Why Do Workers Dislike Inflation? Wage Erosion and Conflict Costs

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Why do Workers Dislike Inflation?

Prior work focus in real wage – do nominal wages keep up with prices? How fast?

[Kessel-Alchian '60, Fischer-Modigliani '78, Shiller '97, Lorenzoni-Werning '23, Blanco et al. '23; Stantcheva '24]

Instead, this paper:

- Workers must take **costly actions** ("**conflict**") to have wages keep up with prices
  - E.g. tough conversations with employers; union strike; soliciting offers from other firms; ...
  - Afrouzi, Blanco, Drenik, Hurst '25; Pilossoph, Ryngaert, Wedewer '25
- Substantial welfare costs of inflation **even if** real wages do not fall during inflations

Costs of Inflation Beyond Real Wages

post-Pandemic

1. **Survey**: workers get wage growth though costly actions w/ firms

2. **Conflict-cost model**: (random) menu-cost model for wage setting:

[Nakamura–Steinsson '10, Alvarez et al. '16, Auclert et al. '21]

- Workers consider costly conflict w/ firm to raise nominal wage [+ idiosyncratic shocks]

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3. **Main analytical results**:
   1. Wage catch-up after inflation from more frequent conflict doesn't raise welfare
      - On the margin: benefit of wage catch-up are offset by cost of conflict [envelope theorem]
   2. Impact of inflation on worker welfare determined by **wage erosion**
      - How inflation lowers real wages if conflict decision do not change with inflation

Takeaway: Costs of inflation to workers not determined by its impact on actual real wages

Quantifying How Conflict Affects the Costs of Inflation

4. **Use survey to elicit key parameters** to quantify the model:
   - Conflict costs: workers willing to sacrifice **1.75% of wages** to avoid conflict
   - Close to no indexation

5. **Quantify**:
   - **Costs of inflation** incorporating conflict **more than double** costs via falling real wages

Literature

Costs of inflation via labor market. [Shiller '97; Hadjini et al '22; Pilossoph & Ryngaert '23; Del Canto et al '23; Ferreira et al '23; Pallotti et al '23; Stantcheva '24; Afrouzi, Blanco, Drenik, Hurst '24; Pilossoph et al '24]

- Real wage growth misses costs of inflation in labor market due to conflict

Costs of inflation. [Baily '56; Friedman '77; Fischer & Modigliani '78; Imrohoroglu '92; Lucas '00; Burstein & Hellwig '08; Alvarez et al '16; Nakamura et al '18; Binetti et al '24]

- Inflation costs from other mechanisms

  [e.g. shoe leather costs, menu costs, relative price distortions, inflation volatility, tax distortions]

Inflation and Conflict. [Lorenzoni & Werning '23 a,b]

- Our focus is the welfare costs of inflation, theirs is the causes of inflation

Survey Design

Our Survey

- Survey: **Prolific**
- 3000 prime-age, employed US workers, **Feb-March '24**
- **Representative** of the general population in terms of chosen **observable characteristics**
  - gender, education and political affiliation

Representation

- **Survey part I [now]:** Qualitative evidence to motivate model
  - Workers achieve wage growth through costly conflict with employers
- **Survey part II [later]:** Quantitative evidence to discipline the model

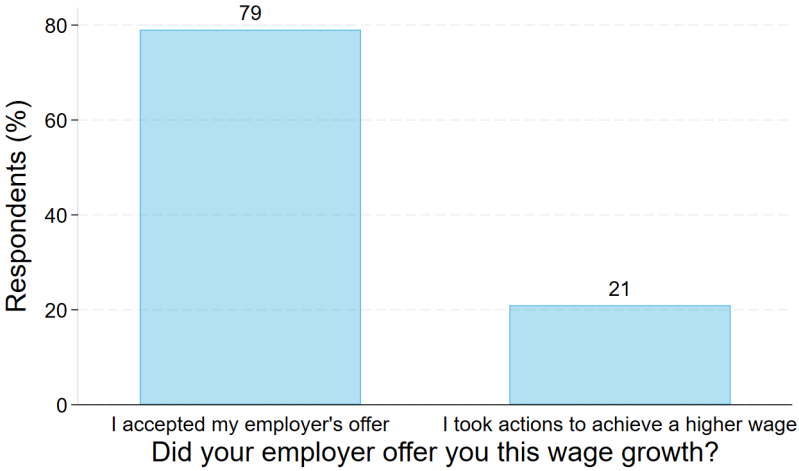
Motivating Evidence:
Wage Growth Though Costly Actions

Survey: Workers Achieve Wage Growth Though Costly Actions w/ Firms

1. **Workers choose between accepting employer's default wage offer or conflict**
2. Conflict raises wages
   2.1 Conflict motivated by desire for wages to keep up with inflation
3. Workers who did not conflict believe conflict could have raised wages
4. Inflation leads to conflict

Workers Choose Employer Offer vs. Conflict to Raise Wage

Hetergeneity By income



Note: actions include tough conversations with employers; union strike; soliciting other offers, etc.

actions

Survey: Workers Achieve Wage Growth Though Costly Actions w/ Firms

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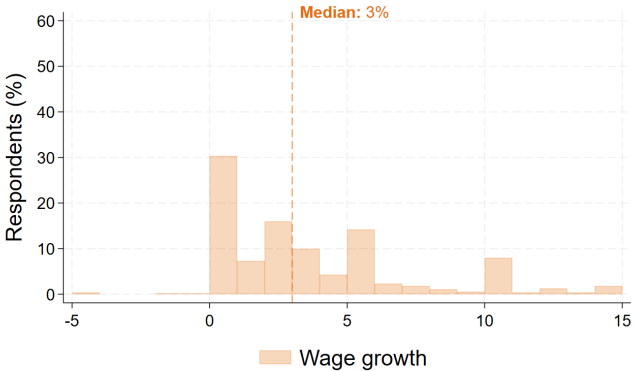
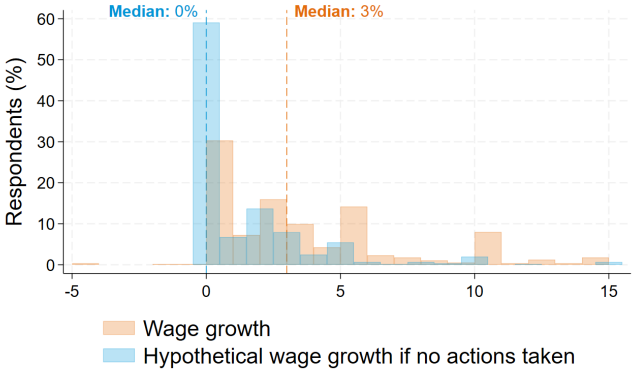
Conflict Leads to Higher Wages...



Conflict Leads to Higher Wages...

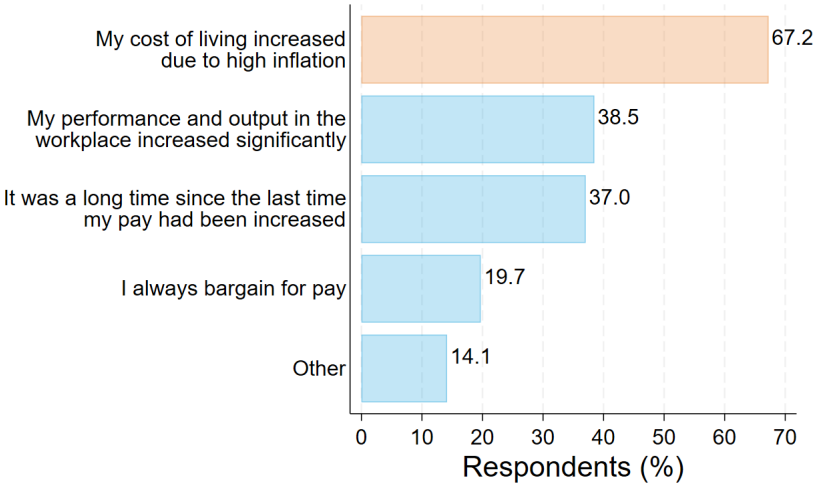
Within-individual | High wage workers



- Workers who conflict increased their wage relative to default employer offer.

... And Catch-Up with Inflation

Motivations for conflict:



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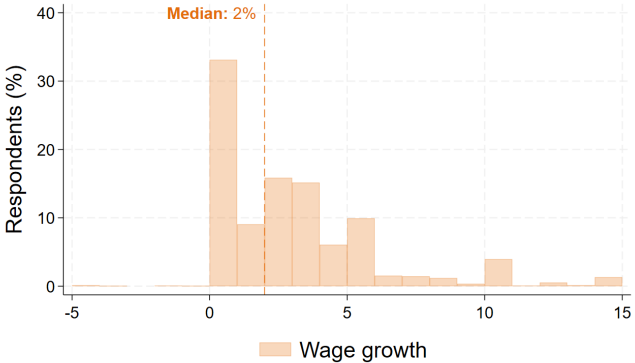
Workers Sacrifice Wage Growth To Avoid Conflict



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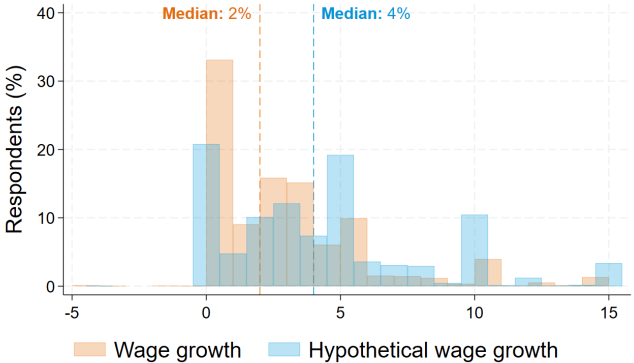

- Workers who do not conflict, report having sacrificed 2pp of wage growth

Survey: Workers Achieve Wage Growth Though Costly Actions w/ Firms

1. Workers choose between accepting employer's default wage offer or conflict
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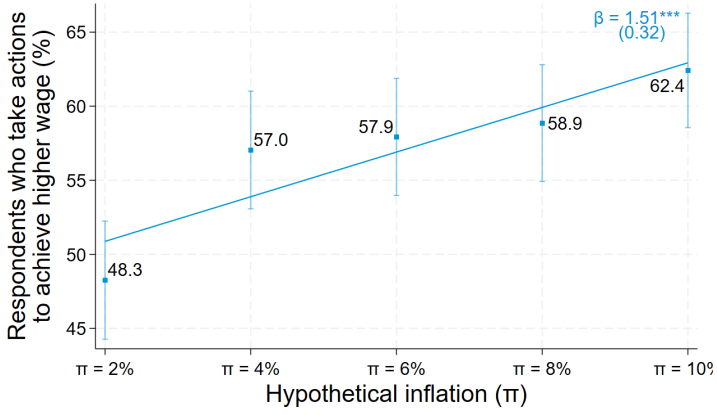
4. **Inflation leads to conflict**

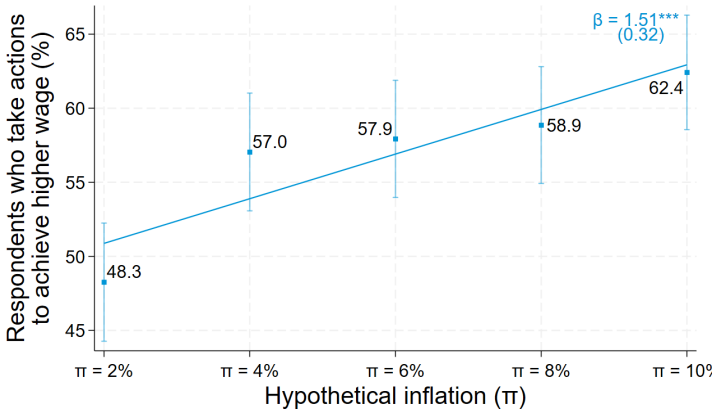
Inflation Increases the Probability of Conflict



Q: consider a hypothetical situation, inflation is expected to be x% in next 12 months.

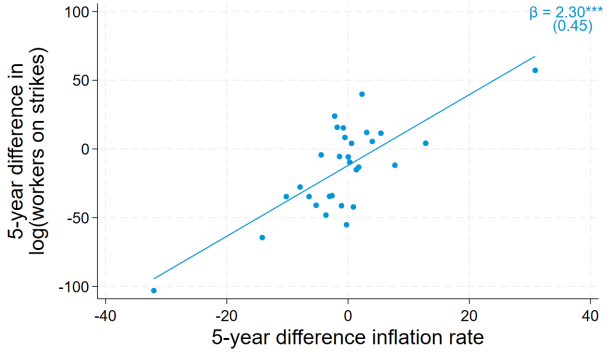
- Where $x \in \{2, 4, 6, 8, 10\}$

Inflation Increases the Probability of Conflict



- 1% $\Delta\pi$ implies a 1.5% increase in conflict – **state-dependent conflict decisions**

Inflation is Associated with Higher Union Activity



$$\Delta \log 100 \times (\text{workers involved in strikes})_{i,t,t-5} = \gamma_i + \lambda_t + \beta \Delta \pi_{i,t,t-5} + \varepsilon_{it},$$

International Labor Organization data, $1960 - 2020$

Survey: Workers Achieve Wage Growth Though Costly Actions w/ Firms

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Next: incorporate these features in a **"menu-cost style" model of wage setting**

[Alvarez et al '16; Nakamura et al. '18; Auclert et al '24]

Costs of Inflation in a Conflict-Cost Model

Workers' Problem

- A continuum of workers $i \in [0,1]$ balances **benefit of wage catch up** and **cost of conflict**

$$\max_{\{\mathscr{I}_{i,t}\}_{t=0}^{+\infty}} \mathbb{E}_0 \left[\sum_{t \geq 0} \beta^t \left(\log c_{i,t} - \kappa_{i,t} \mathscr{I}_{i,t} \right) \right],$$

  where $\mathscr{I}_{i,t} = 1$ if the worker takes costly actions to increase pay and 0 otherwise.

- $\kappa_{i,t}$: i.i.d. "Calvo-plus" cost to increase pay [Nakamura & Steinsson '10; Auclert et al. '23]

$$\kappa_{i,t} = \begin{cases} \kappa & \text{with probability } 1-\lambda \\ 0 & \text{with probability } \lambda \end{cases}$$

  Reduced form cost captures a variety of conflict actions

Workers' Problem

- Here: hand-to-mouth $c_{i,t} = w_{i,t} = \frac{W_{i,t}}{P_t}$. [Paper: borrowing constraints.]

- **Nominal wage** $W_{i,t}$ follows

$$W_{i,t} = \begin{cases} W_{i,t}^d \equiv W_{i,t-1} e^{\alpha + \gamma(\pi_t - \pi^{ss})} & \text{if } \mathscr{I}_{i,t} = 0 \\ P_t w_{i,t}^* & \text{if } \mathscr{I}_{i,t} = 1 \end{cases},$$

  where α is default SS nominal wage growth & γ: degree of indexation to inflation shocks.

- Conflict-induced (real) wage $w_{i,t}^*$, keeps up w/ inflation & productivity [Paper: general process of $w_{i,t}^*$.]

$$\log w_{i,t}^* = \log w_{i,t-1}^* + g_z + z_{i,t},$$

  $z_{i,t} \in [-\overline{z}, \infty)$ is idiosyncratic productivity shock, g_z is trend productivity growth.

Optimal Conflict Choice

- Define **wage gap** $x_{i,t}$ as log difference between default wage and conflict-induced wage

$$x_{i,t} = \log\left(W_{i,t}^{d}\right) - \log\left(P_t w_{i,t}^{*}\right)$$

- Worker's optimal conflict choice is characterized by a threshold rule

$$I_{i,t} = \begin{cases} 1 & \text{if } x_{i,t} \leq \underline{x}_t \\ 0 & \text{if } x_{i,t} > \underline{x}_t \end{cases},$$

where $\underline{x}_t < 0$ is the **conflict threshold**.

The Impact of Inflation Shocks on Worker Welfare and Wages

- Start from a steady state with inflation $\pi^{ss} \geq 0$.
- An unexpected $t = 0$ **inflation shock**, $\{\hat{\pi}_t\}_{t=0}^{+\infty} = \{\pi_t - \pi^{ss}\}_{t=0}^{+\infty}$. Perfect foresight after.
- Study its impact on aggregate worker welfare

$$\mathscr{W} \equiv \int \mathbb{E}_0 \left[\sum_{t=0}^{\infty} \beta^t \left\{ u\left(c_{i,t}\right) - \kappa_{i,t} \mathscr{I}_{i,t} \right\} \right] di$$

and aggregate log real wages

$$\log w_t \equiv \int_0^1 \log\left(w_{i,t}\right) di.$$

The Impact of Inflation Shocks on Worker Wages

Definition 1.

The impact of inflation shocks on aggregate log real wage can be decomposed into

$$\hat{w}_t \equiv \log w_t - \log w^{ss} = \hat{w}_t^{\text{erosion}} + \hat{w}_t^{\text{catch-up}},$$

- **Wage erosion**: impact of inflation shocks holding conflict decision at steady state $\mathscr{I}_{i,t}^{ss}$

$$\hat{w}_t^{\text{erosion}} \equiv \int_0^1 \log \omega_t \left(\pi_t, \mathscr{I}_{i,t}^{ss}, h_{i,t}\right) di - \int_0^1 \log \omega_t \left(\pi^{ss}, \mathscr{I}_{i,t}^{ss}, h_{i,t}\right) di,$$

  where ω_t is wage given path of inflation π_t, conflict choices $\mathscr{I}_{i,t}$, & idio. conditions $h_{i,t}$.

- **Wage catch-up**: impact of inflation shocks through changes in conflict decision $\mathscr{I}_{i,t}$

$$\hat{w}_t^{\text{catch-up}} \equiv \int_0^1 \log \left(\omega_t \left(\pi_t, \mathscr{I}_{i,t}, h_{i,t}\right)\right) di - \int_0^1 \log \left(\omega_t \left(\pi_t, \mathscr{I}_{i,t}^{ss}, h_{i,t}\right)\right) di.$$

The Impact of Inflation Shocks on Worker Welfare

Theorem.

The (first-order) impact of inflation shocks on worker welfare is given by ***wage erosion***

$$\underbrace{\hat{\mathscr{W}}}_{\text{impact on worker welfare}} \approx \sum_{t=0}^{\infty} \beta^t \hat{w}_t^{\text{erosion}} = \underbrace{\sum_{t=0}^{\infty} \beta^t \hat{w}_t}_{\text{real wage response}} - \sum_{t=0}^{+\infty} \beta^t \hat{w}_t^{\text{catch-up}}.$$

Because the benefits of **wage catch-up** are offset by **costs of conflict**

$$\sum_{t=0}^{\infty} \beta^t \hat{w}_t^{\text{catch-up}} \approx \underbrace{\int \mathbb{E}_0 \left[\sum_{t=0}^{\infty} \beta^t \kappa_{i,t} \left(\mathscr{I}_{i,t} - \mathscr{I}_{i,t}^{ss} \right) \right] di}_{\text{aggregate costs of inflation due to conflict } \tilde{\mathscr{X}}} .$$

[Milgrom-Segal '02 envelope theorem applied to discrete choice set]

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- The impact of inflation on **aggregate wage** $\sum_{t=0}^{\infty} \beta^t \hat{w}_t$ **does not measure** welfare
  - Even ≈ 0, inflation could still be costly because wage catch-up comes from costly conflicts
  - Sufficient for welfare only w/ purely time-dependent wage setting ($\kappa = \infty$)

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- Extensions: (1) general distribution of $\kappa_{i,t}$; (2) intensive margin of conflict; (3) general process for $w_{i,t}^*$; (4) other agg. shocks; (5) unemployment; (6) beyond hand-to-mouth

The Impact of Inflation Shocks on Worker Welfare

Proposition.

Wage erosion and the impact of inflation shocks on worker welfare are given by

$$\hat{w}_t^{erosion} \approx -(1-\gamma)\sum_{k=0}^{t}\Phi_k^{ss}\hat{\pi}_{t-k} \quad \forall t \geq 0 \quad \textit{and} \quad \hat{\mathscr{W}} \approx \sum_{t=0}^{\infty}\beta^t\hat{w}_t^{erosion},$$

where $\Phi_k^{ss} \equiv \int_0^1 \left(\Pi_{l=0}^{k}\left(1-\mathscr{I}_{i,t+l}^{ss}\right)\right) di$.

Two key terms impact wage erosion:

1. Φ_k^{ss} is prob. that employer's default wage **"survives"** without conflict for k periods.
   - linked with **frequency of conflict at steady-state inflation**
   - higher $\kappa \Longrightarrow$ higher $\Phi_k^{ss} \Longrightarrow$ more wage erosion $\Longrightarrow$ higher costs of inflation
   - lower $\lambda \Longrightarrow$ higher $\Phi_k^{ss} \Longrightarrow$ more wage erosion $\Longrightarrow$ higher costs of inflation
2. Indexation γ: lower $\gamma \Longrightarrow$ higher costs of inflation

Elicit Conflict Costs with the Survey

Elicit Conflict Costs with the Survey

Use survey to elicit key parameters governing how conflict impacts costs of inflation

- **Elicit conflict costs**
  - utility costs of conflict κ
  - probability of free catch-up λ
- Elicit process for default wage
  - indexation γ
  - SS nominal wage growth α

Eliciting Conflict Costs

- Elicit **conflict-induced** nominal wage growth workers believe they get via costly actions

$$\Delta W^{\text{conflict}} \equiv \log W^{*}_{i,t} - \log W_{i,t-1}$$

[$W^{*}_{i,t}$: conflict-induced nominal wage]

What pay growth in next 12 months do you think you would get if you do your best to increase pay using any strategies at your disposal, including the common strategies listed above?

Eliciting Conflict Costs

- Elicit **conflict-induced** nominal wage growth workers believe they get via costly actions

$$\Delta W^{\text{conflict}} \equiv \log W^{*}_{i,t} - \log W_{i,t-1}$$

[$W^{*}_{i,t}$: conflict-induced nominal wage]

What pay growth in next 12 months do you think you would get if you do your best to increase pay using any strategies at your disposal, including the common strategies listed above?

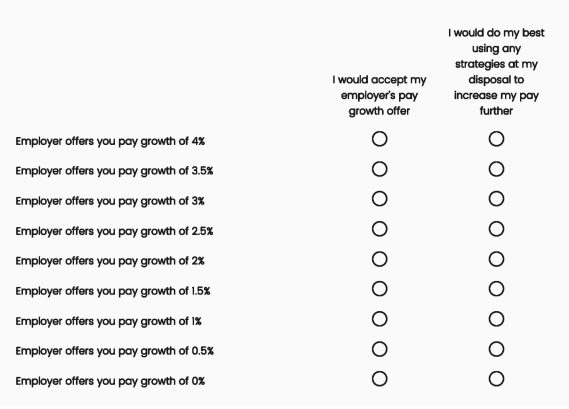
- Elicit nominal wage growth ΔW^{indiff} where workers are **indifferent** between
  - **Accepting** if offered by their employers vs **taking costly actions**
- Find x^{conflict}, the fraction of wage that workers would sacrifice to avoid conflict

$$x^{\text{conflict}} \equiv \Delta W^{\text{conflict}} - \Delta W^{\text{indiff}}$$

  - $x^{\text{conflict}} = |\underline{x}^{ss}|$ elicits **conflict threshold** and is directly linked with the conflict cost κ

Eliciting Costs of Conflict

Elicit ΔW^{indiff} via "multiple price list" standard in experimental economics [Jack et al. '22]



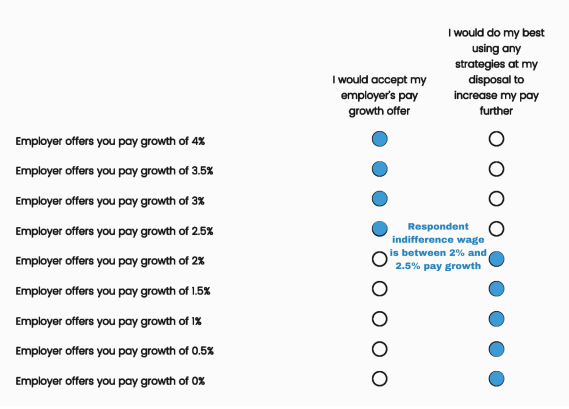
	I would accept my employer's pay growth offer	I would do my best using any strategies at my disposal to increase my pay further
Employer offers you pay growth of 4%	○	○
Employer offers you pay growth of 3.5%	○	○
Employer offers you pay growth of 3%	○	○
Employer offers you pay growth of 2.5%	○	○
Employer offers you pay growth of 2%	○	○
Employer offers you pay growth of 1.5%	○	○
Employer offers you pay growth of 1%	○	○
Employer offers you pay growth of 0.5%	○	○
Employer offers you pay growth of 0%	○	○

Consider a respondent who reports $\Delta W^{\text{conflict}} = h\%$. They get a list of potential employer offers $\leq h\%$.

Here: $h = 4$.

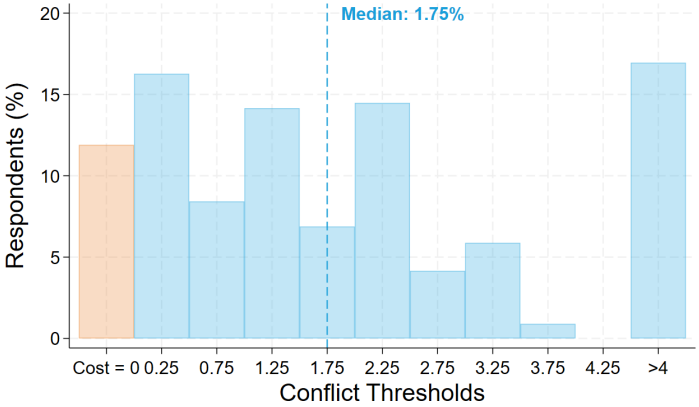
Eliciting Costs of Conflict

Elicit ΔW^{indiff} via "multiple price list" standard in experimental economics [Jack et al. '22]



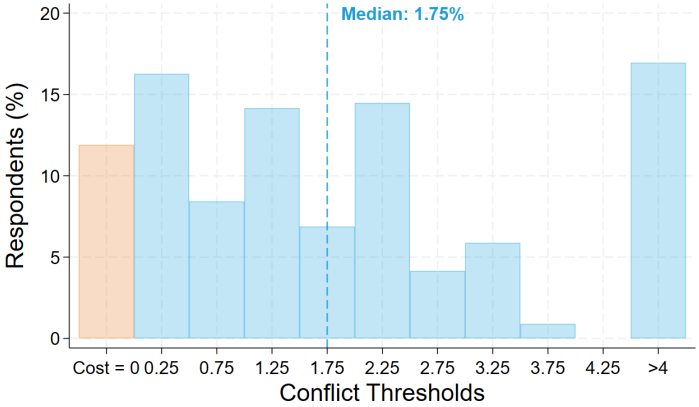
Let ΔW^{indiff} denote lowest nominal wage growth where workers accept employers' offer, then:

$$x^{\text{conflict}} \in \left[\Delta W^{\text{conflict}} - \Delta W^{\text{indiff}},\ \Delta W^{\text{conflict}} - \Delta W^{\text{indiff}} + 0.5\right].$$



- Direct evidence on **conflict costs**: $\kappa_{i,t} = 0$ *with prob.* λ *and* $\kappa_{i,t} = \kappa$ *otherwise*
  - $\lambda = 0.029$ (quarterly) to match share of people who would always conflict
  - Calibrate κ so conflict threshold is equal to median $x^{\text{conflict}} = 1.75\%$

Calibrating κ | Union Dues



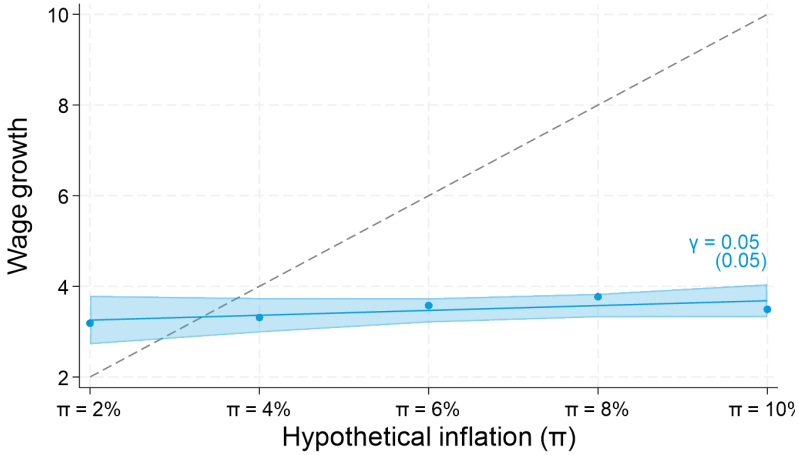
- **Validation exercises**:
  1. **Lower conflict costs** predict **higher likelihood** of having taken actions in 2023 Here
  2. **Lower conflict costs** predict **less wage sacrificed** from not taking actions in 2023 Here

Elicit Conflict Costs with the Survey

Use survey to elicit key parameters governing how conflict impact costs of inflation

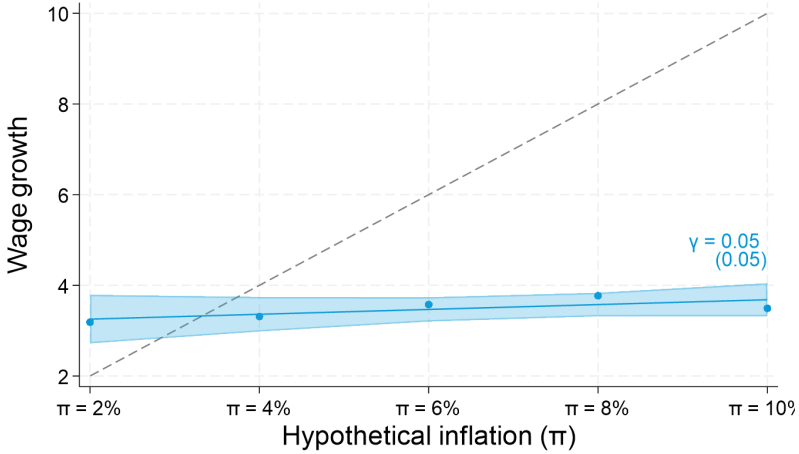
- Elicit conflict costs
  - utility costs of conflict κ
  - probability of free catch-up λ
- **Elicit process for default wage**
  - indexation γ
  - SS nominal wage growth α

Indexation: Perceived Nominal Wage Growth without Conflict



- Consider a hypothetical situation, inflation is expected to be x% in the next 12 months.
- Where $x \in \{2, 4, 6, 8, 10\}$

Indexation: Perceived Nominal Wage Growth without Conflict



- Evidence on **default wages + indexation**: $W_{i,t}^{default} = W_{i,t-1} e^{\alpha + \gamma(\pi_t - \pi^{ss})}$
- Indexation: $\Delta\pi = 1\%$ then $\Delta \log W_{i,t}^{\text{default}} = 0.05\% \Rightarrow \gamma = 0.05$
  - at $\pi^{ss} = 2\%$, 3.25% default wage annual growth $\Rightarrow \alpha = 0.81\%$

Empirical Takeaway

1. **Significant cost of conflict** $x^{\text{conflict}} = 1.75\%$ of wages and $\lambda = 0.029$
2. **Almost no indexation**: 1 p.p. inflation $\Rightarrow \sim 0$ in employer-offered nominal wage growth

Quantifying the Costs of Inflation: The Importance of Conflict

Calibration - Quarterly Frequency

	Description	*Value*	*Target*
β	Discount factor	0.99	Standard
κ	Conflict cost	8.14%	Own survey such that $\underline{x}^{ss} = -1.75\%$
λ	Probability of free catchup	2.87%	Own survey
g	Trend real wage growth	0.76%	ASEC-CPS 3.02% annual real wage growth
α	Default nom. wage growth at π^{ss}	0.81%	Own survey
γ	Indexation of default nominal wage	0.05	Own survey
π^{ss}	Steady state inflation	0.5%	2% annual inflation
$z_{i,t}$	Idios. shocks $z_{i,t} + \mu \sim \text{Gamma}(a, b)$	$(0.14, 0.03)$	$\mathbb{E}\left[z_{i,t}\right] = 0$ 48% yearly share of conflict

Quantifying the Aggregate Costs of Inflation Due to Conflict

Solve first-order responses to inflation shocks $\{d\pi_t\}_{t\geq 0}$ using **SSJ** methods

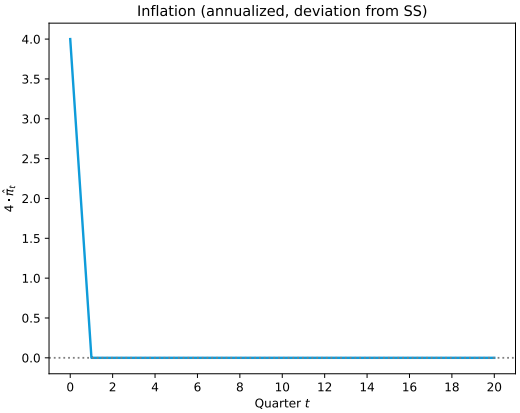
[Auclert-Bardóczy-Rognlie-Straub '21, Auclert-Rigato-Rognlie-Straub '24]

Evaluate welfare costs of inflation shocks to workers

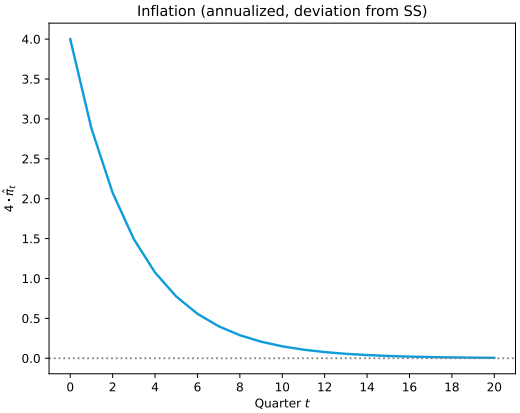
$$\hat{\mathscr{W}} = \sum_{t=0}^{\infty} \beta^t \hat{w}_t^{\text{erosion}} = \underbrace{\sum_{t=0}^{\infty} \beta^t \hat{w}_t}_{\text{aggregate wage response}} - \underbrace{\hat{\varkappa}}_{\substack{\text{aggregate costs of} \\ \text{inflation due to conflict}}} .$$

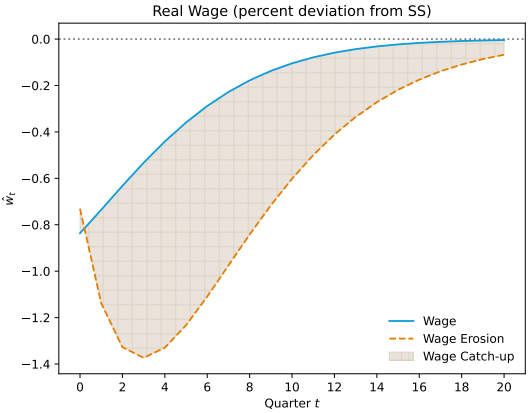
1. Transitory inflation shocks: $d\pi_0 > 0$ and $d\pi_t = 0$ for $t \geq 1$
2. Persistent inflation shocks: $d\pi_t = \rho^t \varepsilon$, with $\rho = 0.72$
3. 2021-23 inflation experience (perfect foresight and observed inflation expectations)

Transitory Inflation Shocks



Persistent Inflation Shocks





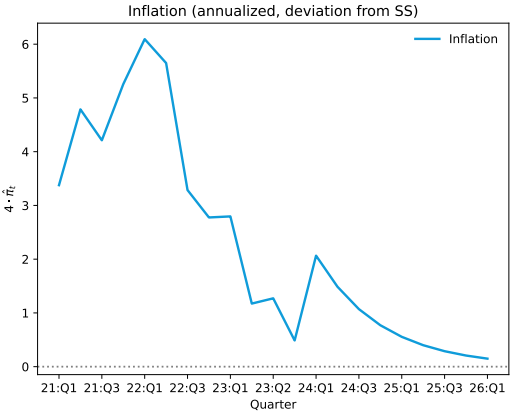
Welfare Decomposition

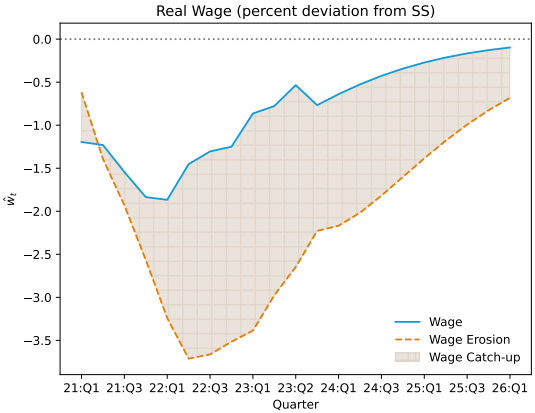
	Overall Welfare Change	Real Wage Response	Aggregate Costs of Inflation due to Conflict
Transitory inflation	-0.95%	-0.22%	-0.73%
Persistent inflation	-3.31%	-1.16%	-2.15%

Note: Welfare units = % of 1-year consumption

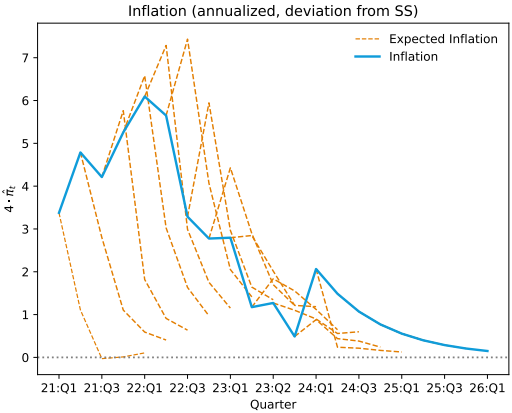
- **Costs of inflation** incorporating conflict **more than double** costs via falling real wages

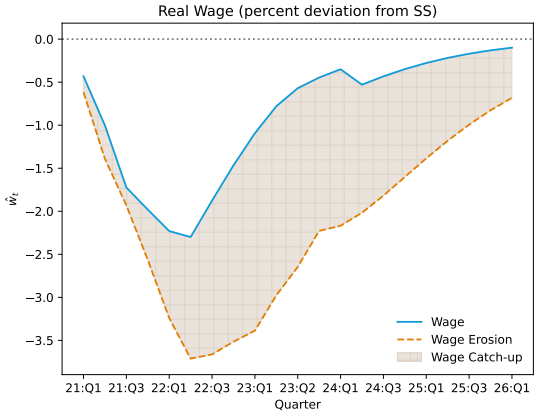
2021-23 Inflation Experience





2021-23 Inflation (Observed Inflation Expectations from Survey)





Robustness and Extensions

Finding that aggregate costs of inflation due to conflict are significant is **robust** to

- Alternative calibration of the indexation parameter γ Gamma
- Alternative calibration of the probability of free wage catch-up λ Lambda
- Alternative calibration of the conflict cost κ Kappa
- General equilibrium determination of employment and wages GE

Conclusion

Conclusion

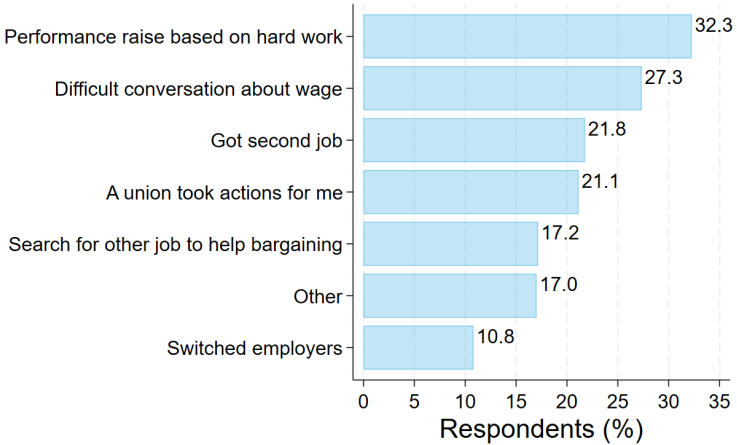
- Workers incur **conflict costs** to have nominal wages keep up with inflation
- Survey: workers willing to sacrifice 1.75% of wages to avoid costly conflicts
- We capture conflict cost in a menu-cost style model applied to wage setting
- Incorporating conflict costs **more than doubles** costs of inflation to workers
- Broader agenda: a tractable approach to **introduce state-dependent wage setting**
  - In progress: firms' costs in adjusting wages downward & downward wage rigidity

Outline

Extra Slides

What are the Costly Actions?

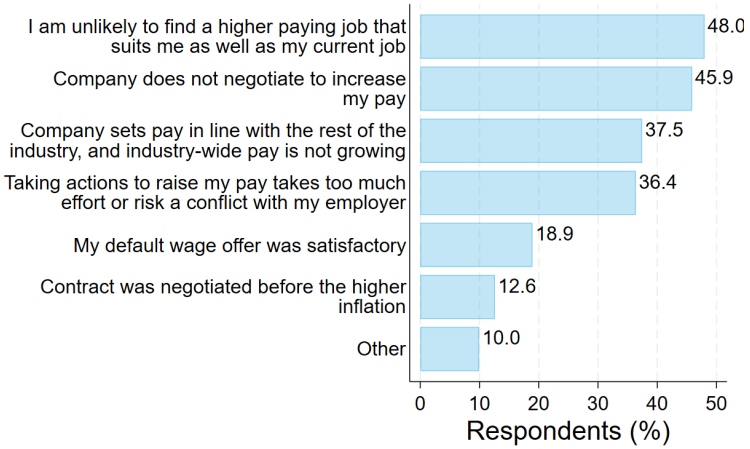
Back



Takeway: Workers engage in a **diverse set of costly actions**

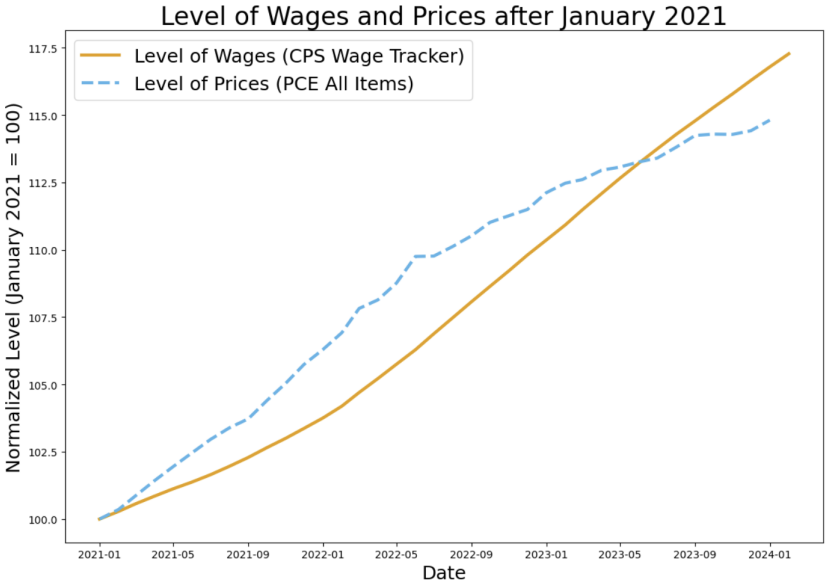
Motivation to Accept Wage Offer

Back



Wages and prices in the post-Pandemic inflation

Back



Sample Representation 1/3

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Table 3: Distributions in Survey Sample vs. Population

	Survey	US population
Male	0.52	0.52
Female	0.48	0.48
Secondary education (e.g. GED/GCSE)	0.02	0.02
High school diploma/A-levels	0.37	0.39
Technical/community college	0.12	0.11
Undergraduate degree (BA/BSc/other)	0.32	0.30
Graduate degree (MA/MSc/MPhil/other)	0.14	0.13
Doctorate degree (PhD/other)	0.04	0.04
Democrat	0.28	0.28
Republican	0.26	0.26
Independent	0.33	0.33
None	0.07	0.07
Other party	0.06	0.06
22-29 years old	0.24	0.20
30-39 years old	0.38	0.29
40-49 years old	0.21	0.26
50-60 years old	0.16	0.26

Sample Representation 2/3

Back

Table 3: Distributions in Survey Sample vs. Population

	Survey	US population
Full-Time	0.83	0.83
Part-Time	0.17	0.17
For-profit company	0.80	0.77
Not-for-profit corporation	0.09	0.07
State government	0.03	0.06
Federal government	0.02	0.03
Local government	0.04	0.07
Other employer	0.01	
White	0.68	0.75
Black	0.12	0.14
Asian	0.08	0.07
Mixed	0.08	0.02
Other	0.04	0.02
Not reported	0.00	

Sample Representation 3/3

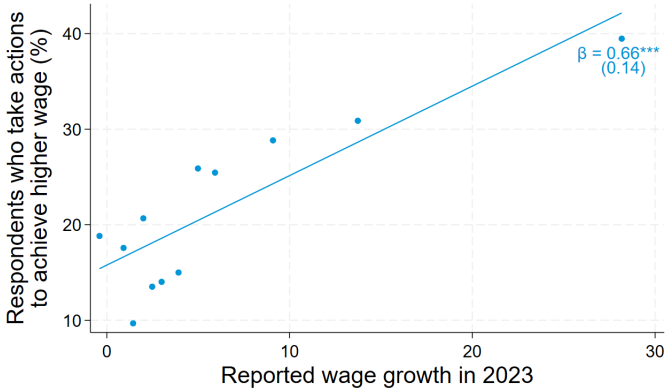
Back

Table 3: Distributions in Survey Sample vs. Population

	Survey	US population
Covered by a union	0.11	0.13
Not part of a union	0.81	0.87
Not reported	0.08	
Income		
$0-$19,999	0.12	0.12
$20,000-$39,999	0.24	0.22
$40,000-$69,999	0.34	0.31
$70,000-$99,999	0.17	0.16
$100,000-$124,999	0.06	0.08
$125,000+	0.07	0.11

Workers with higher wage growth were more likely to have taken costly actions

Back



Calibrating κ

Back

Lemma.

Let $v^{ss}(x)$ denote worker's value as a function of end-of-period wage gap x

$$v^{ss}(x) \equiv \max\left\{x + \beta \mathbb{E}\left[\max\left\{v^{ss}(0) - \kappa', v^{ss}\left(x'\right)\right\}\right]\right\}$$

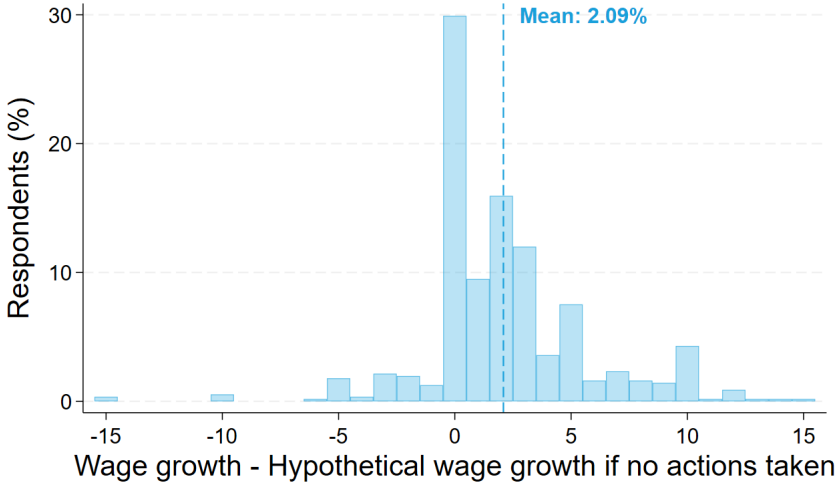
where $x \equiv \log\left(w_{i,t}/w^*_{i,t}\right)$ denotes the wage gap. Then,

$$v^{ss}\left(-x^{conflict}\right) = v^{ss}(0) - \kappa.$$

- Measured conflict threshold is directly informative of κ.

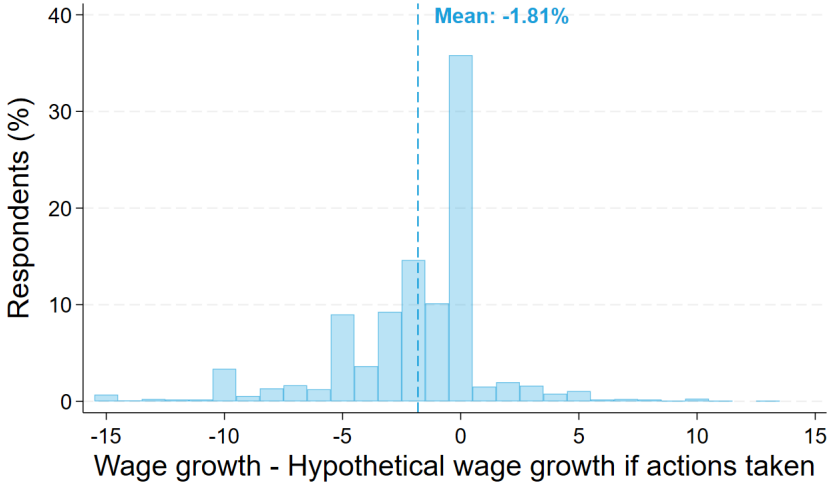
Conflict Leads to Higher Wages: Within-individual

Back



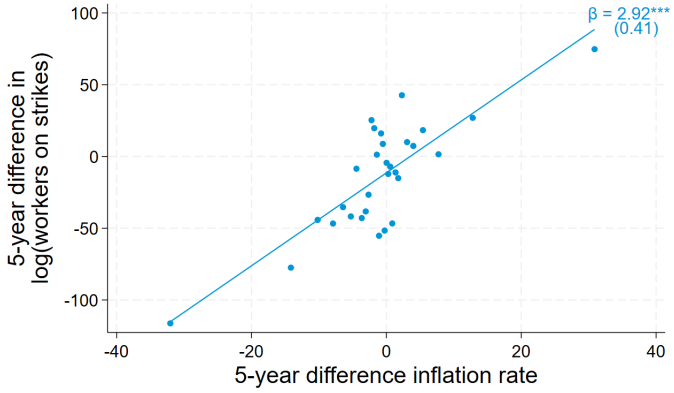
Workers sacrifice wage growth not to conflict: Within-individual

Back



Evidence from Unions

Back



$$\Delta \log(\text{workers involved in strikes}) * 100_{i,t,t-5} = \beta \Delta \pi_{i,t,t-5} + \varepsilon_{it}$$ [1]

[1] Note: Standard errors are clustered at the country level.

Evidence from Unions: Specification

Back

$$\Delta \log(\text{workers involved in strikes}) * 100_{i,t,t-5} = \gamma_i + \lambda_t + \beta \Delta \pi_{i,t,t-5} + \varepsilon_{it}$$

- The dependent variable is the 5-year long log difference of "Workers involved in strikes and lockouts", sourced from the International Labour Organization, multiplied by 100 for ease of interpretation.
- As independent variable, we employ he 5-year long difference of headline inflation, sourced by the World Bank, trimmed at 2.5% on each tail.
- Country and year fixed effects are included.
- Observations are unweights.
- Standard errors are clustered at the country level only.
- The data availability per year depends on the country. The analysis includes 78 countries, between 1969 to 2022: Algeria, Australia, Austria, Bangladesh, Barbados, Belgium, Botswana, Brazil, Burundi, Cameroon, Canada, Chile, Colombia, Costa Rica, Cyprus, Denmark, Ecuador, Egypt, Arab Rep., El Salvador, Estonia, Fiji, Finland, France, Germany, Ghana, Greece, Guatemala, Haiti, Honduras, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Jamaica, Japan, Kenya, Korea, Rep., Latvia, Lithuania, Malaysia, Malta, Mauritius, Mexico, Morocco, Myanmar, Netherlands, New Zealand, Nigeria, Norway, Pakistan, Panama, Papua New Guinea, Peru, Philippines, Poland, Portugal, Romania, Russian Federation, San Marino, Slovak Republic, South Africa, Spain, Sri Lanka, Suriname, Sweden, Switzerland, Thailand, Trinidad and Tobago, Tunisia, Turkiye, Uganda, Ukraine, United Kingdom, United States, and Uruguay.

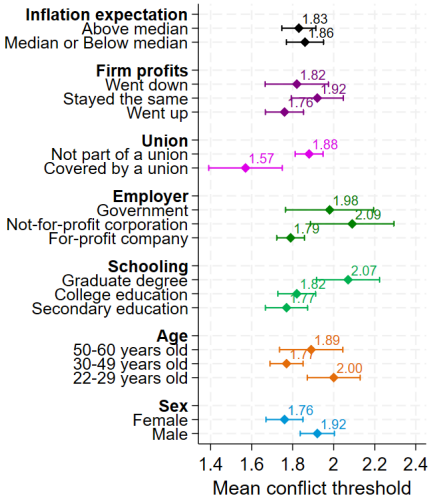
Conflict Costs vs Residualized Conflict Costs

Back

[2] Note: Respondents who never and always engage in conflict have been excluded from the figure and the calculation of the residualized cost of conflict. The residualized cost of conflict has been generated by regressing cost of conflict on dummy variables for the categories of age, education, income and union coverage. The categories excluded were 30-49 years old, income of [100k-125k), graduate education and non-union coverage.

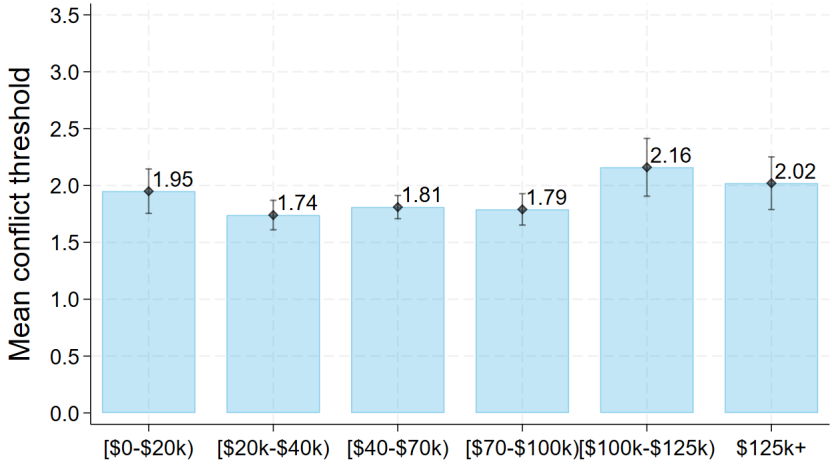
Heterogeneity: Conflict Costs

Back



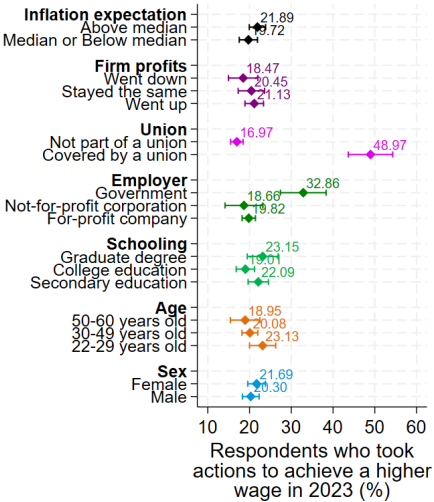
Heterogeneity: Conflict Costs, by income

Back



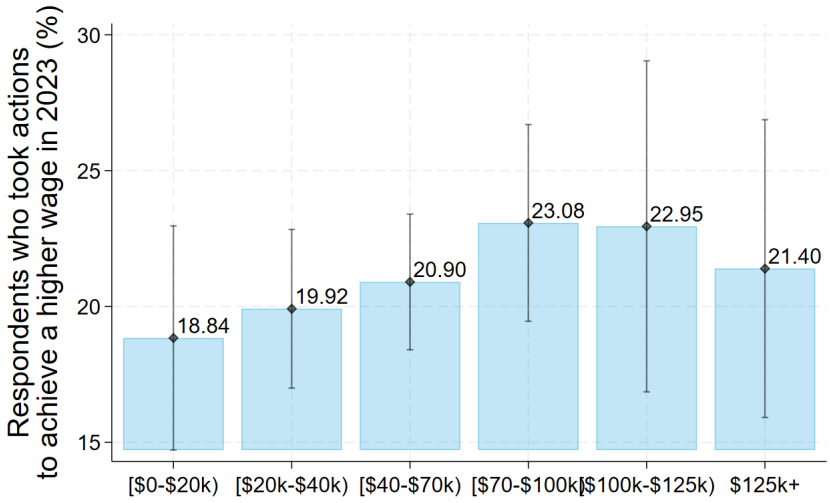
Heterogeneity: Respondents engaging in conflict in 2023

Back



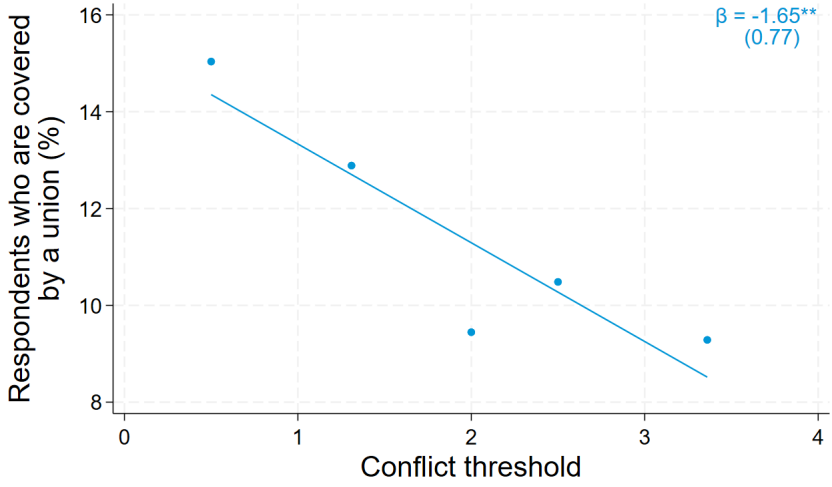
Heterogeneity: Respondents engaging in conflict in 2023, by income

Back



Union members have lower cost of conflict

Back



- **Conflict-induced real wages affected by inflation shocks**

$$\hat{\mathscr{W}} \approx \sum_{t=0}^{\infty} \beta^t \hat{w}_t^{\text{erosion}} \quad \& \quad \hat{w}_t^{\text{erosion}} \approx -(1-\gamma) \sum_{s=0}^{t} \Phi_{t-s}^{ss} \hat{\pi}_s + \sum_{s=0}^{t} \left(1 - \Phi_{t-s}^{ss}\right) \hat{g}_{w,s}, \tag{1}$$

  - $g_{w,s} \equiv \log\left(w_s^* / w_{s-1}^*\right)$ is growth of agg. conflict-induced wages & hats are dev. from SS.
  - $\hat{w}_t^{\text{erosion}}$ still captures the impact of inflation shocks if conflict decisions are hold at SS level
  - $\hat{g}_{w,s}$ increases $\hat{w}_t^{\text{erosion}}$ only if workers conflict between s & t, with prob. $1 - \Phi_{t-s}^{ss}$

- Allowing **other aggregate shocks** (e.g., changing productivity growth g_t)

$$\hat{\mathscr{W}} \approx \sum_{t=0}^{\infty} \beta^t \hat{w}_t^{\text{erosion}} \quad \& \quad \hat{w}_t^{\text{erosion}} \approx -(1-\gamma) \sum_{s=0}^{t} \Phi_{t-s}^{ss} \hat{\pi}_s + \sum_{s=0}^{t} \left[1 - (1-\gamma_g)\, \Phi_{t-s}^{ss}\right] \hat{g}_s.$$

  - Wage erosion and "conflict costs" relevant for the welfare costs of other shocks

Extensions

Back

- **Beyond** log-utility or **hand-to-mouth** consumers (e.g., standard borrowing constraints)

$$\hat{\mathscr{W}} \approx \sum_{t=0}^{\infty} \beta^t \left[\int_0^1 u'\left(c_{i,t}^{ss}\right) w_{i,t}^{ss} di \right] \int_0^1 \frac{u'\left(c_{i,t}^{ss}\right) w_{i,t}^{ss}}{\int_0^1 u'\left(c_{i,t}^{ss}\right) w_{i,t}^{ss} di} \hat{w}_{i,t}^{\text{erosion}} di$$

- **Allowing conflict costs to scale with wage gains from conflict.**
  - Akin to Rotemberg, worker who chooses $w_{i,t}$ incurs a utility cost of $\frac{\kappa}{2}\left(\log w_{i,t} - \log w_{i,t}^{\text{d}}\right)^2$
  - Impact of inflation shocks on aggregate worker welfare is still given by

$$\hat{\mathscr{W}} \approx \sum_{t=0}^{\infty} \beta^t \hat{w}_t^{\text{erosion}} \approx -(1-\gamma) \sum_{s=0}^{\infty} \beta^s \sum_{k=0}^{\infty} \beta^k \hat{\pi}_s$$

  - $\hat{w}_t^{\text{erosion}}$: the impact of inflation shocks if intensity of the conflict $\log w_{i,t} - \log w_{i,t}^{\text{d}}$ is at SS

Milgrom & Segal '02: Envelope Theorems for Arbitrary Choice Sets

Back

- Let X be an **arbitrary** non-empty set and $f : X \times [0,1] \to \mathbb{R}$ be a real-valued function.
- Let $V(\theta)$ be the optimal value as a function of θ and let $X^*(\theta)$ be the set of maximizers.

$$V(\theta) := \sup_{x \in X} f(x,\theta), \ \forall \theta \in [0,1] \quad \text{and} \quad X^*(\theta) := \{x \in X | f(x,\theta) = V(\theta)\}$$

Theorem.

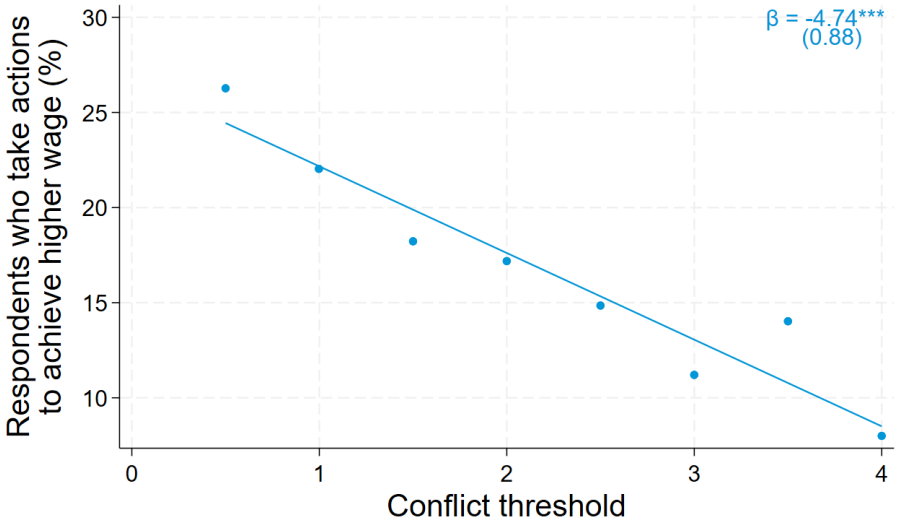
If $f(x,\cdot)$ is differentiable in $\theta \in [0,1]$ for all $x \in X$ and $X^*(\theta) \neq \emptyset$ for all $\theta \in [0,1]$, then for any selection of x^* of X^*,

$$V(\theta) = V(0) + \int_0^\theta \frac{\partial f(x^*(z),z)}{\partial \theta} dz \quad \forall \theta \in [0,1] \quad \textit{and} \quad V'(\theta) = \frac{\partial f(x^*(\theta),\theta)}{\partial \theta} \quad \textit{a.s.}$$

- For us, for each worker i, $\theta \leftrightarrow \{d\pi_t\}_{t=0}^{+\infty}$ & $x \leftrightarrow \{\mathscr{I}_{i,t}\}_{t=0}^{+\infty}$ (conflict choice, $\mathscr{I}_{i,t} \in \{0,1\}$)
- The envelope theorem holds a.s. at the worker level, and everywhere at the aggregate level

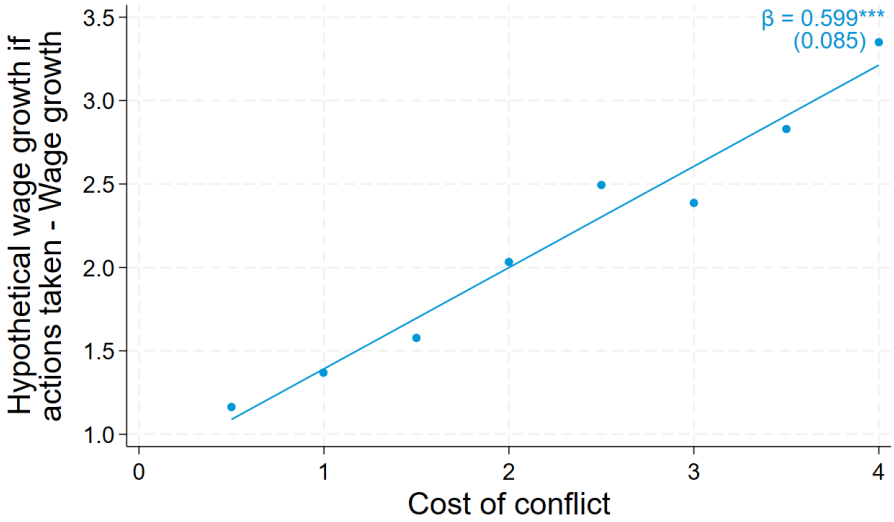
Lower Conflict Costs Predict Costly Actions

Back Union



Lower Conflict Costs Predict Lower Sacrifice from Not Taking Actions

Back



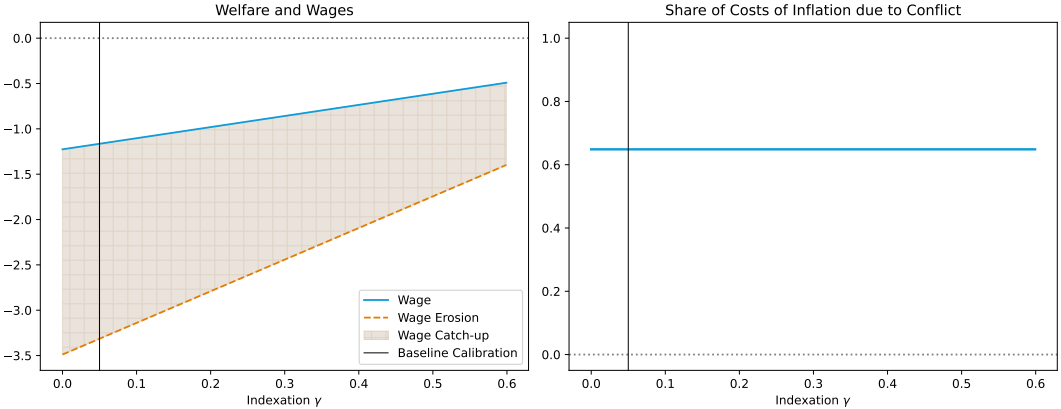
Union Dues

Return

- Service Employees International Union ($\approx$1.9 million members): 1.7% of the member's gross monthly salary for time in regular pay status.
- International Brotherhood of Teamsters ($\approx$1.4 million members): if you make \$15 an hour, your dues are $\approx$1.5% of income.
- United Auto Workers ($\approx$990k members): two hours pay per month for full time members and 1.15% of straight-time hourly pay for part time and per diem members.
- National Education Association ($\approx$ 3 million members): National dues are \$15 per year. For Chicago, to be a member costs from \$745.20 to \$1,242.00 a year.

Robustness: Indexation Parameter γ

Back



Note: Based on the persistent Inflation shocks with $\rho = 0.72$.

Robustness: Indexation Parameter γ

Back

Proposition 2.

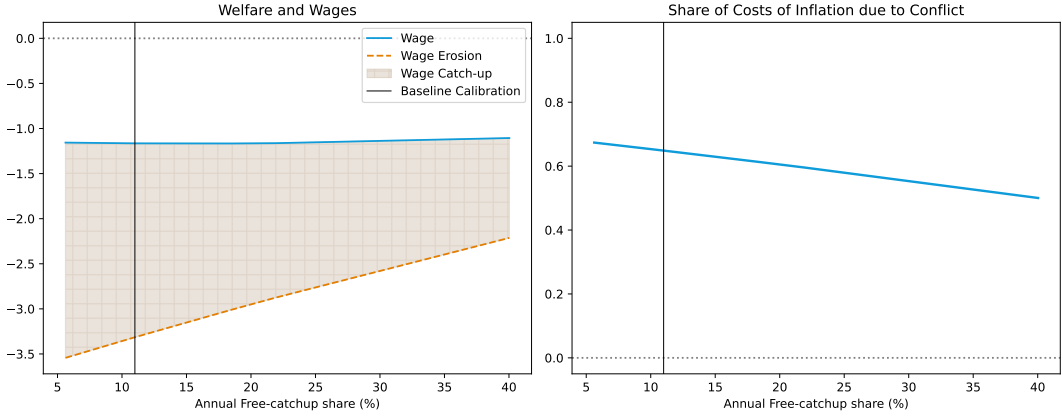
The ratio of aggregate costs of inflation due to conflict to its overall costs, $\hat{\mathscr{K}}/\hat{\mathscr{W}}$, is ***invariant to the degree of indexation of default wage*** $\gamma \in [0,1)$.

Intuition:

- All matters is *inflation net-of-indexation* $\hat{\pi}_t^{net} \equiv (1-\gamma)\,\hat{\pi}_t$.
- So, both $\hat{\mathscr{K}}$ and $\hat{\mathscr{W}}$ scale proportionally with $1-\gamma$.

Robustness: Prob. of Free Wage Catch-up λ

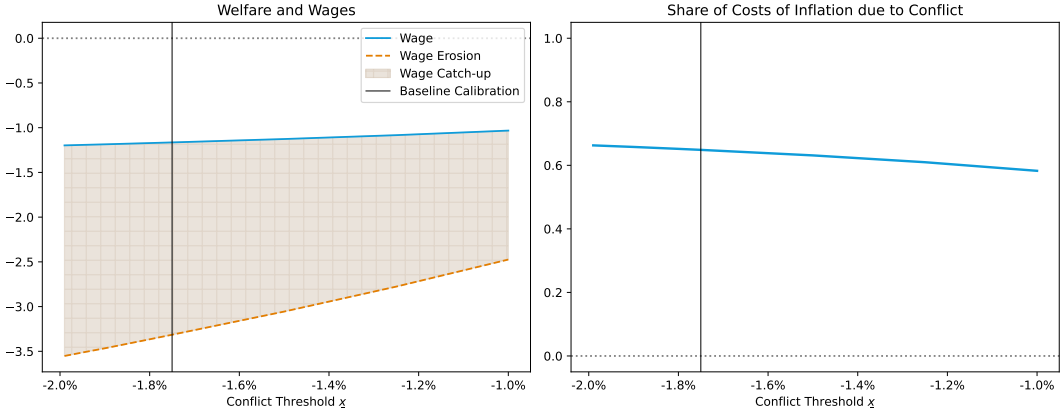
Back



Note: Based on the persistent Inflation shocks with $\rho = 0.72$.

Robustness: Conflict Costs κ

Back



Note: Based on the persistent Inflation shocks with $\rho = 0.72$.

Welfare Decomposition of the 2021-23 Inflation

Back

	Overall Welfare Change	Real Wage Response	Aggregate Costs of Inflation due to Conflict
Perfect foresight	-10.91%	-4.21%	-6.70%
Observed Expectations	-10.91%	-4.45%	-6.46%

Note: Welfare units = % of 1-year consumption

- **Costs of inflation** incorporating conflict **more than double** costs via falling real wages

Employment and Wages in General Equilibrium

- Inflation can impact worker welfare through **employment rates & conflict-induced real wages**
  - "Inflation greases the wheels of the labor market" in GE
  - How does it affect the importance of the conflict channel?

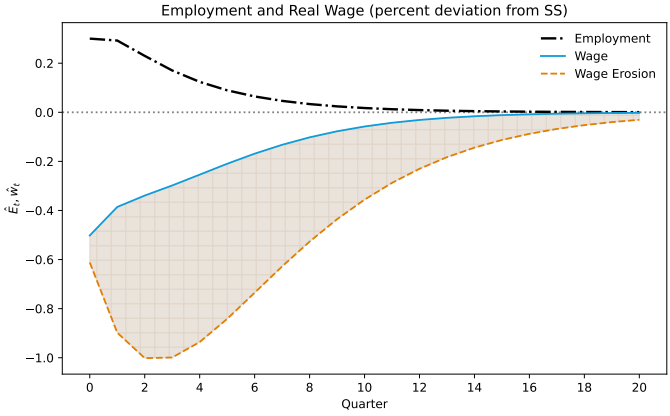
Employment and Wages in General Equilibrium

calibration Back

- Inflation can impact worker welfare through **employment rates & conflict-induced real wages**
  - "Inflation greases the wheels of the labor market" in GE
  - How does it affect the importance of the conflict channel?

- Model overview:
  - Workers problems similar to above, but with exogenous separation rate s
  - Firms post vacancies & competitive free entry
  - Employment E_t depends on random matching between unemployed & vacancies
  - Conflict-induced wage increases with E_t: $\hat{w}_t^* = \psi_E \hat{E}_t$ [Blanchard-Gali '10, Christiano et al. '16]

Employment and Wages in General Equilibrium



Aggregate costs of inflation due to conflict remain **significant**

- Both in absolute value and as a share of the overall costs of inflation.

GE Calibration

Back

- Impact of inflation shocks on worker welfare

$$\hat{\mathscr{W}} = \sum_{t=0}^{\infty} \beta^t \left(\underbrace{E^{ss} \cdot \hat{w}_t^{\text{erosion}}}_{\text{employed}} + \underbrace{(1 - E^{ss}) \cdot \hat{w}_t^{u}}_{\text{unemployed}} \underbrace{- \log(\phi) \cdot \hat{E}_t}_{\text{employment rates}} \right), \tag{2}$$

where $\hat{w}_t^{\text{erosion}} = -(1-\gamma) \sum_{s=0}^{t} \Phi_{t-s}^{ss} \hat{\pi}_s + \sum_{s=0}^{t} \left(1 - \Phi_{t-s}^{ss}\right) \left(\hat{w}_s^* - \hat{w}_{s-1}^*\right)$.

- Separation at a quarterly rate $s = 0.1$ (Shimer, 05)
- Flow value of unemployment to $\phi = 0.5$ (Chodorow-Reich & Karabounis, 16)
- Vacancy filling rate $q(\theta_t) = \Psi \theta_t^{-\eta}$ where $\eta = 0.7$ (Shimer, 05) & $\Psi = 0.6789$ ($U^{SS} = 5.5\%$)
- $c_v = 0.0695$ s.t. PV of vacancy posting costs, $c_v / q(\theta^{ss}) = 0.1 w^{*,ss}$ (Silva and Toledo, 09)
- $\psi_E = 1$ (Gertler, Huckfeldt, & Trigari, 20; Hazell and Taska, 24)