Low Passthrough from Inflation Expectations to Income Growth Expectations: Why People Dislike Inflation

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The randomized control trial is registered at the AER RCT Registry (#AEARCTR-0009062). The views expressed herein are those of the authors and do not necessarily reflect the views of the Federal Reserve Bank of Cleveland or the Federal Reserve System.

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  - Wage-price spiral discussions have resurfaced.
    - ⋆ Blanchard (1986), Curtin (2022).
- Surveys find that consumers dislike inflation
  - Private agents associate higher inflation with worse economic outcomes.
    - ⋆ Consumers: Shiller (1997), Kamdar (2019), Coibion et al. (2019), Candia et al. (2020).
    - ⋆ Firms: Coibion et al. (2020, QJE), Savignac et al. (2022).

Role of Inflation Expectations

- Empirical work finds *causal* link from inflation expectations to firms' and consumers' decisions.
  - Coibion et al. (2020, QJE), Coibion et al. (2022)
- Could inflation expectations management be used as a policy tool? Depends on how people perceive it (supply, demand, other?).
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- Could inflation expectations management be used as a policy tool? Depends on how people perceive it (supply, demand, other?).
  - Coibion et al. (2020, IJE)
- What are the channels through which consumers dislike inflation?
  - Labor markets?
    - Little evidence on the role of inflation expectations on labor market decisions.
    - Bostanci et al. (2020), Jain et al. (2022).
  - Do nominal wage rigidities matter for how households perceive inflation?

This Paper

1. Uses a representative sample of the US population to
   - simultaneously measure both of inflation expectations and income growth expectations.
   - implement a novel experimental setup to assess the causal link between them.
2. Incorporates empirical findings into a New Keynesian model with nominal wage rigidity & search-and-matching frictions to
   - assess their macro implications.
   - understand the mechanism behind why consumers dislike inflation.

Main Empirical Findings

1. Causal, but moderate, relationship from inflation expectations to income growth expectations.
   - 1 ppt increase in inflation expectations results in 0.20 ppt increase in income growth expectations.
   - $\Rightarrow$ current nominal wage rigidities feeding into expectations.
2. Heterogeneity in passthrough across socio-demographic factors such as income or gender.
   - Insignificant passthrough for women and low-income respondents.
   - 34% (27%) passthrough for high-income (male) consumers.
3. Inflation expectations exert small causal impact on labor market actions.
   - 1 ppt increase in inflation expectations results in 0.11 ppt increase in likelihood to apply for another job.

Main Takeaways from Model Application

1. Relative to a counterfactual unit passthrough, the estimated passthrough:
   - Demand-side π shock: lower utility due to longer work hours at lower real wages.
   - Supply-side π shock: amplified (-) link between output and inflation.
2. Higher nominal wage rigidity: less positive or more negative association b/n inflation & utility expectations.
3. No macroeconomic effects from the passthrough of inflation expectations into labor market actions.
   - Efforts exerted to increase wages due to higher inflation expectations yields no changes in the average consumer's real wages, consumption, utility, etc.

Experimental Setup: Overview

0) Pilot in January 2022

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4) Labor Market Actions

Prior Questions: Inflation Expectations

- Indirect Consumer Inflation Expectations (ICIE)
  - Morning Consult & Cleveland Fed project (Hajdini et al. (2022))
  - Weekly measure of inflation expectations for 20,000 respondents

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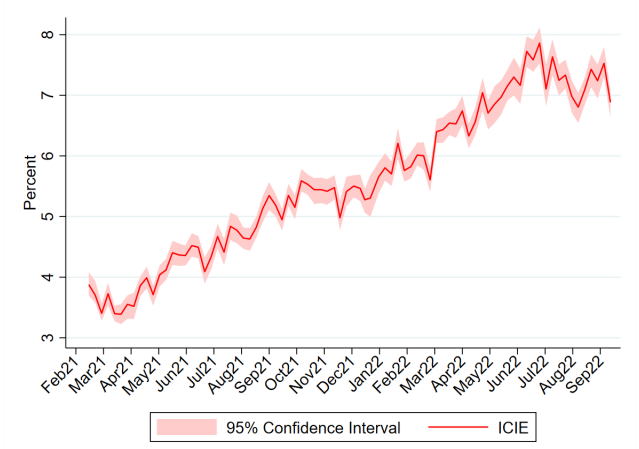
"Next we are asking you to think about changes in prices during the next 12 months in relation to your income. Given your expectations about developments in prices of goods and services during the next 12 months, how would your income have to change to make you equally well-off relative to your current 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;
- Decrease by %.

Prior Questions: Inflation Expectations

Indirect Consumer Inflation Expectations (ICIE)



Notes: Weekly trimmed mean and the 95% confidence interval based on 1,000 bootstrapped samples.

Prior Questions: Income Growth Expectations

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

Baseline Exercise: January 2022

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- According to the U.S. Census Bureau, the United States population was 332,402,978 as of December 31, 2021 (1,120)

Posterior Questions

1. Inflation Expectations: Michigan Survey of Consumers type of question
   - In the next year, do you think prices in general will increase, decrease, or stay about the same?
     - Increase by %;
     - Stay about the same;
     - Decrease by %.
2. Income growth expectations: move the annual forecast horizon forward by 3 quarters
   - Between December 2022 and December 2023, do you expect your income to increase, decrease, or stay about the same?
     - Increase by %;
     - Stay about the same;
     - Decrease by %.

Labor Market Actions

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
- Work longer hours
- Ask for a raise
  - Very likely – 4
  - Somewhat likely – 3
  - Somewhat unlikely – 2
  - Very unlikely – 1
- Other: (description)

Treatments Affecting Expectations

$$\mathbb{E}_i\left(\pi^{Prices}\right) = \alpha + \beta\mathbb{E}_i\left(\pi^{ICIE}\right) + \sum_{j=2}^{6}\gamma_{\pi j} \times T_{ij} + \sum_{j=2}^{6}\theta_{\pi j} \times T_{ij} \times \mathbb{E}_i\left(\pi^{ICIE}\right) + \varepsilon_i \qquad (1)$$

- $T_{ij} = \begin{cases} 1 & \text{if consumer } i \text{ receives treatment } j \\ 0 & \text{otherwise} \end{cases}$
- $\gamma_{\pi j}$ - change in inflation expectations *level* post-treatment j
- $\theta_{\pi j}$ - change in relation b/n inflation expectations pre- vs. post-treatment j

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$$\mathbb{E}_i\left(\pi^{Income,2y}\right) = \alpha + \beta\mathbb{E}_i\left(\pi^{Income,1y}\right) + \sum_{j=2}^{6}\gamma_{Ij} \times T_{ij} + \sum_{j=2}^{6}\theta_{Ij} \times T_{ij} \times \mathbb{E}_i\left(\pi^{Income,1y}\right) + \varepsilon_i \quad (2)$$

Treatments Affecting Expectations

Table: Effects of Treatment on Expectations

	(1)	(2)	(3)	(4)
	$\mathbb{E}_i\left(\pi^{Prices}\right)$	$\mathbb{E}_i\left(\pi^{Prices}\right)$	$\mathbb{E}_i\left(\pi^{\text{Income,2y}}\right)$	$\mathbb{E}_i\left(\pi^{\text{Income,2y}}\right)$
Prior	0.262***	0.505***	0.775***	0.604***
	(0.026)	(0.007)	(0.048)	(0.074)
Target x prior	0.002	-0.023***	-0.127*	-0.094
	(0.036)	(0.008)	(0.072)	(0.117)
Wages x prior	-0.003	-0.213***	-0.047	-0.210*
	(0.035)	(0.013)	(0.071)	(0.101)
CPI x prior	-0.015	-0.258***	-0.114	0.084
	(0.035)	(0.011)	(0.074)	(0.112)
SPF x prior	-0.025	-0.281***	-0.039	-0.091
	(0.036)	(0.011)	(0.071)	(0.111)
Placebo x prior	0.047	-0.008	-0.078	0.001
	(0.035)	(0.008)	(0.074)	(0.131)
Sample	All	All	All	Trimmed
Regression	OLS	Huber	OLS	OLS
Observations	6,620	5,892	6,622	5,753

Low Passthrough from Inflation to Income Growth Expectations

$$\mathbb{E}_i\left(\pi^{Income,2y}\right) = \alpha + \beta\mathbb{E}_i\left(\pi^{Prices}\right) + \psi\mathbb{E}_i\left(\pi^{Income,1y}\right) + \varepsilon_i \tag{3}$$

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$$\text{IV: } \widehat{\mathbb{E}_i\left(\pi^{Prices}\right)} = \begin{cases} \sum_{j=2}^{6} \hat{\gamma}_{\pi j} \times T_{ij} + \sum_{j=2}^{6} \hat{\theta}_{\pi j} \times T_{ij} \times \mathbb{E}_i\left(\pi^{ICIE}\right) & \text{if } j \in \{2,4,5\} \\ 0 & \text{if } j \in \{1,6\} \end{cases} \tag{4}$$

Exogenous variation in inflation expectations due to treatments (Coibion et al., 2022).

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$$\text{IV: } \widehat{\mathbb{E}_i\left(\pi^{Income}\right)} = \begin{cases} \hat{\gamma}_{I3} \times T_{i3} + \hat{\theta}_{I3} \times T_{i3} \times \mathbb{E}_i\left(\pi^{Income,1y}\right) & \text{if } j = 3 \\ 0 & \text{if } j \in \{1,6\} \end{cases} \tag{6}$$

Low Passthrough from Inflation to Income Growth Expectations

Table: Passthrough of Inflation Expectations on Income Growth Expectations

	(1)	(2)	(3)	(4)
	$\mathbb{E}_i\left(\pi^{Income,2y}\right)$	$\mathbb{E}_i\left(\pi^{Income,2y}\right)$	$\mathbb{E}_i\left(\pi^{Prices}\right)$	$\mathbb{E}_i\left(\pi^{Prices}\right)$
$\mathbb{E}_i\left(\pi^{Prices}\right)$	0.085***	0.203***		
	(0.014)	(0.069)		
$\mathbb{E}_i\left(\pi^{Income,1y}\right)$	0.674***	0.636***		
	(0.025)	(0.033)		
$\mathbb{E}_i\left(\pi^{Income,2y}\right)$			0.403***	0.325
			(0.074)	(0.381)
$\mathbb{E}_i\left(\pi^{ICIE}\right)$			0.269***	0.269***
			(0.017)	(0.018)
Constant	0.109	-0.805	4.593***	4.633***
	(0.101)	(0.521)	(0.185)	(0.451)
Regression	OLS	IV	OLS	IV
F-test	-	120.584	-	51.202
Observations	5,525	5,525	2,975	2,910
R^2	0.558	0.539	0.262	0.257

Heterogeneous Passthrough Across Demographic Groups

	$\mathbb{E}_i\left(\pi^{Income,2y}\right)$					
	All	Male	Female	<50k	50k-100k	>100k
$\mathbb{E}_i\left(\pi^{Prices}\right)$	0.201***	0.267***	0.156	0.129	0.309*	0.336***
	(0.070)	(0.103)	(0.097)	(0.091)	(0.171)	(0.122)
$\mathbb{E}_i\left(\pi^{Income,1y}\right)$	0.637***	0.621***	0.634***	0.656***	0.579***	0.589***
	(0.034)	(0.054)	(0.045)	(0.041)	(0.067)	(0.102)
Constant	-0.792	-1.079	-0.534	-0.314	-1.562	-1.503**
	(0.530)	(0.660)	(0.843)	(0.741)	(1.278)	(0.766)
F-test	117.408	51.174	61.95	64.121	27.205	42.654
Observations	5,525	2,724	2,801	2,503	1,894	1,128
R^2	0.540	0.600	0.483	0.528	0.452	0.657

Inflation Expectations Modestly Affect Labor Market Actions

$$\underbrace{y_{ij}}_{\text{Labor market action } j} = \alpha_j + \beta_j \mathbb{E}_i \left(\pi^{Prices} \right) + \varepsilon_{ij} \tag{7}$$

Table: Effect of Inflation Expectations on Actions to Increase Income

	(1)	(2)	(3)	(4)	(5)	(6)
	Apply to Other Job		Work Longer Hours		Ask for a Raise	
$\mathbb{E}_i \left(\pi^{Prices} \right)$	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)
$\frac{dy}{dx} \frac{\bar{x}}{\bar{y}}$	0.019	0.114	0.015	0.034	-0.009	0.011
Regression	OLS	IV	OLS	IV	OLS	IV
F-Test	-	143.3	-	149.8	-	143.3
Observations	4,651	4,651	4,573	4,573	4,409	4,409

Effects across different demographic groups

Second Wave of the Experiment Confirms the Low Passthrough

August 2022; 8K respondents.

- Passthrough from inflation expectations to income growth expectations: **16.6%**.
- Higher passthrough for male (**22.0%**) and high household income respondents (**30.6%**).
- Higher inflation expectations increase the probability of applying for another job (**0.14*****) *and* working longer hours (**0.07*****).
- No significant effect on the probability of asking for a raise (**0.01**).

New Keynesian Model: Overview

General equilibrium model similar to Christoffel and Kuester (2008), Christoffel et al. (2009).

- Search-and-matching in labor markets as in Mortensen and Pissarides (1994).
- Price stickiness as in Calvo (1983).
- Monetary policy responds to inflation deviations from the target and output growth.

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- Monetary policy responds to inflation deviations from the target and output growth.
- Information treatments (public information) affect inflation expectations:
  - information stickiness in inflation expectations, similar to Mankiw and Reis (2002):

$$\widetilde{\mathbb{E}}_t \hat{\pi}_{t+1} = (1-\lambda)\mathbb{E}_t \hat{\pi}_{t+1} + \lambda \mathbb{E}_{t-1} \hat{\pi}_{t+1} \tag{8}$$

  - use treatment information, pre- and post-treatment inflation expectations to estimate λ.

Details

$$\lambda = 0.285$$

Matching Fact 1

- Nominal wage rigidity:
  - in any given period, firms and workers cannot renegotiate nominal wages w/ prob. γ.
  - if no renegotiation, nominal wages adjust to past inflation by $0 \leq \zeta_w \leq 1$.
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  - γ, ζ_w - key parameters to match the estimated passthough. Value of employment/unemployment
- Compute the response of expected nominal wage growth to inflation expectations:

$$\frac{\partial \widetilde{\mathbb{E}}_t(\hat{W}_{t+7} - \hat{W}_{t+3})}{\partial \widetilde{\mathbb{E}}_t \hat{\pi}_{t+4}} = f(\Theta, \gamma, \zeta_w) \tag{9}$$

- Fix all model's parameters Θ, except γ and ζ_w. Calibration of some important parameters

$$(\gamma, \zeta_w) = \begin{cases} (0.875, 0.675) & \text{passthrough across all respondents} \\ (0.65, 0.306) & \text{counterfactual unit passthrough} \end{cases} \tag{10}$$

Matching Fact 3

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

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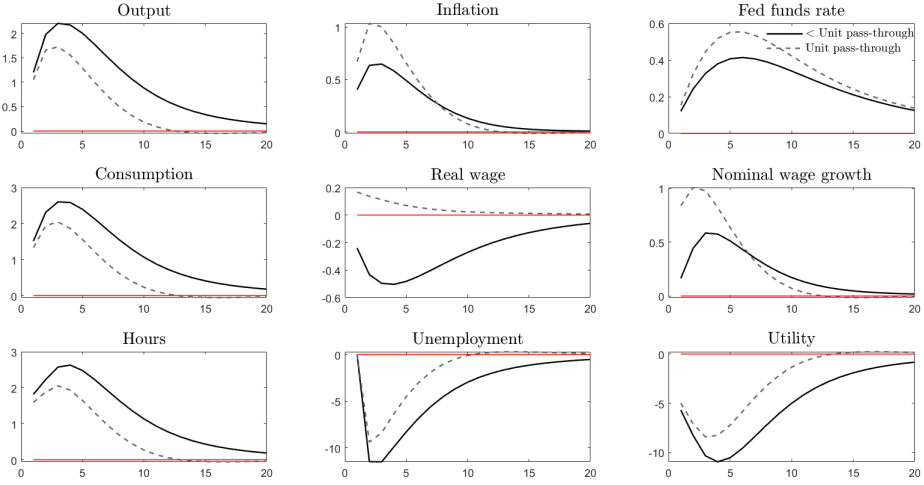
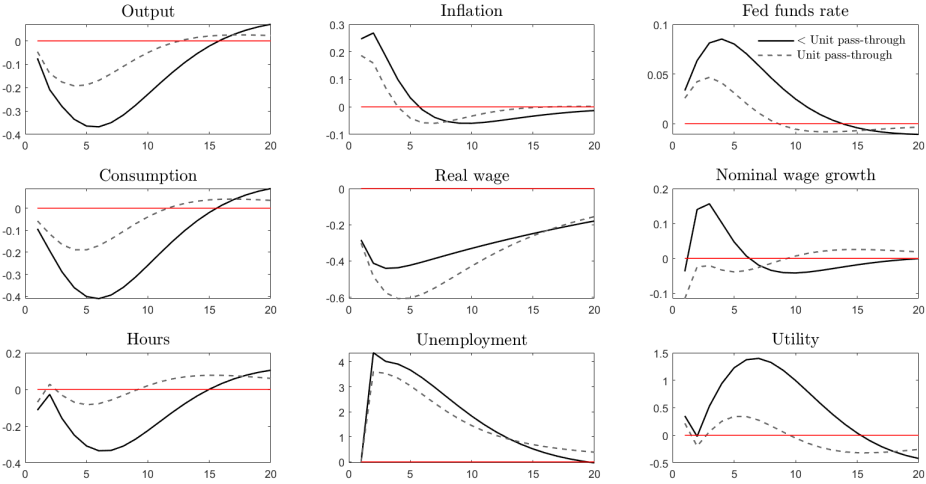
$$\bar{e}_\pi = \text{passthrough} \times \text{elasticity of job applications w.r.t. inflation expectations} \tag{13}$$

$$\bar{e}_\pi = \begin{cases} 0.0228 & \text{passthrough across all respondents} \\ 0.114 & \text{counterfactual unit passthrough} \end{cases} \tag{14}$$

Demand Shock: Lower Passthrough Lowers Consumers' Utility



Supply Shock: Lower Passthrough Strengthens (-) Inflation - Output Link

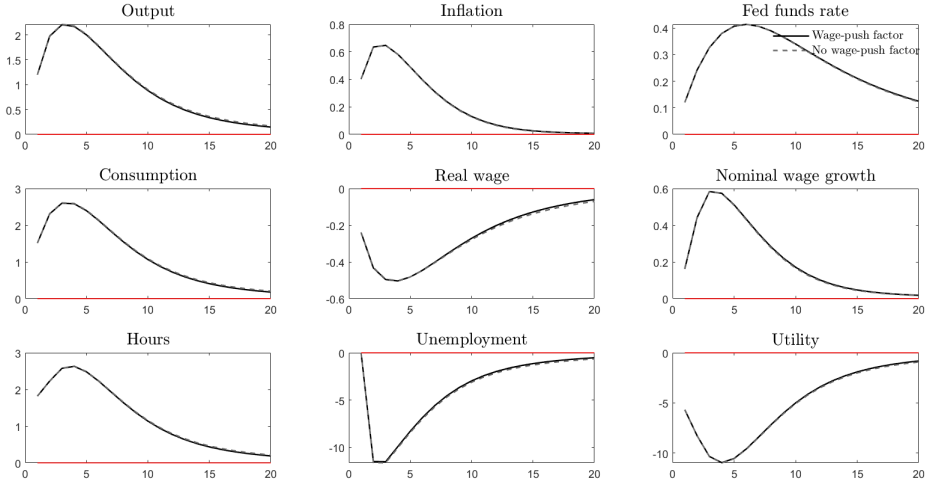


Inflation Expectations and Expected Period Utility

- Generate IRFs to demand and cost-push shocks for 50 periods
  - for many pairs of non-renegotiation prob., γ, and adjustment to past inflation, ζ_w.
- $\mathbb{E}_t\mathcal{U}_{i,t+1} = \alpha_i + \delta_{t+1} + \beta\widetilde{\mathbb{E}}_t\hat{\pi}_{i,t+1} + \theta\left(\gamma_i \times \widetilde{\mathbb{E}}_t\hat{\pi}_{i,t+1}\right) + \phi\left(\zeta_{w,i} \times \widetilde{\mathbb{E}}_t\hat{\pi}_{i,t+1}\right) + \varepsilon_{i,t}$

	Cost-push Shock (1)	Demand Shock (2)
$\widetilde{\mathbb{E}}_t\pi_{t+1}$	9.897***	-0.285
	(1.669)	(0.183)
$\gamma \times \widetilde{\mathbb{E}}_t\pi_{t+1}$	-10.187***	-14.486***
	(1.800)	(0.347)
$\zeta_w \times \widetilde{\mathbb{E}}_t\pi_{t+1}$	-1.305	1.791***
	(0.842)	(0.227)
Observations	5,500	5,500
R-squared	0.204	0.844

Demand Shock: No Macro Effects of Wage-push Factor Channel



Concluding Remarks

- Measure inflation expectations and income growth expectations to assess the causal link between them.
  - Low passthrough from inflation expectations to income growth expectations.
  - Heterogeneous effects across socio-demographic factors such as income or gender.
  - Inflation expectations exert small causal impact on labor market actions.

- Explore implications of inflationary shocks in a NK model that matches empirical facts.
  - Demand-side shocks: lower pass through $\Rightarrow$ larger drop in utility.
  - Supply-side shocks: lower pass through $\Rightarrow$ stronger (-) inflation - output link.
  - Higher nominal wage rigidity: less positive or more negative relation b/n inflation & utility expectations.
  - Efforts exerted to increase wages due to higher inflation expectations yields no changes in the average consumer's real wages, consumption, utility, etc.

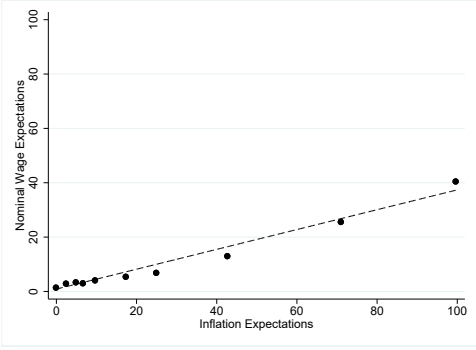
Novel Question

1. Indirect utility approach
   - $u(c_t)$ - utility function; increasing and concave in c_t.
   - For $u(c_t) = u(c_{t+h})$, it must be that $c_t = c_{t+h}$.
   - $\mathbb{E}_t\left(\frac{P_{t+h}}{P_t}\right) = \mathbb{E}_t\left(\frac{Y_{t+h}}{Y_t}\right)$
2. Individual experiences: consumers are asked about the anticipated growth of the price index associated with their *individual* consumption basket.
   - Relatively large and representative pool of respondents is a requirement.

Back to Prior Questions: Inflation

Pilot Exercise: January 2022

- Inflation Expectations: Indirect Consumer Inflation Expectations (ICIE)
- Income growth expectations



Notes: Dashed line shows linear fit b/n ICIE and income growth expectations (20K respondents).

Back to Prior Questions

Pilot Exercise: January 2022

Table: Summary Statistics and Relationship between Price and Income Inflation

	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

Back to Prior Questions

Estimates of $\gamma_{\pi j}$

	(1)	(2)	(3)	(4)
	$\mathbb{E}_i\left(\pi^{Prices}\right)$	$\mathbb{E}_i\left(\pi^{Prices}\right)$	$\mathbb{E}_i\left(\pi^{\text{Income,2y}}\right)$	$\mathbb{E}_i\left(\pi^{\text{Income,2y}}\right)$
T2: Target	-0.627	0.126	-0.203	0.011
	(0.460)	(0.138)	(0.248)	(0.127)
T3: Wages	-0.695	0.771***	-0.208	0.243*
	(0.450)	(0.153)	(0.230)	(0.125)
T4: CPI	-0.825*	0.586***	-0.109	0.200
	(0.456)	(0.150)	(0.254)	(0.131)
T5: SPF	-0.749	0.720***	-0.100	0.064
	(0.465)	(0.149)	(0.247)	(0.127)
T6: Placebo	0.133	0.498***	-0.373	-0.186
	(0.465)	(0.148)	(0.248)	(0.125)
Constant	5.667***	1.343***	0.925***	0.520***
	(0.337)	(0.098)	(0.185)	(0.131)
Sample	All	All	All	Trimmed
Regression	OLS	Huber	OLS	OLS
Observations	6,620	5,892	6,622	5,753

Back to Treatments Affecting Expectations

Effects of Inflation Expectations on Labor Market Actions

	All	Male	Female	<50k	50k-100k	100k+
	(1)	(2)	(3)	(4)	(5)	(6)
	Apply for a Job(s) that Pays More					
$\frac{dy}{dx}\frac{\bar{x}}{\bar{y}}$	0.114	0.072	0.184	0.076	0.182	0.094
	Work Longer Hours					
$\frac{dy}{dx}\frac{\bar{x}}{\bar{y}}$	0.034	0.014	0.080	0.003	0.088	0.043
	Ask for a Raise					
$\frac{dy}{dx}\frac{\bar{x}}{\bar{y}}$	0.034	0.014	0.080	0.003	0.088	0.043

Notes: We color in red estimates that are significantly different from 0 at at least a 90% significance level.

Back to the main effect

Calibration of λ

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

- $\mathbb{E}_i\left(\pi^{Prices}\right) - \mathbb{E}_i\left(\pi^{ICIE}\right) = \alpha + \beta T_i\left[I_{ij} - \mathbb{E}_i\left(\pi^{ICIE}\right)\right] + \varepsilon_i$

Table: Effect of new information in 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

Back to New Keynesian Model

Value of Employment and Unemployment

$$\mathcal{V}_t^E(W_{it}) = \underbrace{w_{it}h_{it} - \kappa_h \frac{h_{it}^{1+\varphi}}{(1+\varphi)\lambda_t}}_{\text{labor income-labor disutility}} \tag{15}$$

Value of Employment and Unemployment

$$\mathcal{V}_t^E(W_{it}) = \underbrace{w_{it}h_{it} - \kappa_h \frac{h_{it}^{1+\varphi}}{(1+\varphi)\lambda_t}}_{\text{labor income-labor disutility}} + \underbrace{\mu\, \mathbb{E}_t\left[\Gamma_{t,t+1}\mathcal{V}_{t+1}^U\right]}_{\text{if unemployed}} \tag{16}$$

Value of Employment and Unemployment

$$\mathcal{V}_t^E(W_{it}) = \underbrace{w_{it}h_{it} - \kappa_h \frac{h_{it}^{1+\varphi}}{(1+\varphi)\lambda_t}}_{\text{labor income-labor disutility}} + \mu \underbrace{\mathbb{E}_t\left[\Gamma_{t,t+1}\mathcal{V}_{t+1}^U\right]}_{\text{if unemployed}}$$

$$+ (1-\mu)\mathbb{E}_t\left[\Gamma_{t,t+1}\left(\gamma \underbrace{\mathcal{V}_{t+1}^E(W_{it}(e_t^w \pi_t^{\zeta_w} \bar{\pi}^{1-\zeta_w}))}_{\text{sticky wage}} + (1-\gamma)\underbrace{\mathcal{V}_{t+1}^E(W_{t+1}^*)}_{\text{flexible wage}}\right)\right] \tag{17}$$

Value of Employment and Unemployment

$$\mathcal{V}_t^E(W_{it}) = \underbrace{w_{it}h_{it} - \kappa_h \frac{h_{it}^{1+\varphi}}{(1+\varphi)\lambda_t}}_{\text{labor income-labor disutility}} + \mu \underbrace{\mathbb{E}_t\left[\Gamma_{t,t+1}\mathcal{V}_{t+1}^U\right]}_{\text{if unemployed}}$$

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$$\mathcal{V}_t^U = \underbrace{b}_{\text{unemployment benefits}} \tag{19}$$

Value of Employment and Unemployment

$$\mathcal{V}_t^E(W_{it}) = \underbrace{w_{it}h_{it} - \kappa_h \frac{h_{it}^{1+\varphi}}{(1+\varphi)\lambda_t}}_{\text{labor income-labor disutility}} + \mu \underbrace{\mathbb{E}_t\left[\Gamma_{t,t+1}\mathcal{V}_{t+1}^U\right]}_{\text{if unemployed}}$$
$$+ (1-\mu)\mathbb{E}_t\left[\Gamma_{t,t+1}\left(\gamma \underbrace{\mathcal{V}_{t+1}^E(W_{it}(e_t^w \pi_t^{\zeta_w}\bar{\pi}^{1-\zeta_w}))}_{\text{sticky wage}} + (1-\gamma)\underbrace{\mathcal{V}_{t+1}^E(W_{t+1}^*)}_{\text{flexible wage}}\right)\right] \tag{20}$$

$$\mathcal{V}_t^U = \underbrace{b}_{\text{unemployment benefits}} + (1-s_t)\underbrace{\mathbb{E}_t\left[\Gamma_{t,t+1}\mathcal{V}_{t+1}^U\right]}_{\text{if unemployed}} \tag{21}$$

Value of Employment and Unemployment

$$\mathcal{V}_t^E(W_{it}) = \underbrace{w_{it}h_{it} - \kappa_h \frac{h_{it}^{1+\varphi}}{(1+\varphi)\lambda_t}}_{\text{labor income-labor disutility}} + \mu \underbrace{\mathbb{E}_t\left[\Gamma_{t,t+1}\mathcal{V}_{t+1}^U\right]}_{\text{if unemployed}}$$

$$+ (1-\mu)\mathbb{E}_t\left[\Gamma_{t,t+1}\left(\gamma \underbrace{\mathcal{V}_{t+1}^E(W_{it}(e_t^w \pi_t^{\zeta_w}\bar{\pi}^{1-\zeta_w}))}_{\text{sticky wage}} + (1-\gamma)\underbrace{\mathcal{V}_{t+1}^E(W_{t+1}^*)}_{\text{flexible wage}}\right)\right] \tag{22}$$

$$\mathcal{V}_t^U = \underbrace{b}_{\text{unemployment benefits}} + (1-s_t)\underbrace{\mathbb{E}_t\left[\Gamma_{t,t+1}\mathcal{V}_{t+1}^U\right]}_{\text{if unemployed}}$$

$$+ s_t\mathbb{E}_t\left[\Gamma_{t,t+1}\left(\gamma \underbrace{\mathcal{V}_{t+1}^E(W_{it}(e_t^w \pi_t^{\zeta_w}\bar{\pi}^{1-\zeta_w}))}_{\text{sticky wage}} + (1-\gamma)\underbrace{\mathcal{V}_{t+1}^E(W_{t+1}^*)}_{\text{flexible wage}}\right)\right] \tag{23}$$

Back to Matching Fact 1

Calibration of Some Important Parameters

- Steady-state values set to U.S. realizations in 2021:IV
  - Unemployment rate: 4.2%
  - Job vacancy rate: 7%
  - Job separation rate: 4.1%
- Others
  - Persistence of wage-push factor: 0.9
  - Labor supply elasticity: 0.1 (Trigari, 2006, closer to micro estimates)

Back to Matching Fact 1