation rates much higher than expected at the time of the last wage negotiation, which has arguably been the case during our sample period. On the other hand, agents might expect that high inflation is only transitory. If wage changes are sticky, only long-term inflation expectations should matter.

Forward- vs. Backward-Looking Pass-through First, we investigate the extent to which respondents’ expected wage growth is backward-looking, i.e., reacts to current inflation realizations. To this end, we test how wage growth expectations are correlated with the current inflation rate and whether variation in the expected inflation rate for the next 12 months remains its explanatory power after controlling for current realized rates. For this purpose, we run horse-race regressions between the respondents’ expected inflation rates and one of two measures of the current inflation rate: Either the official CPI inflation rate in the month prior to the survey, i.e., the latest available information on inflation published by the Federal Statistical Office, or respondents’ perceived current inflation rate, which is only elicited in the household survey. By definition, the former measure is constant across participants at a given point in time, while the latter varies across the survey respondents.

Table 5 shows that, after controlling for the current inflation realization, the pass-through coefficient of expected inflation remains positive and significant, but is somewhat lower compared to the baseline results for both firms (0.16, Column (2)) and employees (0.05, Column (4)). The coefficient on the latest realized official inflation rate is of comparable order of magnitude in both samples: An increase of current inflation of one percentage point is associated with an increase in expected wage growth during the next twelve months by 0.17 percentage points among firms and 0.16 percentage points among employees. Column (5) of Table 5 suggests that employees’ wage growth expectations are also more responsive to their current perceived inflation rather than their inflation expectations. Overall, pass-

Table 5: Forward- vs. Backward-Looking Pass-through

| | Expected Wage Growth next 12 Months | | | | |
|---------------------------|-------------------------------------|---------------------|---------------------|---------------------|---------------------|
| | (1) | (2) | (3) | (4) | (5) |
| | Firms | | Employees | | |
| Infl. exp. | 0.231*** (0.011) | 0.161*** (0.013) | 0.100*** (0.013) | 0.054*** (0.014) | 0.048*** (0.015) |
| Actual infl. last obs. | | 0.165*** (0.015) | | 0.156*** (0.023) | |
| Past perceived infl. rate | | | | | 0.108*** (0.015) |
| Constant | 2.952*** (0.080) | 2.249*** (0.101) | 1.853*** (0.105) | 1.133*** (0.150) | 1.598*** (0.111) |
| Observations | 14145 | 14145 | 6764 | 6764 | 6764 |
| R. sq. (within) | 0.041 | 0.053 | 0.013 | 0.023 | 0.024 |
| Ind./Firm FE | yes | yes | yes | yes | yes |

Notes: This table shows the panel regression results of expected wage growth (in percent) on the expected inflation rate for the next 12 months and one of two measures on the current inflation rate: Either the official CPI inflation rate in the month prior to the survey, i.e., the latest available information on inflation published by the Federal Statistical Office, or respondents' perceived current inflation rate (elicited in the household survey, only). All specifications include fixed effects at the firm or individual level, respectively. Standard errors in parentheses. Levels of significance : * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

through seems to be rather backward-looking than forward-looking for employees, while for firms the coefficients on inflation expectations is of comparable order of magnitude as the coefficient on the current CPI inflation rate.

The results could suggest that past inflation has explanatory power beyond their effect on inflation expectation, which might indicate that wage setting lags behind inflation and employees want to be compensated for past (perceived) decreases in real wages rather than for expected future inflation. Relatedly, this could also reflect the fact that at time of wage negotiations both firms and employers by nature face a higher degree of uncertainty regarding the future development of inflation compared to already realized past and current inflation rates and might hence put larger weight on the latter.

Short-run vs. Long-run Inflation Expectations We can also look at the potential role of long-term inflation expectations. For this purpose, we elicited the 5-year ahead inflation expectations of firms and employees in the survey waves of June 2022 and December 2022. Table 6 shows the results of horse-race regressions between short-term and long-term inflation

Table 6: Short-run vs. Long-run Forward-Looking Pass-through

| | Expected Wage Growth next 12 Months | | | | | |
|---------------------|-------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Firms | | | Employees | | |
| Infl. exp. 1y ahead | 0.104*** (0.035) | | 0.101*** (0.035) | 0.050 (0.040) | | 0.044 (0.042) |
| Infl. exp. 5y ahead | | 0.020 (0.020) | 0.009 (0.020) | | 0.028 (0.036) | 0.016 (0.038) |
| Constant | 4.081*** (0.271) | 4.783*** (0.107) | 4.060*** (0.275) | 2.624*** (0.367) | 2.879*** (0.260) | 2.562*** (0.396) |
| Observations | 5415 | 5415 | 5415 | 2352 | 2352 | 2352 |
| R. sq. | 0.005 | 0.001 | 0.005 | 0.002 | 0.001 | 0.003 |
| Ind./Firm FE | yes | yes | yes | yes | yes | yes |

Notes: This table shows the panel regression results of expected wage growth (in percent) on the expected inflation rate for the next 12 months and 5 years ahead. All specifications include fixed effects at the firm or individual level, respectively. Standard errors in parentheses. Levels of significance : * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

expectations for the two survey waves. Strikingly, the results do not deliver a positive correlation of long-run inflation expectations on one-year ahead expected wage growth over and above the effect of short-run inflation expectations (Column (3) and (6)). Moreover, the pass-through coefficient of short-term (1-year ahead) inflation expectations to wage growth expectations does not change considerably once controlling for long-term expected inflation.

Alternatively, we can also examine whether the degree of pass-through of expected short-term inflation to wage expectations varies interacts with the level of long-term inflation expectations. Pass-through might be different between agents that expect the inflation surge to be temporary and agents that belief inflation will be permanently higher, as the latter might perceive a larger need to adjust wages over the next 12 months given the stickiness of wages. To this end, we compare participants with on average high levels (above 4.5%) and low levels (below 4.5%) of long-term inflation expectations. Table A.4 in the Appendix indicates that pass-through of short-term expected inflation to wage expectations does not vary strongly with the degree of long-term inflation expectation. If anything, the pass-through seems to be stronger among firms and employees with low levels of long-term expected inflation.

6. Conclusion and Outlook

[To be written.]

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A. Appendix

A.1. Additional Tables and Figures

Table A.1: Firms' Wage Growth and Inflation Expectations: Summary Statistics

| | Survey Wave | Mean | Median | std. | p1 | p10 | p25 | p75 | p90 | p99 |
|----------------------|-------------|------|--------|------|------|------|------|-------|-------|-------|
| Expected wage growth | 2021:M12 | 3.53 | 3.00 | 2.92 | 0.00 | 0.00 | 2.00 | 4.70 | 6.00 | 15.00 |
| Expected wage growth | 2022:M03 | 4.27 | 3.80 | 3.59 | 0.00 | 0.00 | 2.30 | 5.00 | 8.00 | 20.00 |
| Expected wage growth | 2022:M06 | 4.75 | 4.50 | 3.63 | 0.00 | 0.00 | 3.00 | 6.00 | 10.00 | 20.00 |
| Expected wage growth | 2022:M09 | 5.21 | 5.00 | 3.76 | 0.00 | 0.00 | 3.00 | 7.00 | 10.00 | 20.00 |
| Expected wage growth | 2022:M12 | 5.00 | 5.00 | 3.31 | 0.00 | 0.00 | 3.00 | 6.50 | 9.00 | 15.00 |
| Expected inflation | 2021:M12 | 4.44 | 4.00 | 1.95 | 2.00 | 2.80 | 3.00 | 5.00 | 6.00 | 12.00 |
| Expected inflation | 2022:M03 | 6.28 | 6.00 | 2.48 | 2.10 | 4.00 | 5.00 | 7.00 | 9.00 | 15.00 |
| Expected inflation | 2022:M06 | 7.52 | 7.00 | 2.59 | 3.00 | 5.00 | 6.00 | 8.50 | 10.00 | 20.00 |
| Expected inflation | 2022:M09 | 8.65 | 8.00 | 2.89 | 3.50 | 5.00 | 7.00 | 10.00 | 12.00 | 20.00 |
| Expected inflation | 2022:M12 | 7.94 | 8.00 | 2.58 | 3.00 | 5.00 | 6.00 | 9.00 | 10.00 | 20.00 |
| Realized wage growth | 2022:M12 | 4.69 | 4.00 | 4.11 | 0.00 | 0.00 | 2.30 | 5.80 | 10.00 | 20.00 |

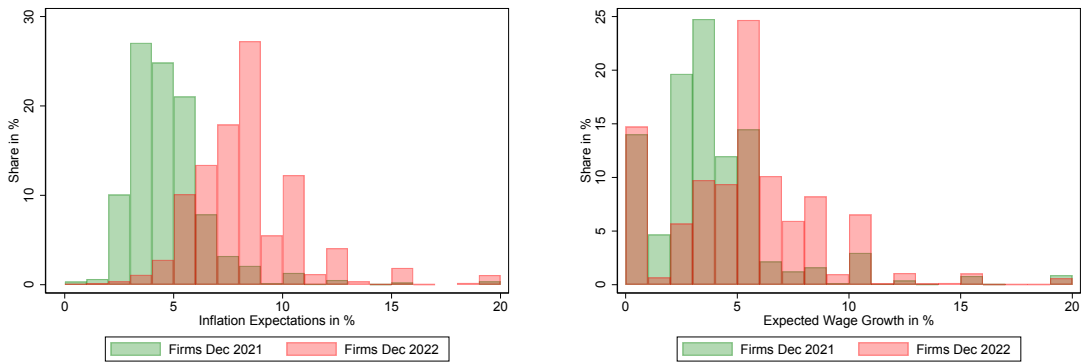
Notes: This table presents summary statistics of expected wage growth for the next 12 months and expected inflation during the next 12 months for each wave of the firm survey. The table also shows realized wage growth over the last 12 months in December 2022.

Table A.2: Employees' Wage Growth and Inflation Expectations: Summary Statistics

| | Survey Wave | Mean | Median | std. | p1 | p10 | p25 | p75 | p90 | p99 |
|----------------------|-------------|------|--------|------|------|------|------|-------|-------|-------|
| Expected wage growth | 2021:M12 | 2.05 | 1.00 | 3.45 | 0.00 | 0.00 | 0.00 | 3.00 | 5.00 | 20.00 |
| Expected wage growth | 2022:M03 | 2.37 | 1.00 | 4.07 | 0.00 | 0.00 | 0.00 | 3.00 | 6.00 | 20.00 |
| Expected wage growth | 2022:M06 | 2.97 | 2.00 | 4.21 | 0.00 | 0.00 | 0.00 | 4.00 | 6.00 | 20.00 |
| Expected wage growth | 2022:M09 | 2.89 | 2.00 | 4.03 | 0.00 | 0.00 | 0.00 | 4.00 | 7.00 | 20.00 |
| Expected wage growth | 2022:M12 | 3.19 | 2.00 | 4.11 | 0.00 | 0.00 | 0.00 | 5.00 | 8.00 | 20.00 |
| Expected inflation | 2021:M12 | 5.28 | 5.00 | 3.42 | 1.00 | 2.50 | 3.50 | 5.50 | 8.00 | 20.00 |
| Expected inflation | 2022:M03 | 7.06 | 6.00 | 4.43 | 1.00 | 3.00 | 5.00 | 8.00 | 12.00 | 20.00 |
| Expected inflation | 2022:M06 | 8.69 | 8.00 | 4.01 | 1.50 | 5.00 | 6.00 | 10.00 | 15.00 | 20.00 |
| Expected inflation | 2022:M09 | 9.72 | 9.00 | 4.07 | 2.00 | 5.00 | 7.50 | 10.80 | 15.00 | 20.00 |
| Expected inflation | 2022:M12 | 9.66 | 9.50 | 3.86 | 1.00 | 5.00 | 7.50 | 11.00 | 15.00 | 20.00 |
| Realized wage growth | 2022:M12 | 2.80 | 2.00 | 3.94 | 0.00 | 0.00 | 0.00 | 3.50 | 6.00 | 20.00 |

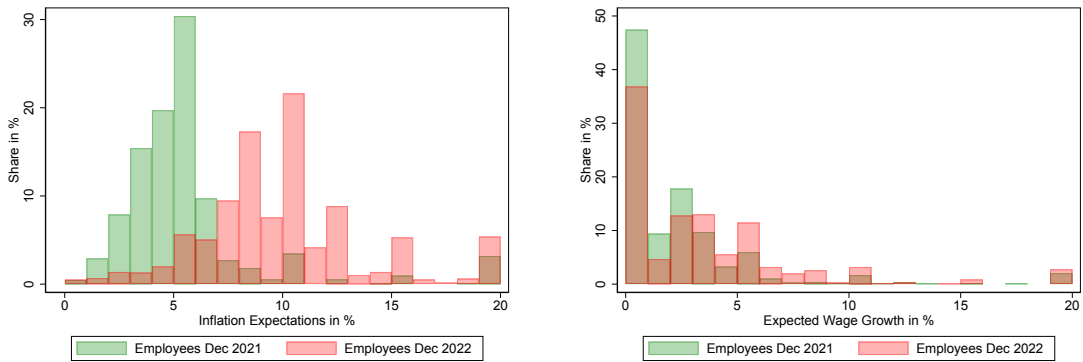
Notes: This table presents summary statistics of expected wage growth for the next 12 months and expected inflation during the next 12 months for each wave of the household survey, where the sample is restricted to employed respondents. The table also shows realized wage growth over the last 12 months in December 2022.

Figure A.1: Change in Distributions of Inflation and Wage Growth Expectations over Time



(a) Firms' Inflation Expectations

(b) Firms' Expected Wage Growth

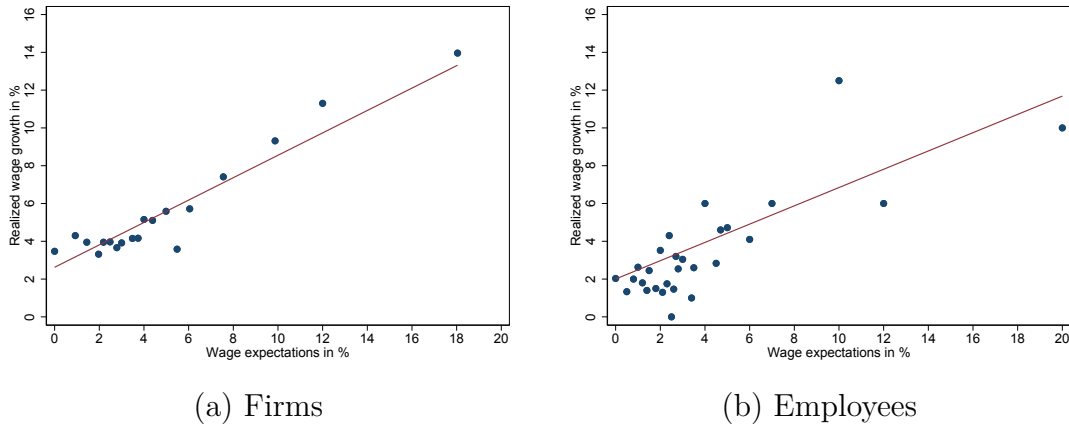


(c) Households' Inflation Expectations

(d) Households' Expected Wage Growth

Notes: This figure displays the distribution of firms' and employees' expectations regarding CPI inflation in Germany over the next 12 months (Panels a and c, respectively) and expected growth in gross wages growth over the next 12 months (Panels b and d, respectively) elicited in December 2021 (green) and December 2022 (red). For firms, expected gross wage growth refers to a "typical" employee in the firm with average qualification, tenure, and job profile.

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



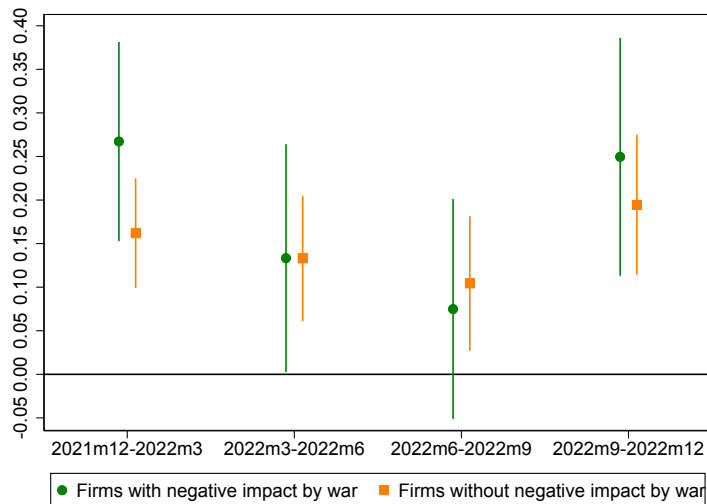
Notes: This binscatter plot displays the relationship between ex-ante expected and ex-post realized wage growth at the level of firms (a) and employees (b). The ex-ante expected wage growth for the next 12 months, which is depicted on the x-axis, was elicited in the December 2021 wave. The ex-post realized wage growth during the same period of 12 months captured by the y-axis stems from the same firms and employees and has been reported in the December 2022 wave.

Table A.3: Expectations Regarding Extensive Margin of Wage Adjustment: Intention to Bargain over Wages

| | Intention to Bargain over Wages in next 12 Months | | | |
|-----------------------|---|----------------------|----------------------|----------------------|
| | (1) | (2) | (3) | (4) |
| | Firms | | Employees | |
| Expected infl. rate | 1.060*** (0.191) | 0.914*** (0.195) | 0.248 (0.170) | 0.242 (0.174) |
| Expected unempl. rate | | 0.732*** (0.274) | | 0.035 (0.200) |
| Business state | | 1.350* (0.742) | | 0.181 (0.967) |
| Business expectations | | -1.525*** (0.549) | | 0.337 (0.866) |
| Constant | 64.473*** (1.483) | 60.998*** (2.033) | 21.751*** (1.513) | 21.564*** (1.858) |
| Observations | 10651 | 10651 | 5294 | 5294 |
| R. sq. (within) | 0.004 | 0.007 | 0.001 | 0.001 |
| Firm/Ind. FE | yes | yes | yes | yes |
| Mean dep. var. | 72.81 | 72.81 | 23.88 | 23.88 |

Notes: This table shows the regression results of the intention to bargain over wages (available from March 2022 onwards) on the expected inflation rate, the expected unemployment rate, and the currently realized and expected future development of business conditions. Specifically, firms are asked whether they expect their employees to ask for pay raises more often than usual in the next twelve months and employees whether they plan to ask for an for an additional, unscheduled salary increase in the next 12 months or not. For households, realized and expected business conditions refer to their firm of employment. Standard errors in parentheses. p-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure A.3: Evolution of Degree of Pass-through over Time by Impact of Russian-Ukrainian War



Notes: This coefficient plot presents the coefficient of a first-difference estimation for the pass-through of inflation expectations to wage growth expectations between any two consecutive survey waves estimated among firms reporting a negative impact by the Russian-Ukrain war on their sales (green dots) and firms that do not (orange squares). The vertical lines correspond to the 95% confidence intervals.

Table A.4: Heterogeneity in the Pass-through: The Role of Long-term Inflation Expectations

| | Expected Wage Growth next 12 Months | |
|----------------------------------|--|---------------------|
| | (1) Firms | (2) Employees |
| Exp. infl. x high long-term exp. | 0.218*** (0.016) | 0.088*** (0.015) |
| Exp. infl. x low long-term exp. | 0.245*** (0.016) | 0.135*** (0.028) |
| Constant | 2.958*** (0.084) | 1.886*** (0.112) |
| Observations | 13344 | 6101 |
| R. sq. | 0.041 | 0.014 |
| Ind./Firm FE | yes | yes |

Notes: This table shows the panel regression results of expected wage growth (in percent) on the expected inflation rate for the next 12 months, distinguishing between participants that have on average high (above 4.5 percent) and low (below 4.5 percent) long-term inflation expectations. All specifications include fixed effects at the firm or individual level, respectively. Standard errors in parentheses. Levels of significance : * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.