Low Pass-Through from Inflation Expectations to Income Growth Expectations: Why People Dislike Inflation[*]

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Abstract

Using a large, nationally representative survey of US consumers, we estimate a causal 20 percent pass-through from inflation expectations to income growth expectations for the average consumer, with considerable heterogeneity in pass-through associated with socio-demographic factors. The results also indicate that higher inflation expectations cause an increase in consumers' likelihood to search for higher-paying jobs but do not change the likelihood of asking for a raise, suggesting that consumers recognize significant wage rigidity with their current employer. In a calibrated search-and-matching model, we find that demand and supply shocks combined with incomplete pass-through produce a strong negative relationship between expected inflation and expected utility. Taken together, the survey results and model analysis provide a labor market account of why people dislike inflation.

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1 Introduction

The rapid economic recovery in the US from the COVID-19-induced recession was characterized by the highest inflation rates seen in the last forty years. These high inflation readings were accompanied by increases in inflation expectations and strong wage gains in tight labor markets, raising concerns about the potential for a wage-price spiral driven by expectations (e.g., Curtin (2022); Blanchard (1986)).[1] However, disentangling the causal effect of inflation expectations on income growth expectations is challenging because these concepts should be related in general equilibrium.[2] More generally, while the literature on expectations formation has made progress in examining how expectations respond to information treatments, it has made less progress in understanding how individuals perceive the relationship between different expected variables.

This paper sheds new light on these issues by investigating the causal relationship between inflation expectations and income growth expectations, and how those expectations affect labor market decisions, in the context of a randomized controlled trial (RCT) for a large, nationally representative survey of the US population. Three findings emerge. First, inflation expectations causally affect income growth expectations but pass-through from the former to the latter is far less than one-for-one, on the order of 20 percent. Second, higher inflation expectations cause a rise in the probability that consumers will search for a new job that pays more but do not affect the likelihood that they will negotiate for a higher wage with their current employer. This finding is consistent with consumers' recognition of substantial nominal wage rigidity with their current employer.[3] Third, a canonical search-and-matching model calibrated to fit our empirical findings shows that low pass-through from expected inflation to expected income growth is consistent with consumers' beliefs that higher future inflation will reduce their expected utility. Taken together, the survey results and model analysis formalize a labor market channel underlying consumers' aversion to inflation.

Our empirical findings primarily come from a survey experiment fielded by the decision intelligence company Morning Consult in March 2022, at a time when inflation expectations and inflation concerns were starting to rise to notable levels, and before inflation had clearly begun to turn back down.[4] The embedded experimental module consisted of four parts. The first part

[1] See Lorenzoni and Werning (2023) for a theoretical analysis on the wage-price spiral in the context of a New Keynesian model.

[2] See, for example, Werning (2022) for a discussion on the challenges related to pinning down the pass-through from inflation expectations to current inflation.

[3] The recent finding of Jäger et al. (2023) that workers wrongly anchor their beliefs about outside options on their current wage speaks to the role that perceived nominal wage rigidity plays for workers' income growth expectations.

[4] We also performed a pilot in January 2022 as well as a follow-up exercise in September 2022 that confirmed the results from March.

elicited inflation expectations and income growth expectations over the next 12 months prior to any experimental treatments.[5] The second part consisted of an RCT that allowed us to provide information to respondents on two key objects, inflation or income growth, to determine the causal relationship between inflation expectations and income growth expectations. In particular, we randomly assigned information treatments to six groups: one control group; one placebo group; three groups that received different information on inflation; and one group that received information on wage growth, which is the primary source of income growth for most consumers.

Following the treatments, the third part of the experiment re-elicited inflation expectations and income growth expectations. This experimental step allows us to measure how consumers' posterior expectations of inflation and income growth react to information treatments while conditioning on their prior expectations. Specifically, the resulting exogenous, experimentally induced variation in posterior inflation expectations then allows us to estimate the causal impact on income growth expectations. We find that a 1.0 percentage point increase in inflation expectations increases income growth expectations, but only by 0.2 percentage point – implying an expected decrease in real income growth of 0.8 percentage point. There is, however, considerable variation in pass-through associated with socio-demographic characteristics. While the extent of pass-through is high and statistically significant for higher-income respondents, it is low and statistically insignificant for lower-income respondents, a finding that is consistent with the former group believing it is better protected from increases in expected inflation than the latter group. We also find a larger pass-through point estimate for male respondents than for female respondents.[6] It is important to note, however, that pass-through remains incomplete and is well below one-for-one in all cases.

Finally, the fourth part of our survey asks respondents about the likelihood they would pursue different labor market actions over the following year to increase their incomes and potentially offset the effects of inflation. Exploiting the exogenous variation in beliefs once again for estimation purposes, we find that higher inflation expectations moderately increase the perceived likelihood that an individual applies for another job paying a higher wage.[7] However, higher inflation ex-

[5] We ran robustness exercises with different prior question wordings to mitigate any concern about particular wording, finding no statistical difference depending on the specific prior.

[6] Our result is consistent with evidence in the literature that highlights different characteristics in the labor market for women and men. For instance, Biasi and Sarsons (2022) find that in the US, women engage less frequently in pay negotiations, whereas Card, Cardoso, and Kline (2016) find that, in Portugal, women are less likely to work at firms where workers have high bargaining power.

[7] Pilossoph and Ryngaert (2023) find that higher inflation expectations are correlated with the likelihood that workers will search for other jobs in the short term.

pectations do not increase the perceived likelihood of two other labor market actions: working longer hours or asking for a raise from a current employer. These results suggest that consumers' mental model (see, for example, Andre et al. (2022) for a general study of subjective models) incorporates the belief that there is a high degree of nominal wage rigidity associated with their current employer.

To evaluate the importance of our findings for the dynamic adjustment process of variables within a structural framework, we adapt a relatively standard New Keynesian model with search-and-matching in labor markets as in Mortensen and Pissarides (1994). We also view this exercise as an opportunity to determine the extent to which a canonical model can fit our empirical facts. The model features several frictions. Motivated by the observation that the provision of publicly available information moves consumers' expectations which contrasts with a full-information rational expectations view of the world, we allow for sticky information in the inflation expectations formation process, similar to Mankiw and Reis (2002). In a novel interpretation of how information stickiness can play out, we calibrate the degree of information stickiness to be consistent with the estimated effect that new information from treatments has on our respondents' inflation expectations.[8] In addition, matching our survey findings requires sluggish wage adjustment. We model wage rigidity as infrequent nominal wage renegotiation in a Calvo (1983) fashion, calibrated to match our estimate of empirical pass-through as a moment.[9] Finally, to capture the impact of inflation expectations on labor market actions, we assume that workers who cannot renegotiate their wages and who apply for other jobs due to higher inflation expectations generate an outside contract with certainty. This wage-push factor puts upward pressure on their nominal wage with the current employer, with an elasticity that we calibrate to match our empirical findings.

Given this setup, we then highlight the responses of key macroeconomic variables in this setup to a positive demand shock and a positive (adverse) supply shock that are meant to broadly capture the prevailing inflationary disturbances in the US economy at the time of our survey in early 2022. We find that nominal wage rigidity plays a crucial role in driving the dynamics of macroeconomic variables within the model. When we subject the model to an inflationary demand shock, this rigidity causes a decline in real wages relative to a counterfactual of full pass-through from inflation expectations to expected nominal wage growth. When we subject the model to an inflationary supply shock, sticky wages temper the movements in real wages compared to the counterfac-

[8] We find that the degree of information stickiness is about 0.28.

[9] We would note that, in contrast to the experiment in our survey, it is impossible within the model setting to isolate the causal effect of inflation expectations on income growth expectations.

tual of full pass-through. In both cases, the responses of real wages under imperfect pass-through help to amplify the fluctuations in output and consumption, generating additional volatility in the wake of the original shock. Moreover, the model predicts that greater wage rigidity produces a stronger negative relationship between inflation expectations and expected utility regardless of whether we look at supply or demand shocks. This latter result is particularly important because it identifies a labor market channel that can explain why consumers dislike inflation.[10]

The rest of the paper is organized as follows. Section 2 discusses works related to our paper. Sections 3 and 4 provide a detailed description of our experiment and its implementation, respectively. Section 5 explains our identification strategy and presents the main empirical findings. Section 6 gives a brief overview of the model, our calibration strategy, and the macroeconomic implications of the model. Section 7 concludes.

2 Literature Review

Our paper is related to the growing literature that focuses on survey data to understand how economic agents form expectations about key variables such as inflation; see, e.g., Coibion and Gorodnichenko (2015), Bordalo et al. (2020), Coibion, Gorodnichenko, and Ropele (2020b), Angeletos, Huo, and Sastry (2021), and Coibion, Gorodnichenko, and Weber (2022), among many others. Relying on the overwhelming evidence of imperfect information presented by this branch of the literature, our paper uses information treatments to exogenously vary beliefs about expected inflation and expected income growth and then uses the variation to estimate the causal link between these two variables.

Another area of interest concerns the issue of public attitudes about inflation, where our survey results and model exercise provide deeper theoretical and empirical insights into the question of *why* consumers and firms associate higher inflation expectations with lower output and well-being. For example, Shiller (1997) and Candia, Coibion, and Gorodnichenko (2020) provide evidence consistent with our results, though that evidence is non-causal. Other studies, such as Savignac et al. (2021), look at the relationship between firms' inflation expectations and wage expectations (through the lens of the latter as a cost of production), finding a low correlation in the case of France. We complement these findings by providing evidence from the consumers' point of view of a causal relationship from inflation expectations to income growth expectations.

[10]Following a *one-time* exogenous shock occurring in the present period, realized inflation h periods ahead co-moves with current expectations about inflation h periods ahead, in the presence of information stickiness. Therefore, within the context of the model, we refer to the two variables interchangeably.

We also consider various labor market actions that consumers may endogenously undertake to affect their income growth. Our empirical evidence shows that frictions in nominal wages and the limited pass-through from inflation expectations to income growth expectations can explain why consumers associate higher inflation with worse economic outcomes, without the reliance on behavioral biases or inattention as in Kamdar (2019). While this negative association seems straightforward from a supply-side view, the perceived frictions affecting nominal incomes found in the empirical analysis help explain why consumers associate inflation with worse economic outcomes even in the presence of demand shocks.

Our paper is also related to the New Keynesian body of literature that incorporates Mortensen and Pissarides (1994) types of labor market search-and-matching frictions. Our model is largely adapted from papers such as Trigari (2006), Christoffel and Kuester (2008), Christoffel, Kuester, and Lizert (2009), and Gertler and Trigari (2009). In contrast to these papers, we calibrate the model, namely, the nominal wage stickiness and elasticity of the wage-push factor with respect to inflation expectations, to match our new empirical facts.[11] Papers such as Christiano, Eichenbaum, and Evans (2005), Smets and Wouters (2007), and Gali, Smets, and Wouters (2012) have shown that wage rigidities play an important role in explaining US aggregate data. Our paper provides additional evidence that wage rigidity is deeply embedded in consumers' inflation and income growth expectations, at least as of the time of our survey in 2022, amid a period of elevated inflation.

3 Experimental Description

To quantify the causal relationship between inflation expectations, income growth expectations and labor market decisions, we design a randomized controlled trial (RCT) and embed it within an established consumer survey. While the next section outlines the details of the survey implementation, the structure of the embedded experimental component has four main parts.

First, the survey elicits initial inflation expectations and income growth expectations from all respondents ("priors"). Second, participants are randomly assigned to a group and either receive the information treatment for that group or no information if they are in the control group. Third, the survey re-elicits expectations ("posteriors") about inflation and income growth. Fourth, to conclude, we collect information about expected labor market decisions.

In the second step, participants are randomly divided into six groups, including a control

[11] The assumption of a wage-push factor plays a similar role to within-quarter job-to-job transition probabilities being affected by inflation expectations. Krusell et al. (2017), for instance, consider within-period job-to-job transitions with a fixed probability.

group, with each participant in those groups receiving the same treatment.

1. Control (receives no information). (N=1,075)
2. The Federal Reserve targets an inflation rate of 2% per year in the long run. (N=1,155)
3. A recent survey from the Conference Board found that wages were expected to rise 3.9% in 2022. (N=1,093)
4. Between January 2021 and January 2022, the Consumer Price Index (CPI), which measures the average change in prices over time that consumers pay for goods and services, showed the inflation rate in the US was 7.5%. (N=1,112)
5. According to the Survey of Professional Forecasters, the Consumer Price Index (CPI), which measures the average change in prices over time that consumers pay for goods and services, showed the inflation rate will be 3.7% by the end of 2022. (N=1,074)
6. According to the US Census Bureau, the United States population was 332,402,978 as of December 31, 2021. (N=1,120)

Treatment 2 aims to inform respondents about the price stability objective of the Federal Reserve and potentially influence their long-run inflation expectations. Treatment 3 provides information about a forecast of future aggregate wage growth. Treatment 4 provides information about past inflation that may affect future inflation expectations as well as perceived real income in case the reported inflation rate was not known. Treatment 5 provides information about a forecast of future aggregate inflation. Last, treatment 6 provides information that should not be relevant and is intended to work as a placebo, allowing us to determine whether consumers react to receiving any information. A priori, we would expect that information about aggregate wage growth in treatment 3 could affect an individual's expected wage growth, while information about aggregate inflation in treatments 2, 4, and 5 could affect the individual's inflation forecast.

In addition to these questions, the survey asks respondents about labor market decisions. This latter set of questions includes an open-ended answer option, which aims to record any further decisions that survey respondents might offer but were not included into the set of possible answer choices.

The overall order of the experiment can be summarized as follows:

1.a **Prior Inflation**: Inflation expectations wording 1 ("Indirect measure of inflation expectations question")

1.b **Prior Wages**: Income growth expectations wording 1 ("Income over the next year question")

2. **Information Treatment or Control**

3.a **Posterior Inflation**: Inflation expectations wording 2 ("Prices in general inflation expectations question")

3.b **Posterior Wages**: Income growth expectations 2 ("Income December 2022-December 2023 question")

4. **Actions**: Options about labor market outcomes question

With this simple treatment-control design we are able to determine the causal effect of treatment-induced variation in inflation expectations and wage growth expectations on each of the posterior responses – our main variables of interest – and labor market actions. For example, when we induce variation in inflation expectations, we can then measure, relative to the control group, to what extent income growth expectations move. Prior expectations in this design serve to capture differences in respondent information sets before any treatments are applied. The methodology section below details how we use the elicited prior and posterior expectations to exactly quantify the treatment effects.

A notable feature of the implementation of our experiment lies in the use of prior and posterior expectations questions (for example, "Inflation expectations wording 1" vs. "Inflation expectations wording 2" in the above summary) that slightly differ in their wording, which we specify precisely in the next section. While one would ideally use identical prior and posterior question wording, several survey design considerations favor a design that features a slight wording variation. First, respondents exposed to the same question twice might want to be particularly consistent. Such a potential behavioral survey-taking response counteracts the attempt to impose treatments and measure their effects. Second, respondents might think that the survey designers are playing with them or "testing" them, especially in the case of the control group were they to receive the identical question twice in short succession without any intervening information. Such respondent reactions raise further concerns about the validity of the information elicited. Because of these considerations, it is preferable to use a question that measures beliefs of consumers without repeating the exact same question.[12] The key criterion for the choice of wording – one that

[12]In line with such general considerations, most papers in the expectations measurement literature indeed use questions to elicit the priors that are different from the questions used to elicit the posteriors, meaning that the priors and posteriors are not directly comparable. For example, Weber et al. (2023) describe many RCTs on firms and consumers in different countries. They describe the use of priors different from posteriors such as distributional questions about inflation expectations in some cases, or past inflation in others.

we verify in our implementation below – is that responses to the prior wording and the posterior wording capture highly correlated information so we can systematically control for prior expectational information sets. As long as the prior question contains information that is relevant to form the posterior, we can use it as a benchmark, to measure whether respondents used information from the treatment to form the posterior, compared to the control group. In case the treatment breaks the relationship between prior and posterior, we can use that variation to estimate the effect of the posterior on other variables.

The next section details the implementation of our experimental design.

4 Implementation

Our main experiment was implemented in a survey in March 2022, when CPI inflation in the US was rising and reached a level of 8.5 percent.[13] Prior to this survey, we performed a short exercise as a proof of concept in January 2022 where we only asked respondents the prior questions for their inflation expectations and income growth expectations in part one and did not supply any treatments, nor did we ask the posterior questions or the labor market questions. We show the correlation from the January 2022 exercise between inflation expectations and income growth expectations in Table 8 in Appendix B. Finally, a follow-up exercise was fielded in September 2022, where we performed the same exercise as in March, except that we updated the information provided in the information treatments to reflect the passage of time. In September 2022, inflation was 8.1 percent, but declining, so this follow-up can be viewed as a test of the external validity of our exercise.

In each case, the survey data come from a large, nationally representative sample of the US population. Our data come from repeated cross-sections, so the respondents in the main experiment were not surveyed previously nor in the September follow-up. Our survey questions focus on inflation expectations, income growth expectations, and potential labor market actions. This subsection describes the specific wording we employ for these prior and posterior questions, as well as the exact labor-market-related questions.

Our prior question on inflation expectations borrows the approach of Hajdini et al. (2022a) by indirectly eliciting consumers' inflation expectations. The idea underlying these data on expectations is not to ask about overall inflation expectations directly, but rather to ask for the change in income that consumers think will be required to buy the same goods and services a year from the

[13] CPI inflation peaked in June 2022, at 8.99 percent.

date of the survey. Details of the implementation and analysis of the results of this survey-based measure of indirect consumer inflation expectations (ICIE) over a long time span are described in Hajdini et al. (2022b).[14] The question, asked of approximately 20,000 respondents a week starting in February 2021, is the following:

"Next we are asking you to think about changes in prices during the next 12 months in relation to your income. Given your expectations about developments in prices of goods and services during the next 12 months, how would your income have to change to make you equally well-off relative to your current situation, such that you can buy the same amount of goods and services as today? (For example, if you consider prices will fall by 2% over the next 12 months, you may still be able to buy the same goods and services if your income also decreases by 2%.) To make me equally well off, my income would have to"

Respondents then select from three options, filling in the percentages if they select (1) or (3), while (2) is coded as zero:

1. Increase by %;
2. Stay about the same; and
3. Decrease by %.

Our posterior inflation expectations question uses the following wording:

"In the next year, do you think prices in general will increase, decrease, or stay about the same?"
If respondents' answers indicated an expected increase or decrease, then they were subsequently asked to provide a quantitative percentage response.

As noted in the above design description, this question is purposely slightly different from the prior inflation expectations question, by asking directly about prices and by its focus on prices in general rather than the prices to which consumers are exposed. We expect that answers to this question will not be identical to the indirect measure of inflation expectations. Nevertheless, responses should be strongly positively correlated, which allows us to capture the (potential change in) posterior beliefs after an information treatment. In terms of the interpretation of the results in the rest of the paper, all exercises in terms of inflation will consider this question as the posterior. While the ICIE question is used to measure respondents' priors, it is the systematic deviation between the treated groups and the control group in terms of this aggregate inflation question that is our main outcome of interest. The prior only serves as a control variable to measure the information set of the respondents. In fact, as shown in Appendix E, our results are not affected by the

[14]Figure 5 in Appendix C plots the evolution of ICIE jointly with the inflation expectations from the Michigan Survey of Consumers and the NY Fed Survey of Consumers Expectations.

selection of an alternative question to elicit the prior inflation expectations.

Our second prior question elicits income growth expectations. The second question is the following:

"Do you expect your income to increase, decrease, or stay about the same over the next 12 months?"

The question comes with the same options as in the previously described posterior question. If respondents indicated they expect their income to increase or decrease, then they were subsequently asked to provide a quantitative percentage response.

Our posterior income growth expectations question uses the following wording:

"Between December 2022 and December 2023, do you expect your income to increase, decrease, or stay about the same over the next 12 months?"

Compared to the prior question on income growth expectations, this question mainly differs in its reference to a fixed time period. This period partially overlaps with the previous income growth question, so we expected a positive correlation with the previous question given the overlap as well as the fact that many wages are adjusted infrequently and at a particular time of the year.

Questions about labor market decisions follow the elicitation of these posterior expectations, asking consumers:

"How likely are you to do the following to increase your income over the next three months?"

We asked respondents to provide answers for three actions, choosing from the response set *very likely*, *somewhat likely*, *somewhat unlikely*, *very unlikely*, or they *do not know*. The actions we asked for are:

- Apply for a job(s) that pays more
- Work longer hours
- Ask for a raise

In addition to these actions, we left an open-ended answer option to record any further possibilities that survey respondents might offer.

5 Empirical Analysis

This section uses the expectations elicited through the RCT to estimate the causal impact of inflation expectations on income growth expectations as well as on the short-term plans around labor market decisions. Three main findings emerge: First, the pass-through of inflation expectations to income growth expectations is positive and statistically significant but less than unity.

Second, estimated pass-through varies across respondent demographic characteristics, with some evidence of statistically significant differences. Third, while higher inflation expectations cause consumers to report a moderately higher probability that they will search for a higher-paying job, they do not increase the perceived probability of working more hours or asking for a raise from a current employer.

5.1 Inflation Expectations and Income Growth Expectations

The analysis takes three steps. First, we verify that our "posterior" questions capture information similar to that of the baseline prior questions. This finding validates the choices of question wording against the backdrop of the design considerations outlined above in the experimental description. Second, we establish which treatments affect the posterior beliefs. Last, we use the results from the treatments to infer the causal effect of inflation expectations on income growth expectations, which yields our main findings.

In the first step, we estimate two specifications that relate prior beliefs to posterior beliefs. For inflation expectations, we estimate the following specification:

$$E_i\left[\pi_p^{Posterior}\right] = \alpha + \beta E_i\left[\pi_p^{Prior}\right] + \varepsilon_i \tag{1}$$

where $E_i\left[\pi_p^{Prior}\right]$ denotes respondent i's prior inflation expectations from the ICIE question and $E_i\left[\pi_p^{Posterior}\right]$ denotes the posterior general price growth expectations in the next year. For income growth expectations, we estimate the following specification:

$$E_i\left[\pi_y^{Posterior}\right] = \alpha + \beta E_i\left[\pi_y^{Prior}\right] + \varepsilon_i \tag{2}$$

where $E_i\left[\pi_y^{Posterior}\right]$ denotes the posterior expectations of income growth between December 2022 and December 2023 and $E_i\left[\pi_y^{Prior}\right]$ denotes the prior income growth expectations over the next 12 months.

When we estimate regressions in (1) and (2) for the full sample of respondents and the control group (after winsorizing 2.5 percent of the highest and lowest responses to remove extreme outliers), we find that the responses to our posterior questions are systematically related to the responses to the prior questions. Table 1 reports the estimation results. As columns (1) and (4) in

Table 1 show, we find positive and statistically significant correlations between the prior and posterior beliefs for both inflation expectations and income growth expectations for the full sample.[15] This finding in particular validates the choices of question wording against the backdrop of the design considerations outlined above in the experimental description.

Our second step investigates the properties of our treatments and their effect on the posterior inflation expectations and posterior income growth expectations. In the case of inflation expectations, we estimate the following specification:

$$E_i\left[\pi_p^{Posterior}\right] = \alpha + \beta E_i\left[\pi_p^{Prior}\right] + \sum_{j=2}^{6} \gamma_p^j \times T_i^j + \sum_{j=2}^{6} \theta_p^i \times T_i^j \times E_i\left[\pi_p^{Prior}\right] + \varepsilon_i \tag{3}$$

We estimate a similar regression for income growth expectations:

$$E_i\left[\pi_y^{Posterior}\right] = \alpha + \beta E_i\left[\pi_y^{Prior}\right] + \sum_{j=2}^{6} \gamma_y^j \times T_i^j + \sum_{j=2}^{6} \theta_y^j \times T_i^j \times E_i\left[\pi_y^{Prior}\right] + \varepsilon_i \tag{4}$$

where T_i^j is a dummy variable that is equal to 1 if respondent i received treatment j and 0 otherwise. The control group $j = 1$ is the reference group.

Regression specifications (3) and (4) relate the posterior belief to the prior belief and each of the treatments. Ideally, if the treatment represents new information to the respondent, then providing that information will elicit a response and move the posterior away from the prior. If treatment j is effective, then we should expect a negative coefficient for θ_p^j and θ_y^j as the prior will have a reduced role in explaining the posterior for the treated group compared to the control group.

To estimate specifications (3) and (4), we run two types of regressions: First, we conduct Huber-robust regressions, and second, we run trimmed regressions, with the latter dropping 5 percent of the biggest changes between individuals' prior and posterior beliefs. Both types of regressions aim to remove the influence of outliers, especially those that display extreme revisions. In the context of a different survey, Knotek et al. (2024) show that those respondents displaying large revisions usually are the ones who pay less attention to the information treatments in the survey. Drawing upon the common practice in survey analysis (for example, Coibion, Gorodnichenko, and Ropele

[15] Furthermore, as we show below, the relationship between the prior and the posterior inflation expectations is considerably stronger (i.e., a larger positive coefficient) when we focus attention on the control group that received no information treatment.

(2020b)), we view the Huber-robust regressions as our preferred specification, with the trimmed regressions serving mainly as a robustness check.[16]

The estimation of (3) and (4) – reported in columns 2-3 and 5-6, respectively, in Table 1 – shows three results.[17] First, there is a high correlation of the posteriors with the priors as in the above first step, even after controlling for outliers.For inflation expectations, we find that a 1 percentage point increase in the prior beliefs of the control group increases the posterior beliefs by around 0.5 percentage point. This result confirms that the ICIE measure is a good prior for aggregate inflation expectations. In the case of income growth expectations, the correlation is even higher and associates the same 1 percentage point increase in prior beliefs with an increase in the posterior beliefs of between 0.78 and 0.96 percentage point.

Second, in terms of the effect of the treatments, our results show that all of the treatments for inflation expectations have a statistically significant effect on the posterior except for the placebo, as column 2 indicates. Moreover, the estimated coefficients on the interacted treatment and prior are negative, indicating that consumers who receive one of the treatments place less weight on their prior beliefs. Column 3 shows similar results when we explicitly drop respondents who make extreme changes between their prior and posterior beliefs (over 50 percentage points).

The magnitude of the estimated effects varies across treatments. In particular, while the prior interacted with the treatment about the Federal Reserve's inflation target is negative and statistically significant, the coefficient is an order of magnitude smaller compared to those reported for the prior interacted with treatments 3-5. As previously noted, the prior interacted with the placebo does not generate a meaningful effect on the posterior beliefs compared to the control group. These results are not driven by outliers.[18]

Third, in contrast to inflation expectations, the regression results show that the treatments have little effect on the posterior beliefs of income growth expectations. That is, there is a high correlation between the prior and posterior beliefs, meaning that most respondents do not revise their answers. As a result, the Huber-robust regressions fail to run with the standard tuning factor due

[16]Appendix B implements a third quantile regression approach, with results reported in Table 9.

[17]Figure 6 in Appendix C shows the distribution of the prior and posterior and Figure 7 in Appendix C shows the distribution of the posterior for each treatment group. We observe rounding (see Binder (2017)) in particular at zero as in other surveys (43 percent for the prior, 32 percent for the posterior; see Andrade, Gautier, and Mengus (2023) for properties of zero answers). Hajdini et al. (2022b) describe in more detail the distribution of the prior.

[18]As a robustness check using other techniques, Table 9 in Appendix B confirms these results using quantile regressions. Figures 8 and 9 in Appendix C plot the distribution of priors and posteriors and their relationship with the control group. We observe big differences between the control group and treatments 3, 4, and 5. The change in the slope is smaller but statistically significant for treatment 2. We can also see that the control group and the placebo have a very similar distribution, with small differences that are irrelevant in terms of the magnitude and the distribution of the responses.

to the small number of outliers that can be dropped. When we use the minimum tuning value to achieve convergence, the results in column 5 indicate that the treatments generally exert little influence on the posterior beliefs. However, the same conclusion arises for the trimmed regressions in which we eliminate respondents who reported extreme absolute changes between their prior and their posterior beliefs at or above the 95th percentile (10 percentage points). As shown in column 6, we find little effect from the information treatments, other than the wage inflation treatment, on respondents' posterior beliefs for income growth expectations.

Overall, the results in Table 1 suggest that the information treatments have a greater effect on inflation expectations than on income growth expectations. The evidence of strong priors for income growth expectations is consistent with the view that consumers are very attentive to their income trajectories, which, as in Weber et al. (2023), makes their forecasts less responsive to information treatments about aggregate variables. In the case of inflation expectations, however, the findings suggest that respondents are subject to some type of information frictions as all treatments contain public information. In fact, even though inflation was high at the time of the experiment and salient because of elevated news coverage and the notable impact of inflation on consumers' budgets, the results suggest that consumers were not fully informed about price developments.

While a detailed investigation into information frictions is beyond the scope of this paper, the observed treatment effects offer some insights into how these frictions manifest in consumers' inflation expectations. From our treatment about the Fed's inflation target, we see uncertainty about the Fed's objectives, a point studied in Coibion et al. (2020a). From the SPF treatment, we see that there is uncertainty about the inflation outlook. Moreover, the fact that consumers continue to put some weight on their priors, even after the receipt of this information, suggests that they face sluggish or costly inflation expectations formation, as in Coibion and Gorodnichenko (2015). Finally, while past inflation can affect expectations in many ways, the fact that it affects expectations over 12 months indicates over-extrapolation, as in Angeletos, Huo, and Sastry (2021).

Table 1: Effects of Treatments on Expectations

	(1)	(2)	(3)	(4)	(5)	(6)
	$E_i\left[\pi_p^{Posterior}\right]$	$E_i\left[\pi_p^{Posterior}\right]$	$E_i\left[\pi_p^{Posterior}\right]$	$E_i\left[\pi_y^{Posterior}\right]$	$E_i\left[\pi_y^{Posterior}\right]$	$E_i\left[\pi_y^{Posterior}\right]$
$E_i\left[\pi_p^{Prior}\right]$	0.262***	0.506***	0.490***			
	(0.026)	(0.006)	(0.020)			
$E_i\left[\pi_y^{Prior}\right]$				0.775***	0.775***	0.960***
				(0.048)	(0.056)	(0.010)
T2: Target		0.126	-0.382		-0.292	-0.081
		(0.138)	(0.395)		(0.296)	(0.104)
T3: Wages		0.771***	-0.540		-0.445*	0.146
		(0.153)	(0.385)		(0.256)	(0.108)
T4: CPI		0.586***	-0.547		-0.271	-0.048
		(0.150)	(0.395)		(0.277)	(0.112)
T5: SPF		0.720***	-0.429		-0.147	-0.049
		(0.149)	(0.409)		(0.338)	(0.106)
T6: Placebo		0.498***	0.482		-0.439	-0.182*
		(0.148)	(0.403)		(0.274)	(0.106)
T2 x Prior		-0.023***	-0.053*		-0.116	-0.003
		(0.008)	(0.028)		(0.081)	(0.015)
T3 x Prior		-0.213***	-0.036		-0.037	-0.029*
		(0.013)	(0.028)		(0.087)	(0.017)
T4 x Prior		-0.258***	-0.065**		-0.171*	0.013
		(0.011)	(0.027)		(0.092)	(0.013)
T5 x Prior		-0.281***	-0.084***		-0.061	0.005
		(0.011)	(0.030)		(0.085)	(0.016)
T6 x Prior		-0.008	-0.026		-0.103	0.006
		(0.008)	(0.026)		(0.085)	(0.015)
Constant	5.667***	1.343***	4.223***	0.925***	0.925***	0.274***
	(0.337)	(0.098)	(0.291)	(0.185)	(0.217)	(0.075)
Regression	OLS	Huber	Trimmed	OLS	Huber	Trimmed
Observations	1,072	5,892	6,373	1,074	6,622	6,335
R-squared	0.236	0.786	0.432	0.604	0.555	0.922

Notes: The table shows estimates of equations 1 and 2 that relate priors and posteriors, as well as estimates of equations 3 and 4 that gauge the effect of treatments and their interaction with prior beliefs.

In the third and final step, our analysis uses information from the effective treatments in Table 1 to derive an instrument that can be used to infer the causal effect of inflation expectations on income growth expectations. Specifically, we construct the instrument for expected inflation, $\widehat{E_i\left[\pi_p^{Posterior}\right]}$, using the following specification:

$$E_i\left[\widehat{\pi_p^{Posterior}}\right]=\begin{cases}\sum_{j=2,4,5}\gamma_p^j\times T_i^j+\sum_{j=2,4,5}\theta_p^j\times T_i^j\times E_i\left[\pi_p^{Prior}\right] & if\quad T_i=2,4,5\\ 0 & if\quad T_i=1,6\end{cases}\tag{5}$$

where we exclude the treatment providing information on wage inflation (T3) because the reported results indicate it directly affects income growth expectations. Based on the estimation results from the Huber regression and the trimmed regression, we then apply the relevant coefficients in column 2 and column 3 to form an instrument for each regression model. This approach is similar in spirit to the one in Coibion et al. (2019) that uses the prior as an instrument. However, because multiple treatments are available to us, we can weigh them according to their importance in affecting the posterior.[19]

This identification strategy is validated by a combination of factors related to our survey design and the estimated effects of information treatments on expectations. First, the assignment of information treatments to the respondents in the survey is random. Second, we only use targeted, carefully worded treatments containing information about inflation to form the instrument for inflation expectations. Third, and in line with the findings of other RCT work on inflation expectations, we find that providing people with publicly available information treatments – even at a time when inflation was particularly salient – tends to move their beliefs, thus invalidating full-information rational expectations. Fourth, the results in Table 1 demonstrate that the inflation treatments in the first stage only change the posterior beliefs of inflation expectations but do not have an effect on income growth expectations, which serves as a test of exclusion restrictions in the instrumentation. Moreover, our finding that inflation-related information treatments only affect inflation expectations is consistent with the theoretical findings in Angeletos and Lian (2023) that information frictions attenuate general equilibrium inference.

In terms of income growth expectations, we consider both OLS and instrumental-variable (IV) regressions of the posterior belief of income growth expectations on the prior belief of income growth expectations and the posterior belief of inflation expectations, where the instrument is defined by equation (5). As previously discussed, the instrument captures the exogenously induced variation in expected inflation generated from the assigned information treatment(s).[20] Because

[19] Coibion, Gorodnichenko, and Ropele (2020b) use the past inflation treatment as an instrument. Unfortunately, we do not have the time series dimension that they have to generate enough predictive power for the instrument.

[20] As a robustness check, we have also constructed instruments by demographic groups, such as by gender, allowing for coefficient heterogeneity in the γ_p^i and θ_p^i. We find that subsequent results are not affected.

only 3 of the treatments are used in constructing the instrument, the sample size for the regressions is smaller compared to those in Table 1.

Table 2: Effect of Inflation Expectations on Income Growth Expectations

	(1)	(2)	(3)
	$E_i\left[\pi_y^{Posterior}\right]$	$E_i\left[\pi_y^{Posterior}\right]$	$E_i\left[\pi_y^{Posterior}\right]$
$E_i\left[\pi_p^{Posterior}\right]$	0.085***	0.203***	0.168***
	(0.014)	(0.069)	(0.045)
$E_i\left[\pi_y^{Prior}\right]$	0.674***	0.636***	0.624***
	(0.025)	(0.033)	(0.033)
Constant	0.109	-0.805	-0.563*
	(0.101)	(0.521)	(0.332)
Regression	OLS	IV	IV
Sample	All	Huber	Trimmed
F-test		120.584	572.491
Observations	5,525	5,525	5,322
R-squared	0.558	0.539	0.538

Notes: This table shows results from OLS and IV regressions of the posterior of income growth expectations on the prior of income growth expectations and the posterior of inflation expectations. Columns (2) and (3) use IV, instrumenting with $E_i\left[\widehat{\pi_p^{Posterior}}\right]$. Column (2) uses the instrument constructed from the regression in (1) with Huber weights, whereas column (3) uses the instrument constructed from the trimmed regression in (1). The estimates of γ_p^j and θ_p^j, where $j = \{2,4,5\}$, for both Huber and trimmed regressions are reported in Table 1. Robust standard errors are in parentheses.

Table 2 reports the results and highlights a key empirical finding of our paper. Specifically, we document a moderate positive causal relationship from inflation expectations to income growth expectations that reflects only partial pass-through. As shown in column 1, the OLS regression indicates that inflation expectations exhibit a very low correlation with income growth expectations. However, as shown in column 2, the Huber IV regression yields a notably higher coefficient. In particular, the estimate implies that a 1 percentage point increase in inflation expectations increases expected income growth by 0.2 percentage point.[21] The trimmed IV regression in column 3 shows a slightly lower pass-through estimate of 0.17, but it is within one standard deviation of the estimate in column 2. Moreover, the instrument displays a relatively high F-test statistic.

Looking more closely at the Huber IV regression, which is our preferred specification, the re-

[21] This pass-through differs markedly from a correlation of 0.37 in the raw data, as shown in Table 8 in Appendix B. This difference highlights the importance of estimating a causal relationship as we do based on our RCT.

sults suggest that pass-through is considerably lower than one-to-one.[22] Viewed from a different perspective, the same 1 percentage point increase in inflation expectations implies a 0.8 percentage point reduction in expected real income growth. A key takeaway from this finding is that it suggests consumers associate increases in expected inflation with a marked decline in expected real income growth and offers one reason for an aversion to inflation. Our subsequent analysis will explore how the effect of expected inflation on real income may influence the labor market actions of consumers and further shape their attitudes toward inflation.

Finally, we show that distinct demographic characteristics are associated with different degrees of pass-through from inflation expectations to income growth expectations. To do so, we separate our sample based on the gender of survey respondents and their self-reported annual income (less than \$50,000, between \$50,000 and \$100,000, and more than \$100,000). We report OLS and IV regression results in Table 3.

[22] In Table 17 in Appendix D, we calculate the pass-through for each of the treatments individually, rather than combining them as in Table 2. Each of the inflation treatments produces very similar estimates, pointing to incomplete pass-through in each treatment, with the magnitudes similar to the main result of 0.2.

Table 3: Pass-Through from Inflation Expectations to Income Growth Expectations, by Demographics

	$E_i\left[\pi_y^{Posterior}\right]$					
	(1)	(2)	(3)	(4)	(5)	(6)
$E_i\left[\pi_p^{Posterior}\right]$	0.148***	0.267***	0.313***	0.052***	0.129	0.089
	(0.026)	(0.103)	(0.071)	(0.018)	(0.091)	(0.064)
$E_i\left[\pi_p^{Posterior}\right]$ x Female	-0.105***	-0.111	-0.244***			
	(0.031)	(0.142)	(0.091)			
$E_i\left[\pi_p^{Posterior}\right]$ x 50k-100k				0.052*	0.180	0.118
				(0.032)	(0.194)	(0.093)
$E_i\left[\pi_p^{Posterior}\right]$ x >100k				0.093**	0.207	0.343**
				(0.042)	(0.152)	(0.140)
$E_i\left[\pi_y^{Prior}\right]$	0.669***	0.621***	0.560***	0.675***	0.656***	0.606***
	(0.033)	(0.054)	(0.051)	(0.034)	(0.041)	(0.046)
$E_i\left[\pi_y^{Prior}\right]$ x Female	-0.008	0.014	0.090			
	(0.050)	(0.070)	(0.069)			
$E_i\left[\pi_y^{Prior}\right]$ x 50k-100k				-0.040	-0.077	0.015
				(0.058)	(0.078)	(0.073)
$E_i\left[\pi_y^{Prior}\right]$ >100k				0.033	-0.067	-0.075
				(0.062)	(0.110)	(0.112)
Female	0.768***	0.545	1.465**			
	(0.207)	(1.071)	(0.654)			
50k-100k				-0.318	-1.248	-0.895
				(0.240)	(1.477)	(0.704)
>100k				-0.611**	-1.189	-2.094**
				(0.249)	(1.065)	(0.925)
Constant	-0.294**	-1.079	-1.333***	0.332**	-0.314	0.006
	(0.141)	(0.660)	(0.437)	(0.154)	(0.741)	(0.503)
Regression	OLS	IV	IV	OLS	IV	IV
F-Test		30.974	74.163		9.068	13.233
Instrument		Huber	Trimmed		Huber	Trimmed
Observations	5,525	5,525	5,322	5,525	5,525	5,322
R-squared	0.563	0.544	0.539	0.562	0.533	0.528

Notes: This table shows results from IV regressions from different demographic subsamples. The regression used is the same as in column (2) in Table 2. Robust standard errors are in parentheses.

As Table 3 shows, male respondents have a statistically significantly higher pass-through coefficient compared with female respondents, such that the coefficient for males is almost 70 percent higher and the coefficient for females is not statistically different from zero. However, the difference between male and female coefficients is not always statistically different from 0 across specifications. In the case of differences across income groups, we also observe very heterogeneous effects. Respondents in the highest income group have a perceived pass-through that is more than 2.5 times higher than that for the lowest-income respondents. The pass-through coefficient is statistically significant for respondents in the middle or highest income group, but not the lowest income group. However, differences are only statistically different for certain specifications and only for the high-income group.

These heterogeneous results might reflect some characteristics of the labor market that these groups face. For example, Card, Cardoso, and Kline (2016) find that, in Portugal, women are less likely to work in firms where workers have high bargaining power. In the case of the US, Biasi and Sarsons (2022) find that women engage less frequently in negotiations over pay, which helps to determine workers' ability to bargain for higher wages. In the next section, we look at various labor market actions to see how these bargaining dynamics can potentially explain the pass-through results.

5.2 Labor Market Decisions

This subsection shows that inflation expectations have a moderate effect on some labor market decisions, but not others. The effect is heterogeneous across demographic groups.

To assess the extent to which expected inflation drives labor market decisions, we run regressions of the reported individual likelihood of undertaking each action j that the survey elicited, ℓ_i^j, on expected inflation. These labor market actions included "Apply for a job(s) that pays more," "Work longer hours," and "Ask for a raise." For each of these actions, respondents were asked to indicate the respective likelihood, as explained above in Section 3.

The motivation for these regressions is clear: if consumers believe that higher inflation will reduce their real wages, then they may take actions to protect themselves against lower real wages. Here, ℓ_i^j takes values from 1 to 4, indicating qualitative probabilities ranging from *very unlikely* to *very likely*. We use the same instrument for expected inflation as before, estimating the following regression:

$$\ell_i^j = \alpha + \beta E_i \left[\widehat{\pi_p^{Posterior}} \right] + \varepsilon_i \tag{6}$$

Results from the estimation indicate that inflation expectations have a moderate effect on some labor market decisions, but not others. Table 4 presents the OLS and Huber IV estimates of (6).[23] In particular, results indicate that higher expected inflation increases the likelihood that consumers may apply for another job that pays more. To gauge the associated magnitudes, we derive an elasticity by taking the partial effect found in the estimated regression and multiplying and dividing by the average values of the relevant variables in the sample.

In the case of "Apply for a job(s) that pays more," the estimated OLS regression shows that a 1 percentage point increase in inflation expectations increases the probability of applying for another job by 2 percent, assuming that the minimum value is equal to a zero probability of applying for another job and the highest value is equal to complete certainty of applying for another job. When we run the Huber IV regression, the estimated coefficient of the effect of inflation expectations on the likelihood of applying for another job increases and is statistically significant, with the associated elasticity rising to 11 percent. An F-test of 143.3 indicates instrument validity. Overall, the evidence indicates that higher expected inflation increases the likelihood that consumers will consider applying for a new and higher-paying job. This finding also implies an increase in the probability of job-switching on the part of a consumer.

Table 4: Effect of Inflation Expectations on Wage Increase Actions

	Apply for a job(s) that pays more		Work longer hours		Ask for a raise	
	(1)	(2)	(3)	(4)	(5)	(6)
$E_i\left[\pi_p^{Posterior}\right]$	0.005***	0.030***	0.004**	0.009	-0.002	0.002
	(0.002)	(0.006)	(0.002)	(0.005)	(0.002)	(0.006)
Constant	2.231***	2.013***	2.263***	2.216***	2.111***	2.072***
	(0.022)	(0.053)	(0.022)	(0.050)	(0.022)	(0.051)
Regression	OLS	IV	OLS	IV	OLS	IV
F-Test		143.3		149.8		143.3
$\frac{dy}{dx}\frac{\bar{x}}{\bar{y}}$	0.019	0.114	0.015	0.034	-0.009	0.011
Observations	4,651	4,651	4,573	4,573	4,409	4,409

Notes: This table shows OLS and IV regressions from equation 6. ℓ_i^j is a value that ranges from 1 to 4, where 1 is "Very unlikely, " 2 is "Somewhat unlikely," 3 is "Somewhat likely" and 4 is "Very likely." For columns (1) and (2) ℓ_i^j is the answer to the question about "apply for a job(s) that pays more," columns (3) and (4) are the answers to the question about "work longer hours," and columns (5) and (6) are the answers about "ask for a raise." Robust standard errors are in parentheses.

[23]The results using the trimming regression display a similar pattern, and are hence relegated to Table 10 in Appendix B.

In terms of the other margins, we find no evidence that respondents systematically connect their inflation expectations to these labor market actions. While the OLS regression reveals a statistically significant effect of expected inflation on respondents' plans to work longer hours, the result is not robust under IV estimation. Similarly, we do not find evidence of a channel through which expected inflation will lead respondents to ask for a raise in their current jobs. Because the pattern of the standard errors in Table 4 is similar, the finding that these effects are statistically insignificant suggests a preponderance of "Very unlikely" responses and not imprecision in the parameter estimates. The implied elasticity for "Work longer hours" and "Ask for a raise" is 0.03 and 0.01, respectively.

Following our earlier evidence on pass-through, we view these labor market action results as providing an additional reason for consumers to display an aversion to inflation. Applying for a new job requires search time and effort, which is costly. Furthermore, the elasticity that we document is not very high, consistent with a view that relatively few workers will ultimately undertake this application process to offset higher expected inflation. With little evidence that people will work longer hours or ask for a raise, they will generally associate higher inflation with a reduced standard of living.

Our results also indicate demographic heterogeneity in terms of the effect of inflation expectations on labor market actions. Tables 11, 12, and 13 in Appendix B show the results. We find that female and middle-income workers have a higher coefficient and elasticity in terms of the causal effects of inflation expectations on the likelihood of applying for another job and working longer hours. A statistically significant effect of inflation expectations on asking for a raise for higher-income workers also emerges, consistent with the view that they may have more negotiating power by being in a salaried position, but the elasticity is relatively small.

In addition to the question concerning consumers' possible labor market actions, we added a complementary open-ended question to investigate if respondents were undertaking any other actions beyond those we considered to increase their incomes. From the 6,629 total responses, 5,993 (90.4 percent) decided not to provide any additional information. From the 636 who responded, 199 (3.0 percent) said that they were going to look for a second job in different ways, while 112 (1.7 percent) said that they received some type of fixed income, such as retirement or Social Security.[24] Among the other answers, some individuals named different forms of investments or adjusting

[24] Survey respondents did not indicate whether these payments were indexed for inflation. Notably, Social Security payments are indexed to inflation, but with a lag.

their billing rates (likely for independent contractors, who have the power to set their wages); some others associated this situation with adjusting their spending. Only one respondent claimed that their income is adjusted automatically every year to keep up with inflation.

Finally, in September 2022, we conducted a follow-up exercise to our original survey. The details and results of this exercise are described in Appendix D. In the follow-up exercise we repeated the survey questions in the same order as described above and updated treatments to the latest information available. We also conducted the same empirical exercise using a pseudo-panel structure, which allowed us to take advantage of our doubled sample size while controlling for time fixed effects. We found very similar effects, suggesting that the findings in September 2022 remained relevant in an environment where the COVID situation had shown further improvement. In addition, the fielding of the survey took place after a year of relatively high inflation, suggesting that persistently high inflation did not change consumers' perceptions of the linkage between their incomes and inflation or their attitudes on how inflation would affect their labor market actions.

6 Why Do Households Dislike Inflation?

This section uses a structural model to assess the role of our empirical findings, and in particular the role of inflation expectations, for the macroeconomic adjustment process to shocks. The analysis employs an off-the-shelf DSGE model with search-and-matching in the labor market. While we thus do not purport to provide a model more sophisticated than conventional search-and-matching models, we do explicitly allow for inflation expectations to affect nominal wage growth expectations. To capture our finding that consumers' inflation expectations are affected by publicly available information, we also allow for sticky information in inflation expectations similar to Mankiw and Reis (2002). The model is calibrated to match key features of the US economy in early 2022, when our survey was conducted; the reaction of our respondents' inflation expectations to information treatments; and our three main empirical facts:[25]

1. **Less than unit pass-through to income growth expectations:** A 1 percentage point increase in inflation expectations causes nominal income growth expectations to rise by about 0.20 percentage point.

[25] The purpose of the model is to qualitatively understand the macroeconomic implications of the moderate pass-through from inflation expectations to income growth expectations. In contrast to the experiment, within the model setting it is impossible to isolate the causal effect of inflation expectations on income growth expectations (see, for instance, Werning (2022) for a discussion on the difficulties of isolating the effects of inflation expectations). However, we can match the empirical pass-through as a moment along the impulse response functions in the model.

2. **Pass-through to income growth expectations increases in consumers' current income:** For low- (high-) income respondents, a 1 percentage point increase in inflation expectations leads to a statistically insignificant (statistically significant 0.34 percentage point) increase in nominal income growth expectations.

3. **Small impact on labor market actions:** A 1 percentage point increase in inflation expectations raises the probability of applying for another job by about 0.11 percentage point.

Two lessons emerge when we focus our analysis on the responses of key macroeconomic variables to a positive demand shock and a positive (adverse) supply shock, which we view as the prevailing shocks hitting the US economy around the time of our survey. First, regardless of the source of the shock, the dampened response of real wages due to nominal wage rigidity necessary to match Fact 1 translates into an amplified responsiveness and volatility of output and consumption. Inflationary shocks, whether coming from the demand side or the supply side, produce a decline in consumers' utility. In the case of a demand-side shock, the utility decline is greater for higher degrees of nominal wage rigidity. Second, the mechanism we propose to capture the relationship between inflation expectations and labor market actions has a negligible effect on the macroeconomic dynamics of the model; on average, consumers' efforts to increase their wages due to higher inflation expectations do not improve their utility, real wage, or consumption. Overall, we view the lessons coming from this modeling exercise as helping us further understand why consumers dislike current and future inflation.

6.1 A Search-and-Matching Model

We employ a New Keynesian model featuring a Mortensen and Pissarides (1994) type of search-and-matching frictions in labor markets. We further incorporate a right-to-manage feature as developed in Trigari (2006), where firms and workers bargain over nominal wages and then workers guarantee to supply the labor hours demanded by firms at the bargained wage.[26] A matched firm-worker pair negotiates wages infrequently in a Calvo fashion. Finally, as in Christoffel and Kuester (2008), we account for firms' fixed costs of maintaining a job.[27]

[26]For our purposes, the right-to-manage (RTM) framework differs from, for instance, "efficient bargaining" (EB), where labor supply always equals labor demand. The advantage of the RTM over EB is that it generates more realistic movements in inflation dynamics, which facilitates matching the model-implied pass-through with the empirical estimates. On the other hand, RTM can trigger fluctuations in labor hours that are larger than what is observed in the data. The increased variability in labor hours is a particularly important limitation that we return to below, especially because our empirical results suggest that consumers do not expect to increase their hours when they raise their inflation expectations. See de Walque et al. (2009) for an instructive review of such tensions in this group of models.

[27]The RTM framework can counterfactually dampen the response of employment in the extensive margin, and, as shown in Christoffel and Kuester (2008), the presence of a fixed cost amplifies the response of unemployment over the

The economy in the model is composed of representative families that make optimal decisions on behalf of their members with respect to consumption and one-period riskless bond holdings. There are three types of firms: labor goods firms produce a homogeneous labor intermediate good; wholesalers use the labor good as an intermediate to produce differentiated goods and face Calvo price rigidity; and retailers bundle the differentiated goods into a homogeneous consumption basket sold to households and the government. Monetary policy sets the nominal interest rate following a Taylor rule, and government spending is exogenous. Because these parts of the model are standard in the literature and are not central to our paper, we describe them in more detail in Appendix F.

We now lay out some key features of the labor market because they directly connect the model with our empirical findings presented in Section 5. The matching process between workers and labor firms is governed by a Cobb-Douglas function:

$$m_t = \sigma_m u_t^{\xi} v_t^{1-\xi} \tag{7}$$

where m_t are matches formed in period t; u_t is unemployment; v_t are vacancies; $\xi \in [0,1]$ is the elasticity of matching with respect to unemployment; and $\sigma_m > 0$ is matching efficiency. Matches become productive in the following period, so employment in the extensive margin evolves according to

$$n_t = (1-\mu)n_{t-1} + m_{t-1} \tag{8}$$

where $\mu \in [0,1]$ is the employment separation rate. Labor market tightness is defined as:

$$\theta_t = \frac{v_t}{u_t} \tag{9}$$

Then, the probabilities that a vacancy is filled and that an unemployed worker matches with a firm are, respectively,

$$q_t = \frac{m_t}{v_t}, \quad s_t = \frac{m_t}{u_t} \tag{10}$$

To match our findings in Table 1 that providing an individual a treatment consisting of publicly available information at time t has an effect on our respondents' inflation expectations, we

business cycle.

assume that inflation expectations are subject to sticky information, such that:

$$\widetilde{\mathbb{E}}_t \hat{\pi}_{t+h} = (1-\lambda)\mathbb{E}_t \hat{\pi}_{t+h} + \lambda \widetilde{\mathbb{E}}_{t-1} \hat{\pi}_{t+h}, \qquad \text{for any } h \geq 1 \tag{11}$$

where $\mathbb{E}_t$ is the full-information rational expectations operator, $\lambda \in [0,1]$ denotes the probability that our agents do *not* update their information set in period t, and $\hat{\pi}_t$ is inflation in log-linear deviation from its steady-state value.

To match **Fact 1**, we assume that agents in the economy face nominal wage rigidities. If a worker is not separated from employment, she can bargain her nominal wage to W^*_{t+1} in period $(t+1)$ with probability $(1-\gamma) \in [0,1]$. In contrast, the nominal wage of the γ share of workers who cannot bargain partially adjusts for past inflation such that $W_{t+1} = W_t(e^w_t \pi_t^{\zeta^w} \bar{\pi}^{1-\zeta^w})$, where $\zeta^w \in [0,1]$ denotes time-varying wage indexation to past inflation and e^w_t is a newly introduced wage-push factor explained further in the subsequent paragraph. In our setup, different combinations of the nominal wage stickiness parameter, γ, generate different levels of model-implied pass-through from inflation expectations to nominal wage growth expectations. This model feature allows us to study the macro implications of **Fact 2** and of a counterfactual scenario of unit pass-through.

Finally, to match **Fact 3** one would ideally want to incorporate on-the-job search, which is affected primarily by inflation expectations. However, for simplicity purposes, we abstract from formally modelling that channel in the present paper. Instead, we introduce a wage-push factor, e^w_t. The wage-push factor affects the nominal wage only if the worker cannot bargain her wage to W^*_{t+1} and it captures the following idea: in the case of no bargaining, we assume that, due to higher inflation expectations, the worker applies for another job with some probability and is able to generate an outside contract with certainty, which is used to put upward pressure on the nominal wage with her current employer.[28] The wage-push factor is assumed to be persistent and to be affected by inflation expectations as follows

$$\hat{e}^w_t = \rho_w \hat{e}^w_{t-1} + \bar{e}_\pi \widetilde{\mathbb{E}}_t \hat{\pi}_{t+1} \tag{12}$$

where $\hat{e}^w_t$ is the wage-push factor in log deviations from its steady-state value; $\bar{e}_\pi$ is the elasticity

[28]The wage-push factor plays a role similar to having within-quarter job-to-job transitions with a time-varying transition probability that is only affected by inflation expectations. Within-period job-to-job transitions with constant probability have been incorporated in Krusell et al. (2017). Another interpretation would be to have a non-bargaining worker's nominal wage indexed to a base, fixed real wage growth that is greater than 1, along with indexation to past inflation. Time variation in this case would only be induced by inflation expectations.

between inflation expectations and the wage-push factor; and $\rho_w \in [0,1)$ is the persistence in the wage-push factor.

For workers who bargain in a given period, the nominal wage is set according to Nash bargaining,

$$W_t^* = argmax_{W_t}(\mathcal{V}_t^E - \mathcal{V}_t^U)^{\eta_t}(J_t)^{1-\eta_t} \tag{13}$$

where $\mathcal{V}_t^E$ and $\mathcal{V}_t^U$ denote, respectively, the value of employment and unemployment for a worker; J_t is the market value of a labor firm matched to a worker; and η_t is the time-varying bargaining power of workers.[29]

6.2 Calibration

Our calibration of the model aims to capture US labor market trends around the time of our survey in early 2022 while also matching our three empirical findings. In terms of steady-state values, we set the unemployment and vacancy rates to their respective quarterly realizations in 2021:IV of 4.2 percent and 7 percent. The separation rate in the steady state is set to 4.1 percent, matching the quarterly separation rate in 2021:IV. Table 5 summarizes these choices. Due to high labor market tightness these choices imply that in the steady state the probability of finding a job is very high (s = 93.52 percent), whereas the likelihood that a firm finds a worker is very low (q = 0.27 percent).

[29]Under EB, optimal nominal wages satisfy $\eta_t J_t = (1-\eta_t)(\mathcal{V}_t^E - \mathcal{V}_t^U)$. In our case of an RTM framework, the optimal nominal wage condition is $\eta_t \delta_t^W J_t = (1-\eta_t)\delta_t^F(\mathcal{V}_t^E - \mathcal{V}_t^U)$, where δ_t^W and δ_t^F denote, respectively, the net marginal benefits from an increase in the wage to the worker and the firm. See Christoffel and Kuester (2008) for more details.

Table 5: Parameters

Variable	Value	Description
u	4.2 percent	Unemployment rate; US quarterly unemployment rate in 2021:IV
v	7 percent	Vacancy rate; US quarterly vacancy rate in 2021:IV
μ	4.1 percent	Quarterly separation rate; US data in 2021:IV
s	0.9352	Probability of finding a job (implied by the steady-state model equilibrium)
q	0.0027	Probability of finding a worker (implied by the steady-state model equilibrium)
ξ	0.6	Elasticity of matches w.r.t. unemployment; see Petrongolo and Pissarides (2001)
η	0.5	Bargaining power of workers; conventional value
σ_m	0.0037	Efficiency of matching; reconciles m with $u = 4.2$ percent and $v = 7$ percent
ρ_w	0.9	Persistence of the wage-push factor
$\bar{e}_\pi$	0.0228	Wage-push elasticity w.r.t. inflation expectations across all respondents; Tables 2, 4
$\bar{e}_\pi$	0.114	Wage-push elasticity w.r.t. inflation expectations in counterfactual analysis; Table 4
γ	0.875	Nominal wage stickiness; pass-through across all respondents in Table 2
γ	0.65	Nominal wage stickiness; unit pass-through for counterfactual analysis
ζ_w	0.675	Wage indexation; pass-through across all respondents in Table 2
ζ_w	0.306	Wage indexation; pass-through for counterfactual analysis
λ	0.285	Information stickiness; Table 6

In terms of labor market parameters, as shown in Table 5, we parameterize the model as follows: the elasticity of matches with respect to unemployment, ζ, is set to 0.6, consistent with Petrongolo and Pissarides (2001). Wage bargaining power is set to its conventional value in the literature, i.e., $\eta = 0.5$. The implied efficiency of matching, σ_m, is set to 0.0037 to be consistent with the steady-state values of the unemployment and vacancy rates, and matching. We assume the wage-push factor process is persistent with an autocorrelation coefficient of 0.9.

A few more parameters remain to be calibrated in a way that is directly related to our empirical results. First, to calibrate λ, we investigate how our respondents react to new information.[30] Specifically, we rearrange equation (11) to read as:

$$\underbrace{\widetilde{\mathbb{E}}_t \pi_{t+h} - \widetilde{\mathbb{E}}_{t-1} \pi_{t+h}}_{\text{(posterior - prior)}} = (1-\lambda) \underbrace{\left(\mathbb{E}_t \pi_{t+h} - \widetilde{\mathbb{E}}_{t-1} \pi_{t+h} \right)}_{\textit{new} \text{ info in period } t}$$

with $(1-\lambda)$ capturing the effect of *new* information made available in period t on inflation expectations. To discipline λ consistently with our experiment, we use the estimates from the following

[30] As shown by Coibion and Gorodnichenko (2015), in a setting with information stickiness similar to ours, the frequency of updating the information set $(1-\lambda)$ is all one needs to pin down the response of expectations to new information at the time of forecast.

regression:

$$E_i\left[\pi_p^{Posterior}\right] - E_i\left[\pi_p^{Prior}\right] = \alpha + \beta T_i\left[I_{ij} - E_i\left[\pi_p^{Prior}\right]\right] + \varepsilon_i \tag{14}$$

where T_i is an indicator that takes value 1 if individual i receives treatments 2, 4, or 5 (and possibly 3, depending on the specification), and takes a value of zero if the individual i is in the control or placebo group. $\left[I_{ij} - E_i\left[\pi_p^{Prior}\right]\right]$ captures new information due to information treatment j. I_{ij} is the numerical information contained in treatments 2, 3, 4, or 5. In this specification, $\beta = (1-\lambda)$. Table 6 presents the estimates of β. As our benchmark calibration, we use the estimate of $\beta = 0.715$, or equivalently, $\lambda = 0.285$, as reported in column (4) of Table 6, where we account for the control, placebo, and wage treated groups.[31]

Table 6: Effect of New Information on Inflation Expectations

	(1)	(2)	(3)	(4)
New information	0.742***	0.711***	0.742***	0.715***
	(0.014)	(0.014)	(0.012)	(0.012)
Constant	1.581***	-0.678***	1.702***	-0.251
	(0.163)	(0.208)	(0.139)	(0.181)
Wage Treatment	No	No	Yes	Yes
Control and Placebo	No	Yes	No	Yes
Observations	3,338	5,528	4,430	6,620
R-squared	0.730	0.432	0.735	0.483

Notes: The table shows estimates of equation (14). Column (1) only contains information for treatments 2, 4 and 5. Column (2) includes the placebo and control groups. Column (3) is (1) plus treatment 3 and column (4) contains all treated and control groups. We use robust standard errors.

Second, we calibrate nominal wage stickiness, γ, and wage indexation to past inflation, ζ_w, to match **Fact 1** and **Fact 2** *quantitatively* along the IRFs of nominal wage growth to various shocks. Solving the model under rational expectations, one can show under general assumptions (see details in Appendix G) that the response of nominal wage growth expectations to a change in inflation expectations is given by:

$$\frac{\partial \widetilde{\mathbb{E}}_t(\hat{W}_{t+7} - \hat{W}_{t+3})}{\partial \widetilde{\mathbb{E}}_t \hat{\pi}_{t+4}} = \frac{a_1 - a_2}{1-\lambda} + 1 + a_3 \tag{15}$$

[31] Coibion, Gorodnichenko, and Weber (2022) argue that the inclusion of the control group is important since the prior and posterior questions about inflation expectations are worded differently. Our results remain qualitatively similar if we calibrate λ to a lower value of about 0.26.

where the elements a_1, a_2, and a_3 are convoluted functions of the many structural parameters of the model.[32,33] However, wage indexation to past inflation, and especially nominal wage stickiness, γ, are key parameters in these functions, and it is possible to calibrate them such that we are able to match **Fact 1** and **Fact 2** quantitatively. In particular, we can match the inflation expectations pass-through to nominal wage growth across our respondents by choosing a wage contract duration of about 8 quarters ($\gamma = 0.875$) with indexation to past inflation of 0.675.[34] To construct a counterfactual scenario of unity pass-through from inflation expectations to nominal wage growth expectations, we set $\gamma = 0.65$, which implies an average wage contract duration of about 3 quarters. The wage indexation to past inflation in this case is set to $\zeta_w = 0.306$.

Second, to match **Fact 3**, we set the elasticity of the wage-push factor with respect to inflation expectations so that we match the evidence shown in Tables 2-4. Parameter $\bar{e}_\pi$ is the elasticity between inflation and nominal wage growth expectations *conditional* on having applied for another job due to higher inflation expectations. Hence, we parameterize $\bar{e}_\pi$ as follows:

$$\bar{e}_\pi = \underbrace{\text{pass-through}}_{\text{Tables 2, 3}} \times \underbrace{\text{elasticity of job applications w.r.t. inflation expectations}}_{=0.114,\text{ Table 4}} \tag{16}$$

6.3 Impulse Response Functions: Lessons

Next, we analyze the dynamics of our model subject to a positive demand shock and a positive (adverse) cost-push shock, the two predominant disturbances that we judge were affecting the US economy around our survey period. Two lessons emerge that help us understand the mechanism behind households' association of higher inflation with worse economic outcomes, consistent with our empirical findings and the work of Shiller (1997) and Candia, Coibion, and Gorodnichenko (2020).

Lesson 1: Negative or dampened responses of real wages to shocks due to nominal wage rigidity translate into greater fluctuations and volatility in output and consumption.

Regardless of whether the model is subjected to a demand- or supply-side inflationary distur-

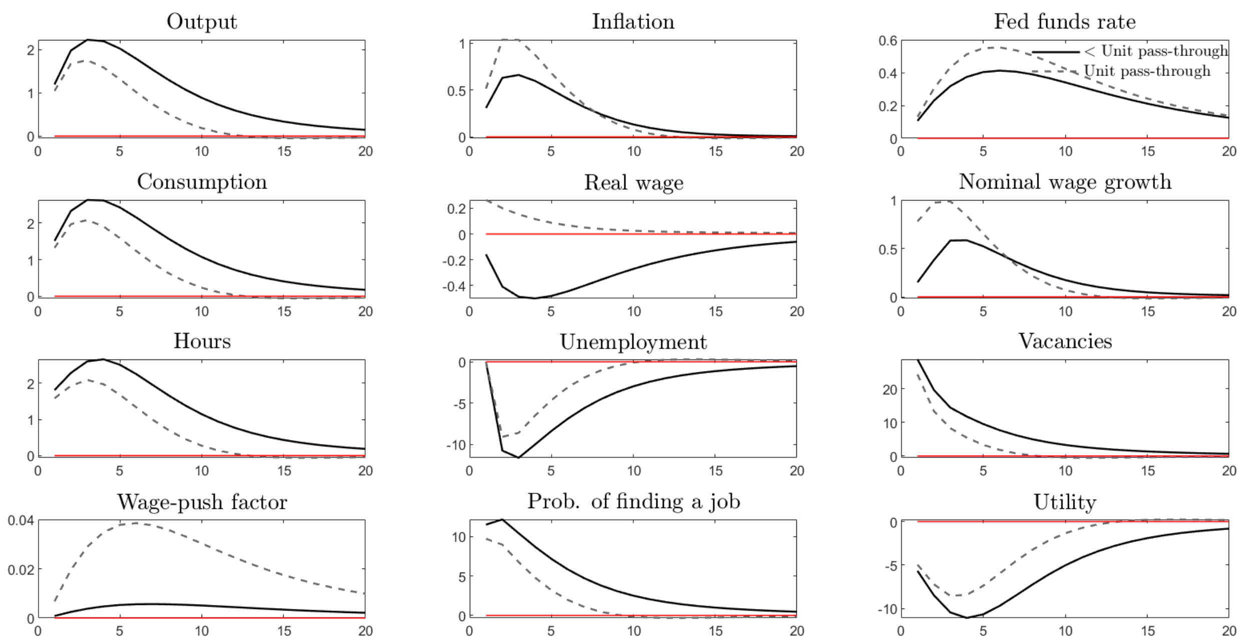
[32] While there are many parameter combinations that can match the model-implied pass-through in (15) with the empirical one, we interpret a less than unity pass-through as evidence of significant nominal wage rigidity and thus remain focused on calibrating this parameter together with the wage indexation to past inflation.

[33] Recall that our posterior question about income growth expectations infers $\widetilde{\mathbb{E}}_t(\hat{W}_{t+7} - \hat{W}_{t+3})$.

[34] Duration of a wage contract is given by $1/(1-\gamma)$.

bance, an economy calibrated to quantitatively match our empirical pass-through of inflation expectations to income growth expectations has large ramifications for real wage dynamics relative to a counterfactual scenario of a unit pass-through. As we subsequently explain, severe nominal wage rigidity is the driving source for consumers' dislike of inflation in the model.

Figure 1: Response to a Positive Demand Shock



Notes: In black: calibration matching our empirical pass-through from inflation to nominal wage growth expectations ($\gamma = 0.875, \zeta_w = 0.675$). In dashed gray: calibration matching counterfactual of unity pass-through from inflation to nominal wage growth expectations ($\gamma = 0.65, \zeta_w = 0.306$). In red: x axis.

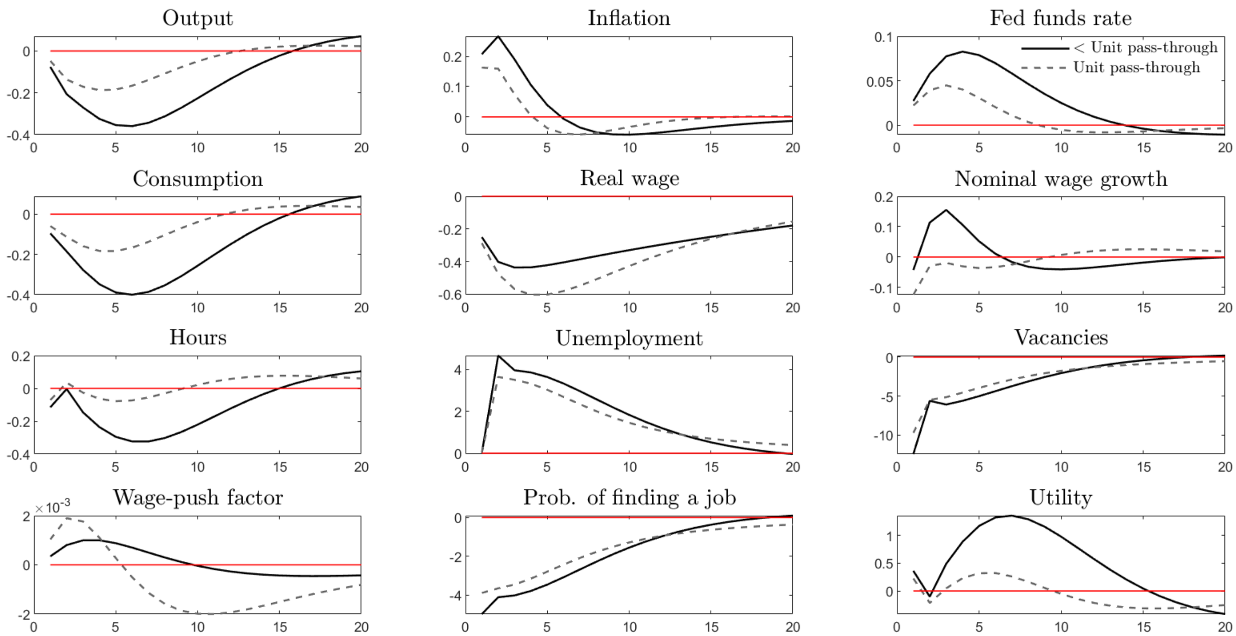
Consider Figure 1, where the economy is subject to a one standard deviation positive demand shock.[35] Relative to the counterfactual of unit pass-through, real wages decline, which results in a larger increase in labor hours that amplifies the responses of output and consumption. Consumers' utility is affected by two opposing forces: it declines in response to working more along both the extensive and the intensive margins, but it increases in response to higher consumption.[36]

[35]The standard deviation of the demand shock is set equal to 1.

[36]It is worth noting that hours in the model fluctuate in response to both the demand and the supply shocks that drive inflation up, while the survey respondents indicated that they did not expect to change their hours in response to higher inflation, indicating some tension between the theoretical model and the empirical data. We leave the resolution of this conundrum for future work.

The former channel is considerably larger in the case of 20 percent pass-through compared with full pass-through, yielding a larger decline in utility even though inflation has risen by less.

Figure 2: Response to a Positive Cost-Push Shock



Notes: In black: calibration matching our empirical pass-through from inflation to nominal wage growth expectations ($\gamma = 0.875, \zeta_w = 0.675$). In dashed gray: calibration matching counterfactual of unity pass-through from inflation to nominal wage growth expectations ($\gamma = 0.65, \zeta_w = 0.306$). In red: x axis.

Figure 2 considers the case where the economy is shocked by a one standard deviation cost-push supply disturbance.[37] Relative to the counterfactual of a unit pass-through economy, the decline in real wages is smaller, putting more downward pressure on labor hours. The large decline in hours worked translates into large declines in output and consumption. Under a supply shock, greater nominal wage frictions cause larger increases in inflation and larger decreases in consumption/output, strengthening consumers' negative association between the two. As was the case for a positive demand shock, a positive cost-push supply shock initially causes an increase in utility, followed by a decline a few periods later, and then a subsequent increase as consumers receive higher utility from working less and enjoying more leisure.[38]

[37] The standard deviation of the cost-push shock is set equal to 1.

[38] As with the demand shock, we note that the fluctuations along the hours margin run counter to our survey results

The comparative analysis pertaining to Figures 1 and 2 is similar when the model is calibrated to match the pass-through from inflation expectations to income growth expectations associated with high- versus low-income respondents. To avoid repetition, we report those IRFs in Appendix I.

We next show how the correlation between expected period utility and inflation expectations varies with the degree of nominal wage stickiness and wage indexation to past inflation. A representative family's period utility in deviation from its steady-state value is given by:

$$\mathcal{U}_t = (c(1-\varrho))^{1-\sigma}(\hat{c}_t - \varrho\hat{c}_{t-1}) - \frac{\kappa_h n h^{1+\varphi}}{1+\varphi}\left(\hat{n}_t + (1+\varphi)\hat{h}_t\right) \tag{17}$$

where $\hat{c}_t$ and $\hat{h}_t$ denote consumption and labor hours, respectively, in deviation from their steady-state values; ϱ is the degree of external habit in consumption; φ is the inverse of labor supply elasticity; and κ_h is a scaling factor to labor disutility.[39]

We simulate 50 periods of expected period utility and inflation expectations data when shocking the model with demand and cost-push innovations, for a given pair j of (γ, ζ_w), and consider the following regression of simulated data:[40]

$$\mathbb{E}_t\mathcal{U}_{j,t+1} = \alpha_j + \gamma_t + \beta\widetilde{\mathbb{E}}_t\hat{\pi}_{t+1} + \theta\left(\gamma_j \times \widetilde{\mathbb{E}}_t\hat{\pi}_{t+1}\right) + \phi\left(\zeta_{w,j} \times \widetilde{\mathbb{E}}_t\hat{\pi}_{t+1}\right) + \varepsilon_{j,t} \tag{18}$$

where α_j is an IRF fixed effect, with an IRF being the series of expected period utility and expected inflation for a given combination of γ and ζ_w; and γ_{t+1} is a fixed effect of every period after the shock. In the regression we drop the coefficient for each specific value γ and ζ_w as it will be absorbed by the IRF fixed effect. Table 7 shows the results for a demand and a supply shock.

in which respondents believe they will not adjust their hours worked in response to a change in expected inflation, providing fertile ground to explore alternative models that can capture this dimension of the data.

[39]See Tables 21 and 22 for their calibration.

[40]For each shock, we consider a total of $10 \times 11 = 110$ pairs of (γ, ζ_w), where $\gamma \in \{0, 0.1, ..., 0.9\}$ and $\zeta_w \in \{0, 0.1, ..., 0.9, 1\}$

Table 7: Relationship between Expected Inflation and Utility for Different Levels of Wage Rigidity

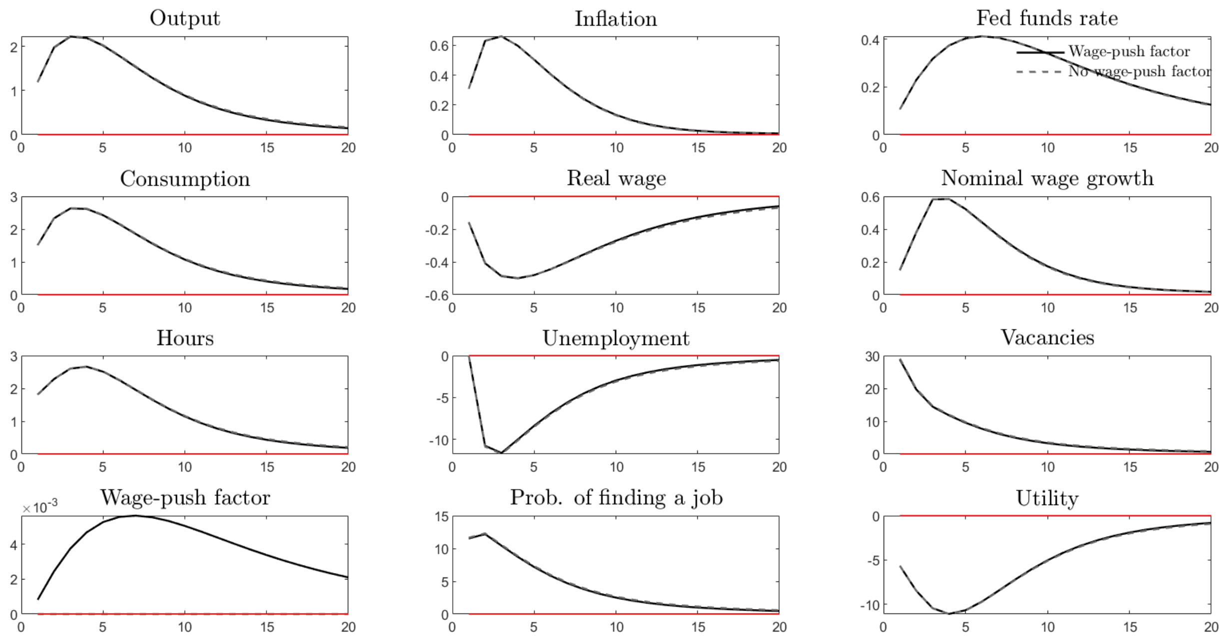
	Cost-push Shock				Demand Shock			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$E_t\pi_{t+1}$	8.842***	1.232**	9.906***	9.897***	1.187***	-1.034**	0.236	-0.285
	(1.438)	(0.561)	(1.756)	(1.669)	(0.223)	(0.482)	(0.227)	(0.183)
γ	0.119***		0.121***		-1.501***		-1.464***	
	(0.016)		(0.016)		(0.071)		(0.067)	
$\gamma \times E_t\pi_{t+1}$	-9.961***		-10.115***	-10.187***	-12.939***		-13.470***	-14.486***
	(1.807)		(1.861)	(1.800)	(0.356)		(0.388)	(0.347)
ζ_w		0.050***	0.051***			0.756***	0.736***	
		(0.011)	(0.011)			(0.059)	(0.046)	
$\zeta_w \times E_t\pi_{t+1}$		-0.830	-1.321	-1.305		0.040	1.509***	1.791***
		(0.816)	(0.897)	(0.842)		(0.394)	(0.255)	(0.227)
Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IRF FE	No	No	No	Yes	No	No	No	Yes
Observations	5,500	5,500	5,500	5,500	5,500	5,500	5,500	5,500
R-squared	0.185	0.150	0.190	0.204	0.743	0.530	0.762	0.844

Notes: This table shows results for regression (18). Columns (1) to (4) show results conditional on a positive cost-push shock and columns (5) to (8) show results conditional on a positive demand shock. Period FE denotes a fixed effect of every period after the shock. IRF FE is a series constant fixed effect. Robust standard errors are in parenthesis.

As shown in Table 7, the correlation between expected period utility and inflation expectations in the model is strongly dependent on the extent of wage rigidity: the higher the share of workers whose wages are rigid, γ, the greater the negative correlation between expected inflation and expected period utility, as captured by the coefficients on the interacted $\gamma \times E_t\pi_{t+1}$. Consistent with our empirical findings, the model exhibits a sticky wage channel to explain consumers' dislike of inflation. These findings hold whether the inflationary shock originates on the supply side or the demand side. Meanwhile, period utility is increasing in the degree of nominal wage indexation to past inflation, ζ_w, once again regardless of whether the shock originates on the supply or the demand side, because this mechanism helps to generally insulate consumers from high inflation. The interaction between indexation and expected inflation is only positive and statistically significant under a demand shock, but it is statistically insignificant when the inflationary shock is from the supply side. Similarly, the impact of other parameters on expected utility depends on the source of the shock. On its own, a higher probability of having a fixed wage tends to lower utility under a demand shock, but it raises utility modestly under a cost-push shock. In Appendix H we explore in more detail the implied correlation between expected utility and inflation when the economy is shocked with a demand or a cost-push innovation. We find that the correlation between the two can be non-linear in the two parameters governing nominal wage rigidity, but the full implications of the non-linearities are beyond the scope of the present paper.

Lesson 2: No macroeconomic effects from inflation expectations operating through the wage-push factor.

Figure 3: Response to a Positive Demand Shock

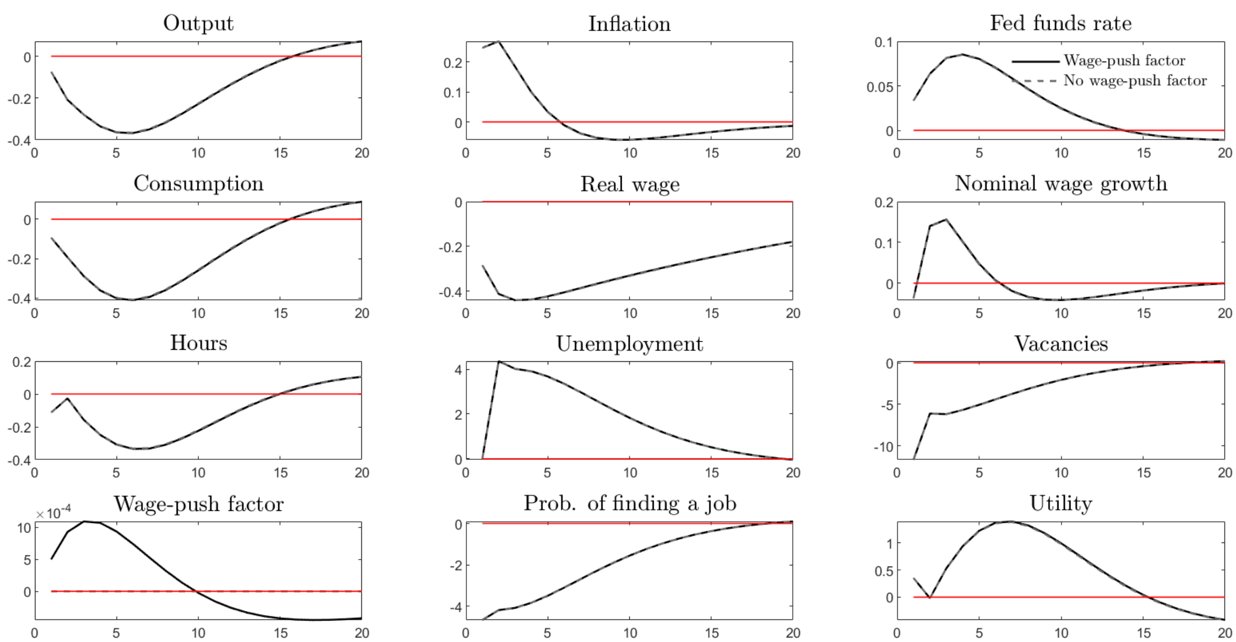


Notes: In black: calibration matching our empirical pass-through from inflation expectations to wage-push factor ($\bar{e}_\pi = 0.0228$). In dashed gray: counterfactual calibration of no pass-through from inflation expectations to wage-push factor ($\bar{e}_\pi = 0$). In red: x axis.

The second macroeconomic implication of our empirical facts is that the positive relationship between expected inflation and nominal wages running through the wage-push factor as we have captured it appears to generate no discernible effects on the macroeconomy in the context of this benchmark model. To show this, we repeat the same IRF exercises when the wage-push factor responds to inflation expectations with an elasticity that matches the pass-through across all respondents, that is, $\bar{e}_\pi = 0.0228$, compared to a case when $\bar{e}_\pi = 0$ and we have shut down this channel. Figures 3 and 4 plot the responses of key macroeconomic variables under both scenarios.

The competing results are virtually indistinguishable. The low pass-through from inflation expectations to nominal wage growth expectations results in a low elasticity of the wage-push factor with respect to expected inflation. On average then, consumers' efforts to raise their wages due to higher inflation expectations do not generate visible changes in their utility, real wage, or consumption.

Figure 4: Response to a Positive Cost-Push Shock



Notes: In black: calibration matching our empirical pass-through from inflation expectations to wage-push factor ($\bar{e}_\pi = 0.0228$). In dashed gray: counterfactual calibration of no pass-through from inflation expectations to wage-push factor ($\bar{e}_\pi = 0$). In red: x axis.

7 Conclusion

This paper relies on an experimental setup to study the causal effect of consumers' inflation expectations on their income growth expectations. Based on the results from a large, nationally representative survey, we find that the rate of pass-through from consumers' inflation expectations to income growth expectations is incomplete, on the order of only 20 percent. Moreover, higher inflation expectations cause a higher willingness to search for a job that pays more, but do not affect the likelihood of working longer hours or asking for a raise. Finally, we find that information about the aggregate economy has little effect on households' expected income growth.

In a general equilibrium model with search-and-matching in labor markets, we calibrate the degree of nominal wage rigidity and wage indexation to past inflation to match the empirical pass-through of inflation expectations to income growth expectations in our survey data. We show that regardless of whether an inflationary shock originates from the demand or the supply side, the matched (less than unity) pass-through generates amplifications and additional volatility in the output and consumption responses, relative to a counterfactual scenario of unit pass-through. As wage rigidity rises, higher rates of expected inflation tend to depress expected utility in the model.

In a seminal paper, Shiller (1997) argued that consumers associate higher inflation with a reduction in their purchasing power. We find that this negative relationship between inflation and consumers' earning prospects holds causally based on our experimental setup. We also explore the consequences of these results. Respondents appear to perceive that their nominal incomes are very rigid with their current employers, as higher inflation expectations only make them more willing to look for another job in order to improve their wages rather than asking for a raise. The implication from these results is that consumers associate inflationary shocks with a reduction in welfare, which can explain why consumers more generally associate higher inflation expectations with worse economic outcomes, as shown by Candia, Coibion, and Gorodnichenko (2020)). Overall, our empirical findings and our theoretical model provide evidence of a labor market channel that can explain why people dislike inflation.

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Appendix (For Online Publication)

A Survey Details and Questions

The experiment was put into the field by Morning Consult during the first week of March 2022. The goal was to sample a total of 6,600 adult respondents. The number of collected responses was 6,629. The survey starts with demographic questions. These are the ones we include in the paper:

- What is your five-digit ZIP Code?
- What is your gender?
  - Male
  - Female
- What is your age?
  - 18-34
  - 35-44
  - 45-64
  - 65+
- Which category represents the total combined income of all members of your HOUSEHOLD during the past 12 months? This includes money from jobs, net income from business, farm or rent, pensions, dividends, interest, Social Security payments and any other money income received by members of your family who are 15 years of age or older.
  - Under 50k
  - 50k-100k
  - 100k+

Then, we have the prior questions for the experiment:

- Next we are asking you to think about changes in prices during the next 12 months in relation to your income. Given your expectations about developments in prices of goods and services during the next 12 months, how would your income have to change to make you equally well-off relative to your current situation, such that you can buy the same amount of goods and services as today? (For example, if you consider prices will fall by 2% over the next 12 months, you may still be able to buy the same goods and services if your income also decreases by 2%.) To make me equally well off, my income would have to

- Increase by __%;
- Stay about the same; and
- Decrease by __%.

- Do you expect your income to increase, decrease, or stay about the same over the next 12 months?
  - Increase by __%;
  - Stay about the same; and
  - Decrease by __%.

At this point, respondents were randomly assigned to receive either a single treatment or to be part of the control group of respondents (with the number of respondents in parentheses):

- Control (N=1,075)
- The Federal Reserve targets an inflation rate of 2% per year in the long run. (1,155)
- A recent survey from the Conference Board found that wages were expected to rise 3.9% in 2022. (1,093)
- Between January 2021 and January 2022, the Consumer Price Index (CPI), which measures the average change in prices over time that consumers pay for goods and services, showed the inflation rate in the US was 7.5%. (1,112)
- According to the Survey of Professional Forecasters, the Consumer Price Index (CPI), which measures the average change in prices over time that consumers pay for goods and services, showed the inflation rate will be 3.7% by the end of 2022. (1,074)
- According to the US Census Bureau, the United States population was 332,402,978 as of December 31, 2021. (1,120)

After being assigned to the control group or receiving a treatment, we asked everybody for their posteriors in the following questions:

- In the next year, do you think prices in general will increase, decrease, or stay about the same?
  - Increase by __%;
  - Stay about the same; and
  - Decrease by __%.
- Between December 2022 and December 2023, do you expect your income to increase, decrease, or stay about the same over the next 12 months?

  - Increase by __%;
  - Stay about the same; and
  - Decrease by __%.

After the posteriors, individuals were asked about their likely labor market actions to increase their income over the next three months.

- How likely are you to do the following to increase your income over the next three months?
  - Apply for a job(s) that pays more
    * Very likely
    * Somewhat likely
    * Somewhat unlikely
    * Very unlikely
    * Don't know / No opinion
  - Work longer hours
    * Very likely
    * Somewhat likely
    * Somewhat unlikely
    * Very unlikely
    * Don't know / No opinion
  - Ask for a raise
    * Very likely
    * Somewhat likely
    * Somewhat unlikely
    * Very unlikely
    * Don't know / No opinion
  - Other (in this case, respondents are asked to provide a description of labor market actions)

B Additional Tables

Table 8: Summary Statistics and Relationship between Price and Wage Inflation

	Panel A			Panel B	
	Inflation Exp	Nominal Income Growth Exp	Real Income Growth Exp		Nominal Income Growth Exp
1st percentile	-2	-12	-100	Inflation Exp	0.365***
First quartile	0	0	-7		(0.012)
Median	0	0	0	Constant	0.891***
Third quartile	10	2	0		(0.104)
99th percentile	100	100	50		
Mean	12.692	5.523	-7.169		
Standard deviation	24.536	18.822	22.735		
Observations	20,550	20,550	20,550		20,550

Notes: This table shows summary statistics for expectations of inflation and nominal income growth. We also report a measure of expected real income growth derived as the difference between expected nominal income growth and expected inflation at the individual level. The right part of the table shows a regression of expected nominal income growth on expected inflation. Huber-robust standard errors are in parentheses. *** denotes statistical significance at the 1 percent level.

Table 9: Robustness First Stage Exercise with Trimmed and Quantile Regressions

	(1)	(2)	(3)	(4)
	$E_i\left[\pi_p^{Posterior}\right]$	$E_i\left[\pi_p^{Posterior}\right]$	$E_i\left[\pi_y^{Posterior}\right]$	$E_i\left[\pi_y^{Posterior}\right]$
$E_i\left[\pi_p^{Prior}\right]$	0.262***	0.467***		
	(0.026)	(0.016)		
$E_i\left[\pi_y^{Prior}\right]$			0.775***	1.000
			(0.048)	-
T2: Target	-0.627	0.558	-0.203	-
	(0.460)	(0.248)	(0.104)	-
T3: Wages	-0.695	1.333**	-0.208	-
	(0.450)	(0.592)	(0.230)	-
T4: CPI	-0.825*	0.533	-0.109	-
	(0.456)	(0.587)	(0.254)	-
T5: SPF	-0.749	1.556***	-0.100	-
	(0.465)	(0.596)	(0.247)	-
T6: Placebo	0.133	1.333**	-0.373	-
	(0.465)	(0.590)	(0.248)	-
T2 x prior	-0.002	-0.079***	-0.127*	-
	(0.036)	(0.022)	(0.072)	-
T3 x prior	-0.003	-0.107***	-0.047	-
	(0.035)	(0.022)	(0.071)	-
T4 x prior	-0.015	-0.107***	-0.114	-
	(0.035)	(0.022)	(0.074)	-
T5 x prior	-0.025	-0.189***	-0.039	-
	(0.036)	(0.023)	(0.071)	-
T6 x prior	0.047	0.013	-0.078	-
	(0.035)	(0.022)	(0.074)	-
Constant	5.667***	0.667	0.925***	-
	(0.337)	(0.419)	(0.185)	-
Sample	OLS	Quantile	OLS	Quantile
Observations	6,620	6,620	6,622	6,622
R-squared	0.261		0.559	

Notes: The table shows estimates of equations 3 and 4 that gauge the effect of treatments and their interaction with prior beliefs. Columns (1) and (3) show results that exclude responses in the tails of the distribution (less than the 5th percentile or greater than the 95th percentile) of changes between priors and posteriors, using robust standard errors. Columns (2) and (4) use quantile regressions at the median.

Table 10: Effect of Inflation Expectations on Wage Increase Actions, Trimmed Sample

	Apply for a job(s)		Work longer hours		Ask for a raise	
	(1)	(2)	(3)	(4)	(5)	(6)
$E_i\left[\pi_p^{Posterior}\right]$	0.005***	0.018***	0.004**	0.008**	-0.002	0.004
	(0.002)	(0.004)	(0.002)	(0.004)	(0.002)	(0.004)
Constant	2.212***	2.103***	2.263***	2.225***	2.110***	2.063***
	(0.023)	(0.039)	(0.022)	(0.039)	(0.022)	(0.041)
Regression	OLS	IV	OLS	IV	OLS	IV
F Test		423.226		447.834		388.324
$\frac{dy}{dx}\frac{\bar{x}}{\bar{y}}$	0.019	0.067	0.014	0.031	-0.008	0.015
Observations	4,471	4,471	4,406	4,406	4,256	4,256
R-squared	0.002	-0.013	0.001	-0.001	0.000	-0.003

Notes: This table shows OLS and IV regressions from equation 6. ℓ_i^j is a value that ranges from 1 to 4, where 1 is "Very unlikely, " 2 is "Somewhat unlikely," 3 is "Somewhat likely" and 4 is "Very likely." For columns (1) and (2) ℓ_i^j is the answer to the question about "apply for a job(s) that pays more," columns (3) and (4) are the answers to the question about "work longer hours," and columns (5) and (6) are the answers about "ask for a raise." We use as an instrument the values generated from column (3) in Table 1 Robust standard errors are in parentheses.

Table 11: Effect of Inflation Expectations on Apply for a Job(s) by Demographics

	Apply for a Job(s) That Pays More					
	All	Male	Female	<50k	50k-100k	100k+
	(1)	(2)	(3)	(4)	(5)	(6)
$E_i\left[\pi_p^{Posterior}\right]$	0.029***	0.021***	0.042***	0.019**	0.048***	0.025***
	(0.006)	(0.007)	(0.010)	(0.010)	(0.011)	(0.007)
Constant	2.015***	2.172***	1.802***	2.173***	1.801***	2.033***
	(0.054)	(0.060)	(0.102)	(0.095)	(0.096)	(0.074)
Regression	IV	IV	IV	IV	IV	IV
F-Test	143.328	82.591	59.017	59.277	36.924	137.812
$\frac{dy}{dx}\frac{\bar{x}}{\bar{y}}$	0.114	0.072	0.184	0.076	0.182	0.094
Observations	4,651	2,371	2,280	1,984	1,662	1,005

Notes: This table shows IV regressions from equation 6. ℓ_i^j is a value that ranges from 1 to 4, where 1 is "Very unlikely, " 2 is "Somewhat unlikely," 3 is "Somewhat likely" and 4 is "Very likely." ℓ_i^j is the answer to the question "apply for a job(s) that pays more." Column (1) is for the full sample, column (2) only for male respondents, column (3) for female respondents, column (4) for respondents who have an income lower than 50k, column (5) for respondents with income between 50k and 100k, and column (6) for respondents with income higher than 100k. We use as an instrument the values generated from column (3) in Table 1. Robust standard errors are in parentheses.

Table 12: Effect of Inflation Expectations on Work Longer Hours by Demographics

	Work Longer Hours					
	All	Male	Female	<50k	50k-100k	100k+
	(1)	(2)	(3)	(4)	(5)	(6)
$E_i\left[\pi_p^{Posterior}\right]$	0.009	0.004	0.018**	0.001	0.024**	0.012
	(0.005)	(0.007)	(0.009)	(0.009)	(0.011)	(0.008)
Constant	2.219***	2.372***	2.008***	2.263***	2.067***	2.296***
	(0.051)	(0.060)	(0.091)	(0.088)	(0.093)	(0.078)
Regression	IV	IV	IV	IV	IV	IV
F-Test	149.752	88.642	60.033	61.735	39.939	138.630
$\frac{dy}{dx}\frac{\bar{x}}{\bar{y}}$	0.034	0.014	0.080	0.003	0.088	0.043
Observations	4,573	2,339	2,234	1,942	1,630	1,001

Notes: This table shows IV regressions from equation 6. ℓ_i^j is a value that ranges from 1 to 4, where 1 is "Very unlikely, " 2 is "Somewhat unlikely," 3 is "Somewhat likely" and 4 is "Very likely." ℓ_i^j is the answer to the question "work longer hours." Column (1) is for the full sample, column (2) only for male respondents, column (3) for female respondents, column (4) for respondents who have an income lower than 50k, column (5) for respondents with income between 50k and 100k, and column (6) for respondents with income higher than 100k. We use as an instrument the values generated from column (3) in Table 1. Robust standard errors are in parentheses.

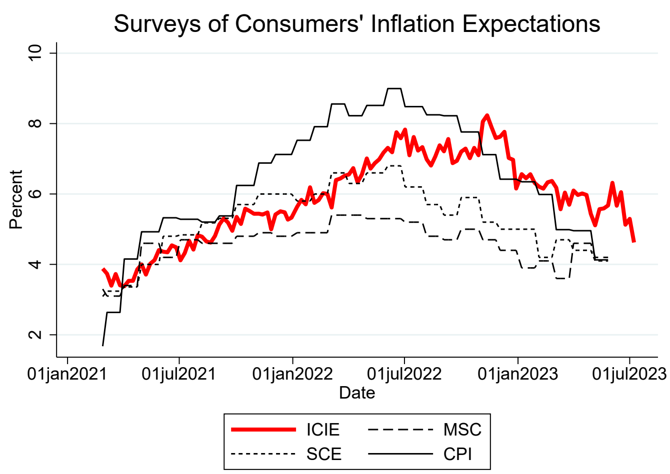
Table 13: Effect of Inflation Expectations on Ask for a Raise by Demographics

	Ask for a Raise					
	All	Male	Female	<50k	50k-100k	100k+
	(1)	(2)	(3)	(4)	(5)	(6)
$E_i\left[\pi_p^{Posterior}\right]$	0.003	0.007	0.000	-0.011	0.016*	0.018**
	(0.006)	(0.007)	(0.010)	(0.010)	(0.009)	(0.008)
Constant	2.068***	2.205***	1.910***	2.100***	1.962***	2.112***
	(0.052)	(0.058)	(0.092)	(0.094)	(0.083)	(0.076)
Regression	IV	IV	IV	IV	IV	IV
F-Test	143.25	88.667	53.836	49.857	50.938	194.820
$\frac{dy}{dx}\frac{\bar{x}}{\bar{y}}$	0.011	0.023	0.002	-0.051	0.064	0.066
Observations	4,406	2,283	2,126	1,847	1,593	969

Notes: This table shows IV regressions from equation 6. ℓ_i^j is a value that ranges from 1 to 4, where 1 is "Very unlikely, " 2 is "Somewhat unlikely," 3 is "Somewhat likely" and 4 is "Very likely." ℓ_i^j is the answer to the question "Ask for a raise." Column (1) is for the full sample, column (2) only for male respondents, column (3) for female respondents, column (4) for respondents who have an income lower than 50k, column (5) for respondents with income between 50k and 100k, and column (6) for respondents with income higher than 100k. We use as an instrument the values generated from column (3) in Table 1. Robust standard errors are in parentheses.

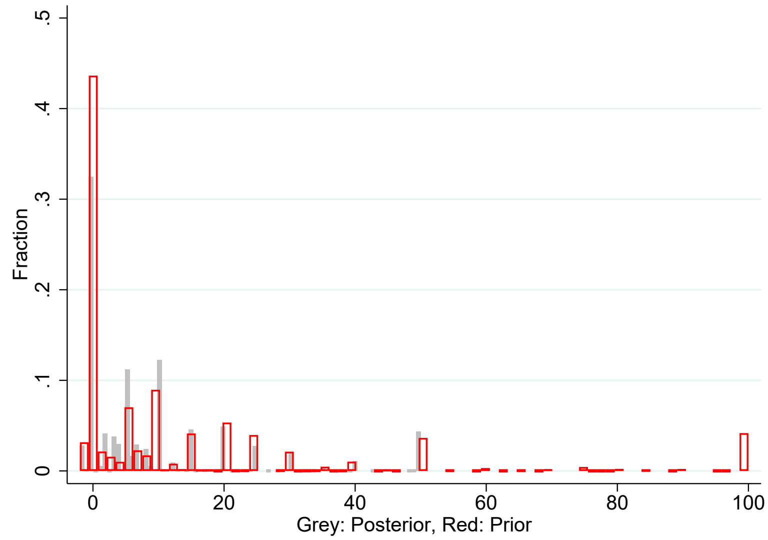
C Additional Figures

Figure 5: ICIE and Other Surveys of Inflation Expectations



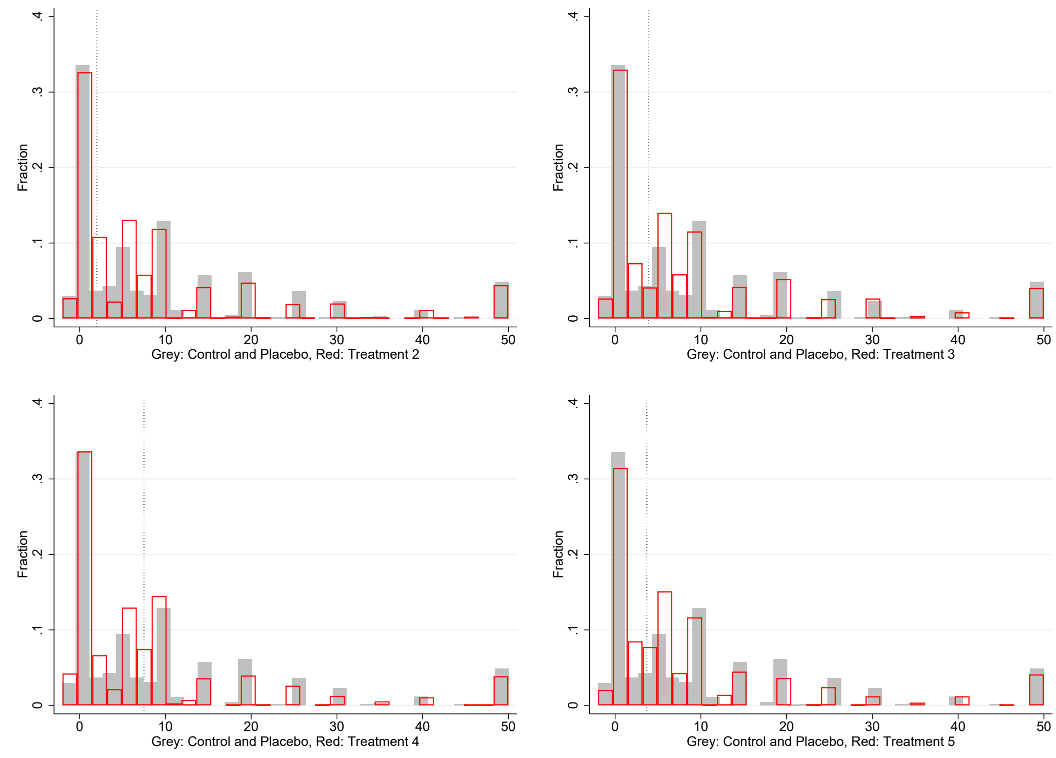
Notes: The figure plots different measures of inflation expectations from March 2021 to July 2023. ICIE is the Indirect Consumer Inflation Expectations. MSC denotes the median inflation expectations from the Michigan Survey of Consumers. SCE denotes the median inflation expectations from the NY Fed Survey of Consumer Expectations. CPI is the price inflation for the US.

Figure 6: Distribution of Price Prior and Posterior



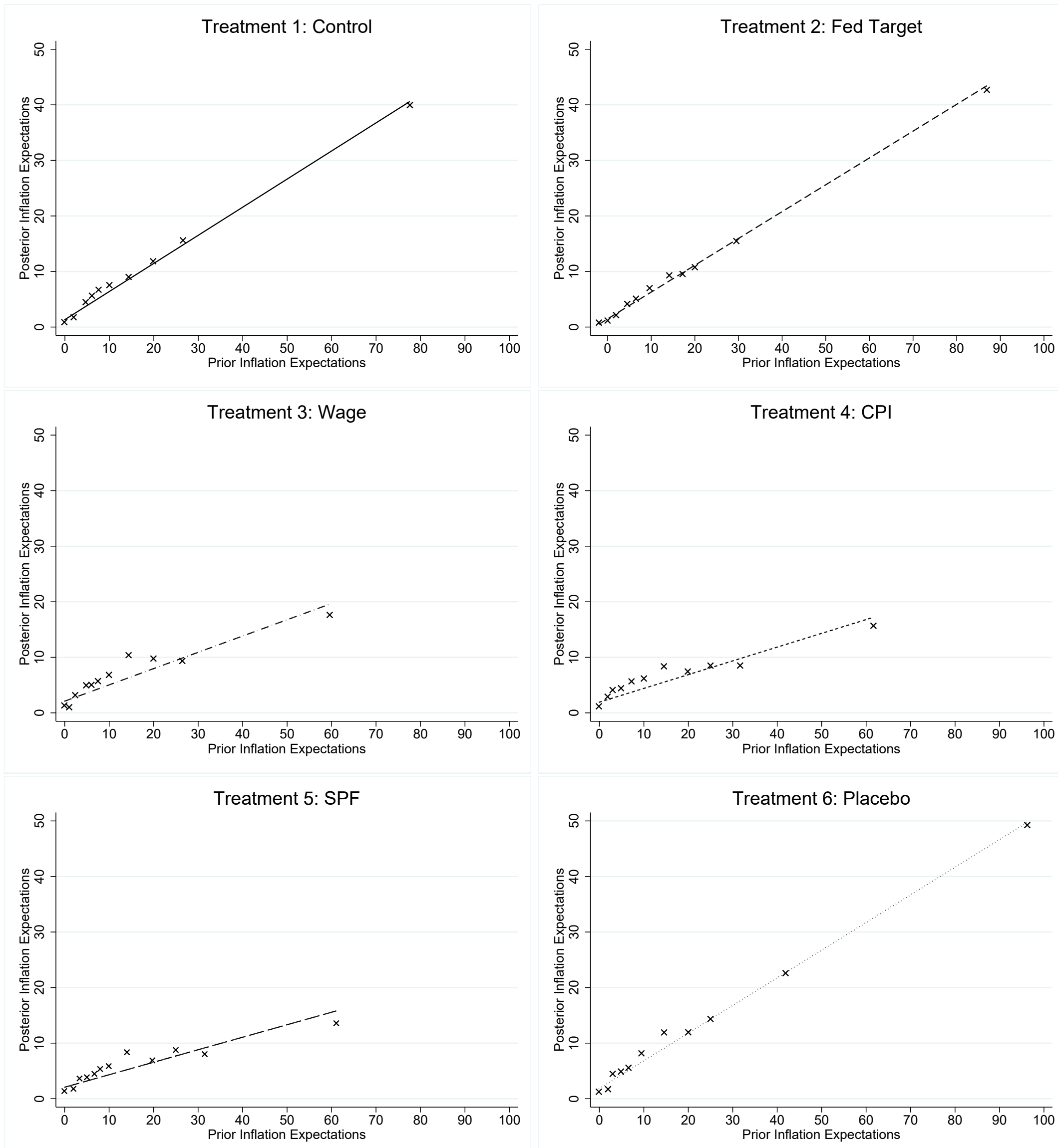
Notes: The figure shows the distribution of the prior (red) and posterior (grey) groups for treated and control groups.

Figure 7: Distribution of Price Posterior by Treatment Group



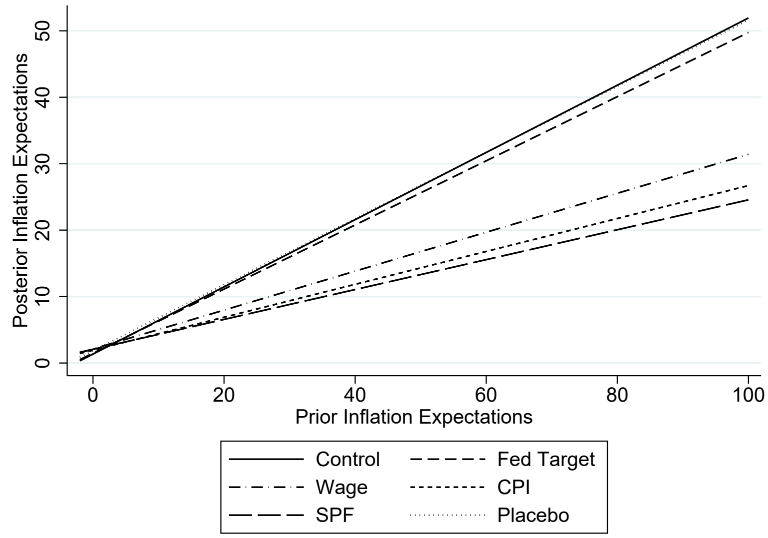
Notes: The figures show the distribution of the posterior for the control and placebo groups (grey) and the treatment groups (red). The upper-left panel shows results for treatment 2 related to the Fed target. The upper-right panel shows results for treatment 3 related to the wage growth expectations. The lower-left panel shows results for treatment 4 related to CPI inflation. The lower-right panel shows results for treatment 5 related to the inflation forecast. The black vertical dots indicate the numerical information provided in the treatment.

Figure 8: Distribution of Prior and Posterior by Treatment Group



Notes: The graph plots a bin scatter plot (n=25) and the linear prediction, weighted by the Huber weights as in Table 1, for each treatment group. The x axis shows the prior inflation expectations and the y axis the posterior inflation expectations.

Figure 9: Prior and Posterior Inflation Expectations by Treatment Group



Notes: The graph shows the linear prediction for the distribution of priors and posteriors for inflation expectations by treatment group. The distribution is weighted by the Huber weights in Table 1. The slope and intercept correspond with results of column (4) in Table 1

D Follow-Up Exercise

In the second week of September 2022, we ran a follow-up exercise. This exercise consisted of the same questions used in the first run, with the same phrasing and ordering. Then, we updated the wage, CPI, and SPF treatments with the most up-to-date information. This time we targeted a sample of 1500 respondents per treatment. The target and placebo treatments remained the same. The wage treatment changed its reference to a forecast from the CBO, as there was no update available on the Conference Board forecast used before and the old forecast was quite outdated at that point. The new wage treatment was the following: *"A recent forecast from the Congressional Budget Office projected that wages and salaries among non-government workers would rise 4.1% on average in 2023."* In the case of the CPI treatment, we used the CPI inflation rate as of July 2022 (8.5 percent) and moved forward the corresponding dates. In terms of the SPF projection, we used the forecast for the CPI inflation rate to the end of 2023 (3.2 percent). We then ran:

$$E_i\left[\pi_p^{Posterior}\right] = \alpha_t + \beta E_i\left[\pi_p^{Prior}\right] + \sum_{j=2}^{6}\gamma_p^j \times T_i^j + \sum_{j=2}^{6}\theta_p^i \times T_i^j \times E_i\left[\pi_p^{Prior}\right] + \varepsilon_i \quad \text{(D.1)}$$

and we estimated the following specification for income growth expectations:

$$E_i\left[\pi_y^{Posterior}\right] = \alpha_t + \beta E_i\left[\pi_y^{Prior}\right] + \sum_{j=2}^{6}\gamma_y^j \times T_{it}^j + \sum_{i=2}^{6}\theta_y^i \times T_{it}^j \times E_i\left[\pi_y^{Prior}\right] + \varepsilon_i \quad \text{(D.2)}$$

where α_t is a time or survey round fixed effect. In this case the treatment information is multiplied by its numerical value, which is why T_{it} varies by individual and time, since we use data from March and September. This is similar to the instrument used by Coibion, Gorodnichenko, and Ropele (2020b). The results are presented in Table 14.

Table 14: Follow-up Treatment Effect

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$E_i\left[\pi_p^{Posterior}\right]$	$E_i\left[\pi_p^{Posterior}\right]$	$E_i\left[\pi_p^{Posterior}\right]$	$E_i\left[\pi_p^{Posterior}\right]$	$E_i\left[\pi_y^{Posterior}\right]$	$E_i\left[\pi_y^{Posterior}\right]$	$E_i\left[\pi_y^{Posterior}\right]$	$E_i\left[\pi_y^{Posterior}\right]$
$E_i\left[\pi_p^{Prior}\right]$	0.199***	0.209***	0.300***	0.450***	0.658***	0.648***	0.570***	0.533***
	(0.015)	(0.018)	(0.038)	(0.005)	(0.036)	(0.046)	(0.042)	(0.060)
$E_i\left[\pi_y^{Prior}\right]$	0.199***	0.209***	0.300***	0.450***	0.658***	0.648***	0.570***	0.533***
	(0.015)	(0.018)	(0.038)	(0.005)	(0.036)	(0.046)	(0.042)	(0.060)
$Target_{it}$	-0.638**	-0.634**	0.442*	1.247***	-0.382**	-0.530***	0.093	0.133
	(0.274)	(0.318)	(0.268)	(0.104)	(0.156)	(0.204)	(0.074)	(0.091)
$Wages_{it}$	-0.603**	-0.510	0.000	1.179***	-0.188	-0.318	0.052	0.084
	(0.269)	(0.313)	(0.251)	(0.106)	(0.160)	(0.210)	(0.072)	(0.088)
CPI_{it}	-0.751***	-0.819***	0.000	1.010***	-0.047	-0.191	0.150*	0.137
	(0.274)	(0.313)	(0.246)	(0.106)	(0.172)	(0.214)	(0.078)	(0.089)
SPF_{it}	-0.696**	-0.710**	0.585**	1.322***	-0.104	-0.207	0.119	0.083
	(0.276)	(0.313)	(0.268)	(0.105)	(0.173)	(0.232)	(0.074)	(0.087)
$Placebo_{it}$	0.207	0.327	0.000	0.335***	-0.305*	-0.341	-0.013	-0.061
	(0.289)	(0.334)	(0.256)	(0.099)	(0.164)	(0.217)	(0.073)	(0.082)
$Target_{it} \times Prior_{it}$	-0.005	-0.008	-0.040*	-0.188***	-0.030	-0.008	-0.041	-0.040
	(0.010)	(0.013)	(0.022)	(0.004)	(0.026)	(0.031)	(0.030)	(0.040)
$Wages_{it} \times Prior_{it}$	0.001	-0.004	-0.012	-0.083***	-0.001	-0.001	-0.012	-0.020
	(0.005)	(0.006)	(0.011)	(0.002)	(0.013)	(0.016)	(0.014)	(0.021)
$CPI_{it} \times Prior_{it}$	-0.001	-0.001	-0.010*	-0.042***	-0.006	-0.007	0.000	0.001
	(0.002)	(0.003)	(0.005)	(0.001)	(0.007)	(0.008)	(0.007)	(0.010)
$SPF_{it} \times Prior_{it}$	-0.005	-0.006	-0.029**	-0.115***	0.004	0.008	-0.022	-0.015
	(0.006)	(0.008)	(0.012)	(0.002)	(0.015)	(0.018)	(0.017)	(0.022)
$Placebo_{it} \times Prior_{it}$	0.038*	0.019	0.057	0.004	-0.021	-0.008	-0.068	-0.045
	(0.021)	(0.025)	(0.047)	(0.007)	(0.052)	(0.062)	(0.055)	(0.072)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	All	All	All	All	All	All	Trimmed	Trimmed
Regression	OLS	Weights	Quantile	Huber	OLS	Weights	OLS	Weights
Observations	15,463	15,463	15,463	14,276	15,465	15,465	13,324	13,324
R-squared	0.212	0.216		0.580	0.487	0.488	0.333	0.314

Notes: The table shows estimates of equations 1 and 2 that relate priors and posteriors, as well as estimates of equations 3 and 4 that gauge the effect of treatments and their interaction with prior beliefs.

We can see from column (4) that we obtain similar effects for the treatments in terms of their effects on inflation expectations, with the exception of the placebo; that is, our treatments are effective in moving people's posterior inflation expectations. Thus, we can once again use our treatments to instrument for inflation expectations. By contrast, columns (5) to (8) show that the information treatments do not seem to affect consumers' posterior income growth expectations, conditional on the prior, meaning that the treated and control groups are effectively the same, and preventing us from doing the same to instrument for income growth expectations. As a result, we run

$$E_i\left[\widehat{\pi_p^{Posterior}}\right] = \begin{cases} \sum_{j=2,4,5} \gamma_p^j \times T_{it}^j + \sum_{j=2,4,5} \theta_p^j \times T_{it}^j \times E_i\left[\pi_p^{Prior}\right] & if \quad T_{it} = Target, CPI, SPF \\ 0 & if \quad T_{it} = Control, Placebo \end{cases}$$

where we use the numerical information provided within each treatment T_{it}^j that varies over time as above. Table 15 shows the results for the average and by demographics

Table 15: Pass-through from Inflation Expectations to Income Growth Expectations, by Demographics Follow-up

	$E_i\left[\pi_y^{Posterior}\right]$					
	All	Male	Female	<50k	50k-100k	>100k
$E_i\left[\pi_p^{Posterior}\right]$	0.174***	0.243***	0.135**	0.148***	0.210**	0.253**
	(0.043)	(0.068)	(0.056)	(0.056)	(0.087)	(0.107)
$E_i\left[\pi_y^{Prior}\right]$	0.594***	0.597***	0.582***	0.597***	0.567***	0.603***
	(0.019)	(0.030)	(0.026)	(0.025)	(0.037)	(0.062)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
F-test	314.429	123.973	185.655	185.638	76.927	61.875
Observations	12,882	6,039	6,843	6,029	4,452	2,401
R-squared	0.486	0.541	0.441	0.477	0.459	0.559

Notes: This table shows results from IV regressions from different demographics. The regression used is the same as in column (2) in Table 2. Regressions have robust standard errors.

We see a pattern similar to the one in the baseline exercise. The estimated pass-through is a little bit smaller, but still close to 20 percent. We find the same pattern for the results by demographics as before. Finally, we run the regressions on the labor market actions using the same strategies, meaning that we use the same controls and time fixed effects. The results are presented in Table 16.

Table 16: Effect of Inflation Expectations on Wage Increase Actions, Follow-up

	Apply for a job(s) that pays more		Work longer hours		Ask for a raise	
	(1)	(2)	(3)	(4)	(5)	(6)
$EE_i\left[\pi_p^{Posterior}\right]$	0.006***	0.036***	0.005***	0.015***	-0.002	0.002
	(0.001)	(0.004)	(0.001)	(0.004)	(0.001)	(0.004)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Regression	OLS	IV	OLS	IV	OLS	IV
F-Test		372.1		377.8		359.9
$\frac{dy}{dx}\frac{\bar{x}}{\bar{y}}$	0.020	0.121	0.016	0.049	-0.007	0.007
Observations	4,651	4,651	4,573	4,573	4,409	4,409

Notes: This table shows OLS and IV regressions from equation 6. ℓ_i^j is a value that ranges from 1 to 4, where 1 is "Very unlikely, " 2 is "Somewhat unlikely," 3 is "Somewhat likely" and 4 is "Very likely." For columns (1) and (2) ℓ_i^j is the answer to the question about "apply for a job that pays more," columns (3) and (4) are the answers to the question about "work longer hours," and columns (5) and (6) are the answers about "ask for a raise." Regressions have robust standard errors.

We find very similar results in terms of point estimates and elasticities. Overall, the follow-up exercise confirms the robustness of the baseline results, suggesting that they are not driven solely by a particular time period in early 2022. In addition, it is worth noting that this exercise from September 2022 shows that our baseline results are robust to varying the precise time frame used in the priors and posteriors. In particular, in this exercise we used a time frame for the posterior income growth expectations question that had greater temporal overlap with the prior than was the case in our baseline exercise conducted in March 2022. Given that our results are essentially unchanged, we are comfortable that different timing assumptions were not driving the results documented in the body of the paper.[41]

In addition to this exercise, we use the variation on the same information treatment to learn about the effect of each treatment on the pass-through result. In order to do so, we use the "control" groups (placebo and control) and only one treatment group individually at a time. Table 17 describes the results for each treatment group.

[41] As a reminder, in the baseline survey results from March 2022, the inflation prior asked about income needed to offset price changes "over the next 12 months," while the inflation posterior asked about the growth in prices "in the next year." Meanwhile, the income growth prior asked about expected income changes "over the next 12 months" while the income growth posterior asked about expected income growth "between December 2022 and December 2023." In the survey results from September 2022, the wording of the prior and posterior questions was unchanged, meaning that there was now more overlap in the time frames for the income prior and posterior questions, whereas there had been little overlap in the March wave. The fact that our results are essentially the same implies that the lack of overlap in the baseline results was not important for our findings.

Table 17: IV Results for Each Individual Treatment

	$E_i\left[\pi_y^{Posterior}\right]$			
	(1)	(2)	(3)	(4)
$E_i\left[\pi_p^{Posterior}\right]$	0.174***	0.151*	0.148*	0.207**
	(0.043)	(0.078)	(0.079)	(0.090)
$E_i\left[\pi_y^{Prior}\right]$	0.594***	0.598***	0.602***	0.606***
	(0.019)	(0.028)	(0.028)	(0.030)
Time FE	Yes	Yes	Yes	Yes
Treatment	All	Target	CPI	SPF
F-Test	314.429	86.127	96.273	82.905
Observations	12,882	7,792	7,735	7,673
R-squared	0.486	0.494	0.478	0.491

Notes: This table shows results from IV regressions one treatment at a time. The regression used is the same as in column (2) in Table 2. Regressions have robust standard errors.

Table 17 shows that the effect changes slightly depending on the treatment. The estimated pass-through is slightly stronger when consumers are treated with information about future inflation, and slightly lower for the other treatments, but they are all comparable. The table shows that our main findings are highly robust: pass-through is on the order of roughly 20 percent. Because each inflation treatment is generating a similar pass-through estimate, we do not believe that the imbalance of having three inflation treatments and one wage treatment is a primary driver of our main result.

E Robustness of Experiment to Prior on Inflation Expectations

Here, we show that our novel indirect measure of inflation expectations, used to capture respondents' prior inflation expectations in the experiment, does not bias the effect of inflation expectations on income growth expectations or labor market actions. In Hajdini et al. (2022a), we describe our novel measure of inflation expectations in detail. In particular, we show that it has properties similar to other measures of inflation expectations such as those of the Federal Reserve Bank of New York's Survey of Consumer Expectations (SCE) or the Surveys of Consumers by the University of Michigan. Regardless of such evidence, we chose to perform a complementary RCT experiment in June 2023 to explore whether relying on our novel indirect measure of inflation expectations biases the effect of inflation expectations on income growth expectations or labor market actions. We find that the choice of the prior question does not yield any significant differences in our main results.

Specifically, a sample of around 4,400 respondents entered our RCT experiment in June 2023. Respondents were randomly assigned to two groups: one group was asked our novel ICIE question and the other group was asked the conventional inflation expectations question from the Federal Reserve Bank of New York's Survey of Consumer Expectations. In particular, the latter question asks consumers the following: *"In the next year, do you think that there will be inflation or deflation? (Note: deflation is the opposite of inflation)."* Respondents were then provided with the following options: *"1. Inflation (%); 2. Deflation (%); 3. Neither inflation nor deflation."* Then, all respondents were asked the same question about income growth expectations, as in the regular exercise in the main text: "Do you expect your income to increase, decrease, or stay about the same over the next 12 months?" Subsequently, half of each group (randomly assigned) received a treatment related to inflation:

"According to the Survey of Professional Forecasters, the Consumer Price Index (CPI), which measures the average change in prices over time that consumers pay for goods and services, showed the inflation rate will be 3.4% by the end of 2023."

The rest of the respondents received no treatment. Finally, all respondents were asked about their posterior inflation expectations and income growth expectations, respectively, relying on the following two questions:

"In the next year, do you think prices in general will increase, decrease, or stay about the same?"

"Between December 2023 and December 2024, do you expect your income to increase, decrease, or stay about the same?" Last, we ask respondents the labor market action questions in the same way as in the main RCT experiment.

The ultimate goal of this exercise is to understand whether the estimated pass-through from inflation expectations to income growth expectations depends on the question used to elicit prior inflation expectations. Our strategy is to first evaluate the effect of the prior and treatment on posterior inflation expectations, running regressions similar to (1) and (3). We do so for the two distinct priors separately as well as jointly, with results shown in Table 18.

Table 18: Effects of Treatments on Expectations: Different Priors

	(1)	(2)	(3)
	$E_i\left[\pi_p^{Posterior}\right]$	$E_i\left[\pi_p^{Posterior}\right]$	$E_i\left[\pi_p^{Posterior}\right]$
$E_i\left[\pi_p^{Prior}\right]$	0.491***	0.218***	0.399***
	(0.003)	(0.006)	(0.063)
T1: SPF	0.580***	0.130	0.239***
	(0.064)	(0.095)	(0.005)
T1 x Prior	-0.446***	-0.057***	-0.192***
	(0.005)	(0.010)	(0.005)
Constant	0.164***	0.830***	0.645***
	(0.035)	(0.066)	(0.041)
Sample	ICIE	NYFED	Pooled
Observations	1,813	1,974	3,846
R-squared	0.880	0.576	0.525

Notes: The table shows estimates of equation (1) that relate priors and posteriors, as well as estimates of equation (3) that gauge the effect of treatments and their interaction with prior beliefs. In column (1), $E_i\left[\pi_p^{Prior}\right]$ refers to prior inflation expectations elicited using the ICIE question, whereas in column (2), $E_i\left[\pi_p^{Prior}\right]$ denotes prior inflation expectations inferred from the NY Fed question. In column (3), both priors are pooled so $E_i\left[\pi_p^{Prior}\right]$ denotes prior inflation expectations inferred from both the ICIE and the NY Fed question.

We then take advantage of the exogenous variation in inflation expectations induced by our information treatment to construct our instrument for inflation expectations, similar to the main RCT experiment. We construct the instrumental variable in two ways: i) using the pooled first-stage regression, thereby assuming the same coefficient for both priors, and ii) allowing for prior-specific coefficients. Specifically,

$$E_i\left[\widehat{\pi_p^{Posterior}}\right] = \begin{cases} \gamma_p T_i + \theta_p \left(T_i \times E_i\left[\pi_p^{Prior}\right]\right) & \text{if treated group} \\ 0 & \text{if control group} \end{cases}$$

where $T_i = 1$ if individual i is treated with the inflation information and 0 otherwise; for the first variant of constructing the instrumental variable we rely on estimates of γ_p and θ_p reported in column (3) in Table 18, whereas for the second variant we use estimates of γ_p and θ_p reported in column 1 for the respondents who are asked the ICIE question and estimates shown in column (2) for those who are asked the Federal Reserve Bank of New York's SCE question.

We then estimate, analogously to our previous instrumented regression setup, the following regression

$$E_i\left[\pi_y^{Posterior}\right] = \alpha_0 + \alpha_1 \times NYFed + \beta_0 E_i\left[\pi_p^{Posterior}\right] + \beta_1\left(E_i\left[\pi_p^{Posterior}\right]] \times NYFed\right) + \psi E_i\left[\pi_y^{Prior}\right] + \varepsilon_i \tag{E.1}$$

where $NYFed$ is a dummy variable taking value 1 if prior inflation expectations are elicited using the Federal Reserve Bank of New York's SCE question and 0 otherwise. We note that, differently from the analysis in the main text, our regression above includes the dummy variable $NYFed$ as well as its interaction with the prior in order to test whether the effects of the choice of prior are significantly different or not. We instrument $E_i\left[\pi_p^{Posterior}\right]$ using $E_i\left[\widehat{\pi_p^{Posterior}}\right]$.

Similarly, we run the following regression of the reported likelihood of undertaking labor market action ℓ_i^j on expected inflation, to assess the extent to which inflation expectations drive labor market decisions:

$$\ell_i^j = \alpha_0 + \alpha_1 \times NYFed + \beta_0 E_i\left[\pi_p^{Posterior}\right] + \beta_1\left(E_i\left[\pi_p^{Posterior}\right] \times NYFed\right) + \varepsilon_i \tag{E.2}$$

where ℓ_i^j is a value that ranges from 1 to 4, where 1 is "Very unlikely, " 2 is "Somewhat unlikely," 3 is "Somewhat likely" and 4 is "Very likely" for three labor market actions: i) apply for a job(s) that pays more; ii) work longer hours; and iii) ask for a raise. As in (E.1), we control for the dummy variable $NYFed$ and its interaction with the prior to test whether the choice of prior has significantly different effects on the estimated pass-through from inflation expectations to labor market actions.

Table 19 shows the pass-through results and Table 20 shows the findings in terms of labor market actions.

Table 19: Pass-through Estimates for Different Inflation Expectations Priors

	(1)	(2)	(3)	(3)
	$E_i\left[\pi_y^{Posterior}\right]$	$E_i\left[\pi_y^{Posterior}\right]$	$E_i\left[\pi_y^{Posterior}\right]$	$E_i\left[\pi_y^{Posterior}\right]$
$E_i\left[\pi_p^{Posterior}\right]$	0.178***	0.106	0.178***	0.104
	(0.039)	(0.131)	(0.039)	(0.131)
$E_i\left[\pi_p^{Posterior}\right] \times NYFed(=1)$	-0.060	-0.120	-0.060	-0.119
	(0.048)	(0.141)	(0.048)	(0.141)
$E_i\left[\pi_y^{Prior}\right]$	0.531***	0.558***	0.531***	0.558***
	(0.029)	(0.034)	(0.029)	(0.034)
$NYFed(=1)$	-0.311	0.098	-0.311	0.092
	(0.233)	(0.684)	(0.233)	(0.681)
Constant	0.488***	0.753	0.488***	0.761
	(0.157)	(0.574)	(0.157)	(0.571)
Sample	Separated	Separated	Pooled	Pooled
Regression	OLS	IV	OLS	IV
F-Test		17.489		17.803
Observations	4,405	4,405	4,405	4,405
R-squared	0.423	0.409	0.423	0.409

Notes: This table shows results from OLS and IV regressions in (E.1). Columns (1) and (2) are the results of regressing the posterior of income growth expectations on the prior of income growth expectations and the posterior of inflation expectations using the IV constructed separately for both priors. In column (2) we use IV, instrumenting with $E_i\left[\widehat{\pi_p^{Posterior}}\right]$. Columns (3) and (4) are the results of regressing the posterior of inflation expectations on the prior of inflation expectations and the posterior of income growth expectations using the pooled estimation for the IV. In column (4) we use IV, instrumenting with $E_i\left[\widehat{\pi_p^{Posterior}}\right]$. $NYFed(=1)$ is a variable that takes a value of 1 if the prior is the NY Fed question. Robust standard errors are in parentheses.

Table 20: Effect of Inflation Expectations on Labor Market Actions

	Apply for a job(s)		Work longer hours		Ask for a raise	
	(1)	(2)	(3)	(4)	(5)	(6)
$E_i\left[\pi_p^{Posterior}\right]$	0.049***	0.049***	0.005	0.005	-0.008	-0.008
	(0.015)	(0.015)	(0.014)	(0.014)	(0.014)	(0.014)
$E_i\left[\pi_p^{Posterior}\right]$ x $NYFed(=1)$	-0.025	-0.025	0.012	0.012	0.003	0.003
	(0.018)	(0.018)	(0.016)	(0.016)	(0.016)	(0.016)
$NYFed(=1)$	0.049	0.049	-0.146	-0.146	-0.052	-0.053
	(0.098)	(0.098)	(0.093)	(0.093)	(0.089)	(0.089)
Constant	1.688***	1.689***	1.949***	1.949***	1.770***	1.770***
	(0.076)	(0.076)	(0.072)	(0.071)	(0.072)	(0.071)
Sample	Separated	Pooled	Separated	Pooled	Separated	Pooled
F-test	21.521	21.274	21.521	21.274	21.521	21.274
Observations	4,405	4,405	4,405	4,405	4,405	4,405

Notes: This table shows IV regressions from equation (E.2). Columns (1) and (2) report the estimated pass-through from inflation expectations to labor market action "apply for a job(s) that pays more," columns (3) and (4) report the estimated pass-through from inflation expectations to labor market action "work longer hours," and columns (5) and (6) provide the estimated pass-through from inflation expectations to labor market action "ask for a raise." $NYFed(=1)$ is a variable that takes a value of 1 if the prior is the NY Fed question. Sample separated means that the instrument is built separately for each prior and pooled means that it is built jointly for both priors, as explained in the text. Robust standard errors are in parentheses.

The following results arise: First, the choice of wording for the inflation expectations question that forms the prior – ICIE or based on the SCE – makes no statistically significant difference in our pass-through regressions. The coefficients on the NY Fed SCE dummy and the interacted prior with the NY Fed SCE dummy are all statistically insignificant. Second, the levels of the pass-through estimates are somewhat lower than in our main exercise. This result indicates that consumers may not be strongly affected by the wording of the question, because in this period, independently of the prior, they expect a low pass-through. Third, we also find similar results in terms of labor market actions, which confirms the results of the main exercise in the paper and reinforces the main result of the robustness exercise – for a different outcome variable – that results are independent of the choice of prior.

F Model

The model has been largely adapted from Christoffel and Kuester (2008) and Christoffel, Kuester, and Lizert (2009).

Households. There are a large number of identical families with unit measure. Each family consists of a measure n_t of employed members and $u_t = 1 - n_t$ of unemployed members. Each family member has the following utility function:

$$\widetilde{\mathbb{E}}_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{(c_{it} - \varrho c_{t-1})^{1-\sigma}}{1-\sigma} - \kappa_h \frac{h_{it}^{1+\varphi}}{1+\varphi} \right) \tag{F.1}$$

where c_{it} denotes the consumption of consumer i; c_{t-1} is the family's aggregate real consumption in period $(t-1)$; h_{it} is the working hours of employed consumer i; $\kappa_h > 0$ is a parameter of work disutility; and $\varrho \in [0,1)$ captures the degree of external habit in consumption. Each family faces the following constraint:

$$c_t + \tau_t + \kappa_t v_t = \int_0^{1-u_t} w_{it} h_{it} di + u_t b + e_t^d d_{t-1} \frac{R_{t-1}}{\pi_t} - d_t + \Psi_t + n_t \Phi^K \tag{F.2}$$

where $\widetilde{\mathbb{E}}$ is a generic expectations operator; τ_t is lump-sum taxes per capita in real terms; κ_t denotes real cost per vacancy posting v_t; w_{it} is the real wage of employed consumer i; d_t denotes the risk-free one-period real bond holdings with return $e_t^d R_t$ and e_t^d being a shock to the risk premium; and b is real unemployment benefits. Variable Ψ_t denotes the real dividends of the family from firms in the economy, such that $\Psi_t = \Psi_t^C + \int_0^{1-u_t} \Psi_{it}^h di$, where Ψ_t^C and Ψ_{it}^h are dividends arising from the differentiated goods and labor goods firms, respectively, to be described in what follows. The model does not account for capital income, so we assume that the family receives a fixed share $n_t \Phi^K$, $\Phi^K \geq 0$, out of current revenue of labor firms as "capital income." The family makes optimal decisions on behalf of its members by maximizing the aggregate utility function in (F.1) with respect to consumption and real bond holdings, subject to the budget constraint in (F.2).

Firms. There are three types of firms: i) firms that produce a homogeneous intermediate good, "labor good"; ii) wholesale firms that purchase labor goods in a perfectly competitive market, and use them as inputs to produce differentiated goods; and iii) retail firms that purchase differentiated goods from the wholesalers and bundle those goods into a homogeneous consumption basket sold to consumers and the government.

Retailers' demand for differentiated good j is given by:

$$y_{jt} = \left(\frac{P_{jt}}{P_t} \right)^{-\varepsilon} y_t \tag{F.3}$$

where P_{jt} is the j^{th} good price; $\varepsilon > 1$ is the own-price elasticity of demand; P_t is the aggregate price level; and y_t denotes the final good/economy's aggregate output.

The wholesale sector has a unit mass with firms indexed by $j \in [0,1]$. Each firm produces variety j according to $y_{jt} = l^d_{jt}$, where l^d_{jt} denotes firm j's demand for the intermediate labor good, which it can acquire in a perfectly competitive market at real price x^h_t. Wholesalers face Calvo-type price stickiness such that in every period, a fraction $\omega \in (0,1)$ of them cannot reset the price. Similar to Christiano, Eichenbaum, and Evans (2005), we assume that the firms that cannot re-optimize can adjust prices by the index factor $\pi^{\zeta_p}_{t-1}\bar{\pi}^{1-\zeta_p}$, where $\zeta_p \in [0,1]$ denotes the degree of inflation indexation. The problem of wholesalers then is expressed as follows:

$$\max_{P_{jt}} \widetilde{\mathbb{E}}_t \sum_{h=0}^{\infty} \left[\omega^h \Gamma_{t,t+h} \left(\frac{P_{jt}\pi^{\zeta_p}_{t-1,t-1+h}(\bar{\pi}^{1-\zeta_p})^h}{P_{t+h}} - mc_{t+h} \right) y_{j,t+h} \right] \tag{F.4}$$

where $\Gamma_{t,t+h} = \beta^h \frac{\lambda_{t+h}}{\lambda_t}$, with λ_t being households' marginal utility of consumption; $\pi_{t-1,t-1+h} = P_{t-1+h}/P_{t-1}$; and $mc_t = x^h_t e^C_t$ is the marginal cost, with e^C_t being a cost-push shock. Total profits of the wholesale sector in period t are given by

$$\Psi^C_t = \int_{j=0}^{1} \left(\frac{P_{jt}}{P_t} - mc_t \right) y_{jt} dj \tag{F.5}$$

Finally, the labor good firms are homogeneous and they need exactly one worker to operate. So, there is a mass of $n_t = (1 - u_t)$ of such firms at any given time. Match i can produce l_{it} labor good units via $l_{it} = z_t h^{\alpha}_{it}$, where z_t is a productivity shock and $\alpha \in (0,1)$.

Labor markets. The matching process between workers and labor firms is governed by a Cobb-Douglas function,

$$m_t = \sigma_m u^{\xi}_t v^{1-\xi}_t \tag{F.6}$$

where m_t is matches formed in period t; u_t is unemployment; v_t is vacancies; $\xi \in [0,1]$ is the elasticity of matching with respect to unemployment; and $\sigma_m > 0$ is a scaling factor. Labor market tightness is defined as:

$$\theta_t = \frac{v_t}{u_t} \tag{F.7}$$

Then, the probabilities that a vacancy is filled and that an unemployed worker matches with a firm are, respectively,

$$q_t = \frac{m_t}{v_t}, \quad s_t = \frac{m_t}{u_t} \tag{F.8}$$

New matches become productive in $(t+1)$. Employment then evolves according to

$$n_t = (1-\mu)n_{t-1} + m_{t-1} \tag{F.9}$$

If a worker is not separated from employment, she can bargain her nominal wage to W^*_{t+1} in period $(t+1)$ with probability $(1-\gamma) \in [0,1]$. The nominal wage of the γ share of workers who cannot bargain partially adjusts for past inflation such that $W_{t+1} = W_t(e^w_t \pi_t^{\zeta_w} \bar{\pi}^{1-\zeta_w})$, where e^w_t is the wage-push factor as defined in the main text and $\zeta_w \in [0,1]$. In this framework, we define the value of employment as follows:

$$\mathcal{V}^E_t(W_{it}) = w_{it}h_{it} - \kappa_h \frac{h_{it}^{1+\varphi}}{(1+\varphi)\lambda_t} + (1-\mu)\widetilde{\mathbb{E}}_t\left[\Gamma_{t,t+1}\left(\gamma \mathcal{V}^E_{t+1}(W_{it}(e^w_t \pi_t^{\zeta_w}\bar{\pi}^{1-\zeta_w})) + (1-\gamma)\mathcal{V}^E_{t+1}(W^*_{t+1})\right)\right] + \mu\widetilde{\mathbb{E}}_t\left[\Gamma_{t,t+1}\mathcal{V}^U_{t+1}\right] \tag{F.10}$$

The value of an employed worker depends on her labor nominal income and her utility loss from working. An employed worker retains her job with probability $(1-\mu)$. In the next period, if she stays employed, she will not be able to renegotiate her nominal wage with probability γ, in which case her employment value is $\mathcal{V}^E_{t+1}(W_{it}(e^w_t \pi_t^{\zeta_w}\bar{\pi}^{1-\zeta_w}))$; in the case of rebargaining, the employment value is given by $V^E_{t+1}(W^*_{t+1})$. With probability μ the worker will be unemployed next period.

The value of unemployment is described as follows:

$$\mathcal{V}^U_t = b + s_t\widetilde{\mathbb{E}}_t\left[\Gamma_{t,t+1}\left(\gamma \mathcal{V}^E_{t+1}(W_t(e^w_t \pi_t^{\zeta_w}\bar{\pi}^{1-\zeta_w})) + (1-\gamma)\mathcal{V}^E_{t+1}(W^*_{t+1})\right)\right] + (1-s_t)\widetilde{\mathbb{E}}_t\left[\Gamma_{t,t+1}\mathcal{V}^U_{t+1}\right] \tag{F.11}$$

An unemployed worker finds a new job with probability s_t. In that case, she enters the same Calvo scheme as the average currently employed worker.[42]

Labor good firms are worthless unless they are matched with a worker. Therefore, the market value of a labor firm matched to a worker is

$$J_t(W_{it}) = \Psi^h_t(W_{it}) + (1-\mu)\widetilde{\mathbb{E}}_t\left[\Gamma_{t,t+1}\left(\gamma J_{t+1}(W_{it}(e^w_t \pi_t^{\zeta_w}\bar{\pi}^{1-\zeta_w})) + (1-\gamma)J_{t+1}(W^*_{t+1})\right)\right] \tag{F.12}$$

where $\Psi^h_t(W_{it}) = x^h_t z_t h^\alpha_{it} - w_{it}h_{it} - \Phi$ with $\Phi \geq 0$ denoting a per-period fixed cost of production.

[42]The Calvo scheme of wages is imposed on both new matches and existing matches to preserve some degree of homogeneity in the model for tractability reasons.

For firms that bargain in a given period, the nominal wage is set according to Nash bargaining,

$$W_{it}^{*} = argmax_{W_{it}} (\mathcal{V}_{it}^{E} - \mathcal{V}_{t}^{U})^{\eta_t} (J_{it})^{1-\eta_t} \tag{F.13}$$

where η_t is the time-varying bargaining power of workers.[43]

Free entry into the vacancy posting market implies that the ex ante value of vacancy posting is 0, yielding the following relationship:

$$\kappa_t = q_t \widetilde{\mathbb{E}}_t \left[\Gamma_{t,t+1} \left(\gamma J_{t+1}(W_t(e_t^{w} \pi_t^{\zeta_w} \bar{\pi}^{1-\zeta_w})) + (1-\gamma) J_{t+1}(W_{t+1}^{*}) \right) \right] \tag{F.14}$$

Expectations. We assume that expectations about any variable, except inflation, are based on full information and are rational. We introduce some degree of information stickiness, $\lambda \in [0,1]$, in the inflation expectations formation process, such that

$$\widetilde{\mathbb{E}}_t \hat{\pi}_{t+1} = (1-\lambda) \mathbb{E}_t \hat{\pi}_{t+1} + \lambda \widetilde{\mathbb{E}}_{t-1} \hat{\pi}_{t+1} \tag{F.15}$$

where $\mathbb{E}_t$ is the full-information rational expectations operator.

Policy. We assume that the monetary authority sets nominal interest rates R_t by responding to inflation deviations from a fixed target $\bar{\pi}$ and output growth.

$$log\left(\frac{R_t}{\bar{R}}\right) = \phi_R log\left(\frac{R_{t-1}}{\bar{R}}\right) + (1-\phi_R)\left[\phi_\pi log\left(\frac{\pi_t}{\bar{\pi}}\right) + \phi_{\Delta y} log\left(\frac{y_t}{y_{t-1}}\right)\right] + e_t^R \tag{F.16}$$

where $\rho_R \in [0,1)$ denotes the interest rate smoothing and e_t^R is a monetary shock. On the fiscal front, we assume that government spending, g_t, is exogenous. Overall, there are a total of 7 shocks in the economy, e_t^d, e_t^R, e_t^C, g_t, κ_t, z_t, and η_t. Let $sh\hat{o}ck_t = log(shock_t / sh\bar{o}ck)$; then, each one of the shocks in log-linear deviation from the steady state is given by

$$sh\hat{o}ck_t = \rho_{shock} sh\hat{o}ck_{t-1} + \epsilon_t^{shock}, \epsilon_t^{shock} \sim \mathcal{N}(0, \sigma_{shock}^2) \tag{F.17}$$

Tables 21 and 22 show, respectively, values for the steady state of a number of variables and model parameters.

[43]Differently from efficient Nash bargaining, we employ the right-to-manage framework of Trigari (2006). The difference between the two is that under the former, firms and workers bargain over both hours and wages, whereas under the latter, they bargain over wages only. Optimal hours and wages in the former case yield $\eta_t J_t = (1-\eta_t)(\mathcal{V}_t^E - \mathcal{V}_t^U)$. In our case, the optimality condition satisfies $\eta_t \delta_t^W J_t = (1-\eta_t)\delta_t^F (\mathcal{V}_t^E - \mathcal{V}_t^U)$, where δ_t^W and δ_t^F denote, respectively, the net marginal benefits from an increase in the wage to worker and firm. See Christoffel and Kuester (2008) for more details.

Table 21: Steady State

Variable	Value	Description
y	1	Ouput
c	0.79	Consumption
whn/y	0.6	Labor income share
J	0.1582	Value of a labor firm
$\mathcal{V}^E - \mathcal{V}^U$	0.1582	Worker's surplus from working

Table 22: Parameter Calibration

Parameter	Value	Description; Reference
$\bar{e}_\pi$	0.0148	Elasticity of wage-push w.r.t. inflation expectations for low income; Tables 3, 4
$\bar{e}_\pi$	0.0388	Elasticity of wage-push w.r.t. inflation expectations for high income; Tables 3, 4
γ	0.895	Nominal wage stickiness; low income pass-through in Table 3
γ	0.8515	Nominal wage stickiness; high income pass-through in Table 3
ζ_w	0.6	Wage indexation to past inflation; low income pass-through in Table 3
ζ_w	0.35	Wage indexation to past inflation; high income pass-through in Table 3
β	0.99	Discount factor; corresponds to a quarterly real rate of 1.01 percent
φ	10	Labor supply elasticity of 0.1; as in Trigari (2006)
σ	1.38	Risk aversion; posterior mean found in Smets and Wouters (2007)
ϱ	0.71	Degree of external habit; posterior mean found in Smets and Wouters (2007)
κ_h	107.2023	Scaling factor to labor disutility; targets $h = 1/3$
α	0.66	Labor elasticity of production; matches labor share of about 60 percent
κ	0.0004	Vacancy posting costs; reconciles m with $u = 0.042$ and $v = 0.07$
z	2.1554	Steady-state technology; matches with y = 1
Φ^K	0.3042	Imputed share of capital in revenue; matches with capital income share
Φ^h	0.0104	Fixed costs linked to labor; matches with y and h
ε	11	Price markup; conventional markup of 10 percent
ω	0.65	Calvo price stickiness; posterior mean found in Smets and Wouters (2007)
ζ_p	0.3	Price indexation to past inflation
ϕ_π	1.5	Response to inflation; conventional Taylor rule
$\phi_{\Delta y}$	0.5	Response to output growth; conventional Taylor rule
ϕ_R	0.8	Interest rate rule smoothness; conventional Taylor rule
$\bar{\pi}$	1	Inflation target
$\bar{g}$	0.2	Steady-state government spending; US government spending as share of GDP
b	0.2505	Unemployment benefits; matches replacement rate of 0.4
ρ_{shock}	0.9	Autocorrelation of every shock
σ_{shock}	1	Standard deviation of every shock

G Calibration Strategy for Nominal Wage Stickiness

Solving the model under full-information rational expectations, the minimum state variable solution is given by

$$\hat{X}_t = A\hat{X}_{t-1} + B\mathcal{E}_t \text{ , } \mathcal{E}_t \sim MN(0,\Sigma) \tag{G.1}$$

where $\hat{X}_t$ is a vector of size $n_x \times 1$ containing the model's endogenous variables in deviations from their steady-state values; $\mathcal{E}_t$ is a vector of size $n_e \times 1$ containing the exogenous shock innovations; and Σ is the covariance (diagonal) matrix of $\mathcal{E}_t$.

In the presence of one-time innovations occurring in period $t = 0$, $\mathbb{E}_t \hat{x}_{t+h} = \hat{x}_{t+h}$ for any $t \geq 0$. Following a one-time shock innovation in period t, inflation expectations are described by:

$$\widetilde{\mathbb{E}}_t \hat{\pi}_{t+h} = (1-\lambda)\hat{\pi}_{t+h} \tag{G.2}$$

Let $A_{w:}$ denote the row in matrix A located in the same position as the real wage in $\hat{X}_t$, let $A_{:\pi}$ denote the column in matrix A located in the same position as inflation in $\hat{X}_t$, and let $A_{x_k x_j}$ be the element in A whose row is the same as x_k's and whose column is the same as x_j's in $\hat{X}_t$. Then, expectations about nominal wage growth, $(\hat{W}_{t+7} - \hat{W}_{t+3})$, are given by:

$$\begin{aligned}
\widetilde{\mathbb{E}}_t(\hat{W}_{t+7} - \hat{W}_{t+3}) &= \widetilde{\mathbb{E}}_t\left(\hat{w}_{t+7} - \hat{w}_{t+3} + \hat{P}_{t+7} - \hat{P}_{t+3}\right) = \mathbb{E}_t\left(\hat{w}_{t+7} - \hat{w}_{t+3}\right) + \widetilde{\mathbb{E}}_t \sum_{j=4}^{7} \hat{\pi}_{t+j} \\
&= \left(\hat{w}_{t+7} - \hat{w}_{t+3}\right) + (1-\lambda)\sum_{j=4}^{7} \hat{\pi}_{t+j} \\
&= A_{w:}A\hat{X}_{t+5} - \hat{w}_{t+3} + (1-\lambda)(\hat{\pi}_{t+4} + \hat{\pi}_{t+5}) + (1-\lambda)\left(A_{\pi:} + A_{\pi:}A\right)\hat{X}_{t+5}
\end{aligned} \tag{G.3}$$

Note that

$$\frac{\partial \hat{X}_{t+5}}{\partial \hat{\pi}_{t+4}} = A_{:\pi}$$

Therefore,

$$\frac{\partial \widetilde{\mathbb{E}}_t(\hat{W}_{t+7} - \hat{W}_{t+3})}{\partial \widetilde{\mathbb{E}}_t \hat{\pi}_{t+4}} = \frac{a_1 - a_2}{1-\lambda} + 1 + a_3$$

where $a_1 = A_{w:}AA_{:\pi}$, $a_2 = A_{w\pi}(A_{\pi:}A_{:\pi})^{-1}$, and $a_3 = A_{\pi\pi} + A_{\pi:}(I+A)A_{:\pi}$.

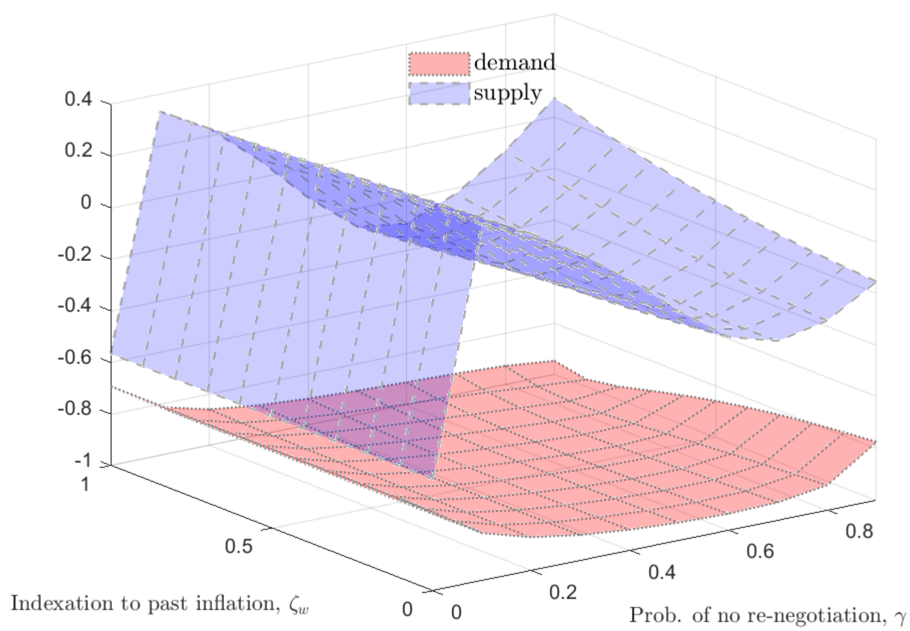
H Correlation between Inflation and Utility Expectations

For a set of (γ, ζ_w) pairs, we compute the model-implied correlation between expected period utility and inflation expectations, conditional on the economy being shocked by only demand innovations or cost-push innovations, that is:

$$C_x = \frac{\mathbb{E}\left[\mathbb{E}_t(\mathcal{U}_{t+1})\widetilde{\mathbb{E}}_t(\hat{\pi}_{t+1})|\epsilon_t^x\right]}{\sqrt{\mathbb{E}\left[\mathbb{E}_t(\mathcal{U}_{t+1}|\epsilon_t^x)^2\right]\mathbb{E}\left[\widetilde{\mathbb{E}}_t(\hat{\pi}_{t+1}|\epsilon_t^x)^2\right]}} \tag{H.1}$$

where ϵ_t^x denotes the innovation to shock x. Figure 10 shows the surfaces of the computed correlation in (H.1) for various pairs of (γ, ζ_w). The surfaces seem to vary substantially more with nominal wage rigidity in the extensive margin (γ) than in the intensive margin (ζ_w).

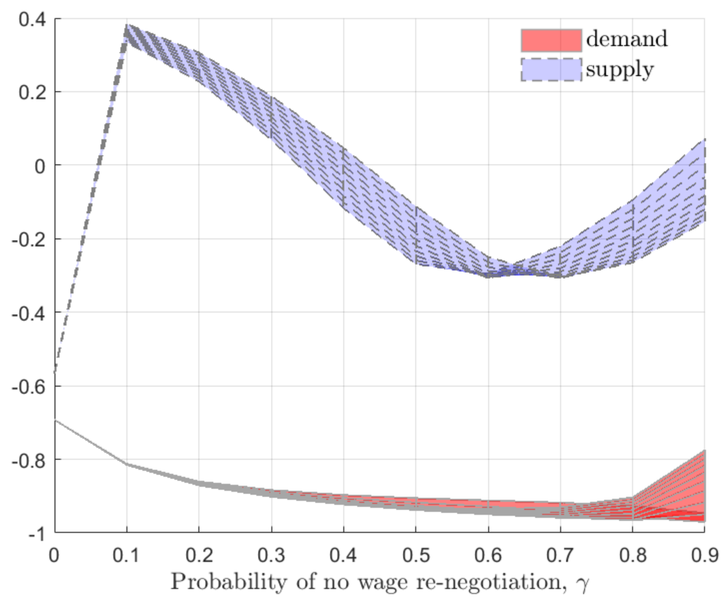
Figure 10: Correlation between $\mathbb{E}_t\mathcal{U}_{t+1}$ and $\widetilde{\mathbb{E}}_t\hat{\pi}_{t+1}$



Notes: In blue: cost-push shock; in red: demand shock.

To better understand the relationship between C_x and nominal wage rigidity, we project the 3-dimensional figure on the (γ, C_x) plane in Figure 11. Subject to cost-push shocks, the relationship between expected utility and inflation is clearly non-monotonic in γ, and it takes negative as well as positive values. On the other hand, conditional on demand innovations, the relationship between expected utility and inflation remains always negative, and it tends to decline with γ.

Figure 11: Correlation between $\mathbb{E}_t \mathcal{U}_{t+1}$ and $\widetilde{\mathbb{E}}_t \hat{\pi}_{t+1}$

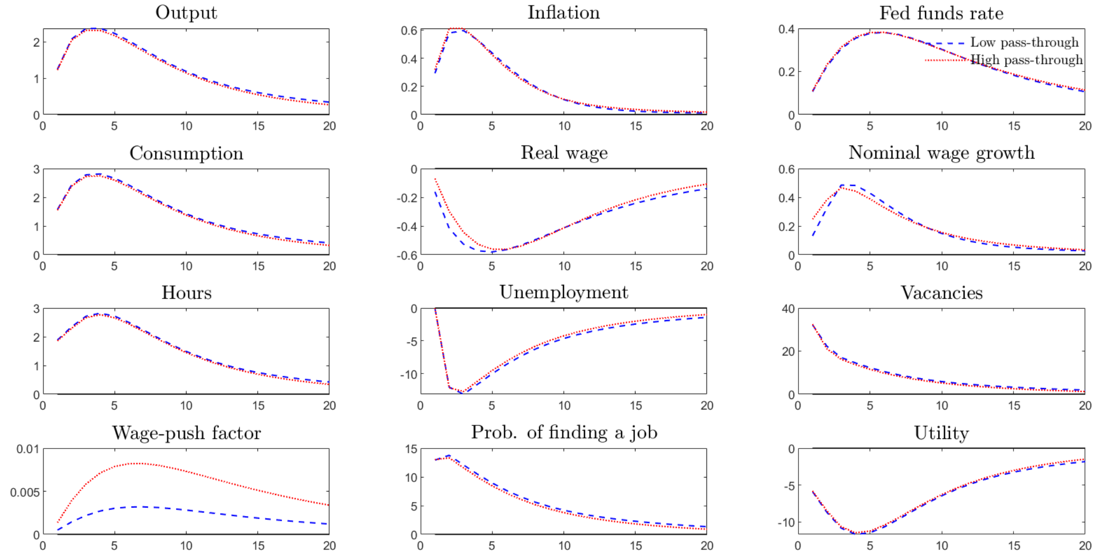


Notes: In blue: cost-push shock; in red: demand shock.

I Additional Impulse Response Functions

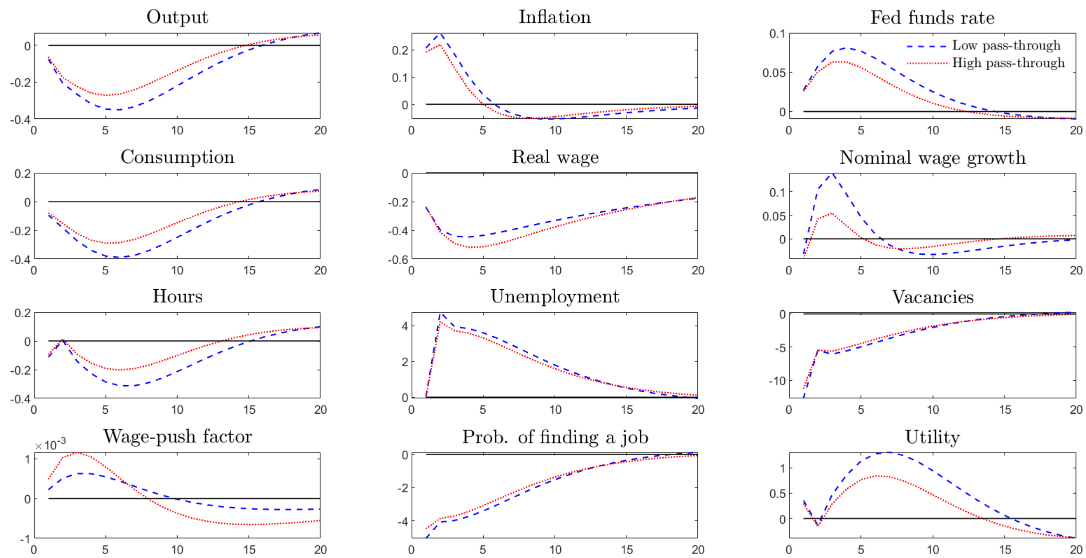
We present here the IRFs of key macroeconomic variables to a one standard deviation positive demand shock and a one standard deviation positive cost-push shock for calibrations that match the pass-through of inflation expectations to income growth expectations for high- and low-income respondents in Figures 12 and 13. We note that the gap between the IRFs with low versus high pass-through is significantly more noticeable when the economy is shocked with a demand innovation relative to a supply innovation.

Figure 12: Response to a Positive Demand Shock



Notes: In dotted red: calibration matching our empirical pass-through from inflation to nominal wage growth expectations for high-income consumers ($\gamma = 0.8515, \zeta_w = 0.35$). In dashed blue: calibration matching our empirical pass-through from inflation to nominal wage growth expectations for low-income consumers ($\gamma = 0.895, \zeta_w = 0.6$). In black: x axis.

Figure 13: Response to a Positive Cost-Push Shock



Notes: In dotted red: calibration matching our empirical pass-through from inflation to nominal wage growth expectations for high-income consumers ($\gamma = 0.8515, \zeta_w = 0.35$). In dashed blue: calibration matching our empirical pass-through from inflation to nominal wage growth expectations for low-income consumers ($\gamma = 0.895, \zeta_w = 0.6$). In black: x axis.