

# The Distributional Effects of Inflation on the Labor Market

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*Evolving...*

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- Some speculation that inflation:
  - has reduced firms' bargaining power by making workers more elastic
  - is good for low-wage workers because it has increased their relative wages
- How does all this work in a micro-founded model? Are low-wage workers actually made better off from inflationary periods?

- Fill a gap in the literature by exploring both theoretically and quantitatively the role of inflationary shocks (temporary or permanent) on the distribution of worker well-being in modern macro-labor model.

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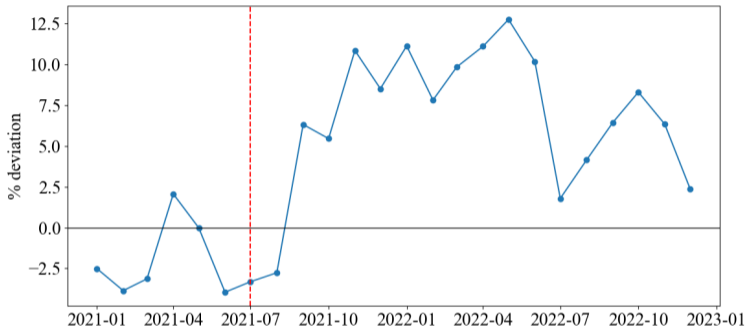
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- Model shows that the effect of inflation on inequality has multiple effects, some of which go in opposite directions.
- Quantitatively, we show that the recent inflation episode had little effect on U.S. wage inequality; show all worker types are *worse off* by roughly the same amount from temporary “inflation” shock.

- Evidence on the effects of inflation on the labor market  
*Blanco, Drenik, Zaratiegui (2024), Autor, Dube and McGrew (2023), Pilossoph and Ryngaert (2023)*
- Yet, households dislike inflation, especially for its effect on their labor income  
*Shiller (1997), Stancheva (2024), Afrouzi, Dietrich, Myrseth, Priftis, and Schoenle (2024)*
- Matching models of labor market with inflation and/or search heterogeneity  
*Barro (1977); Erceg, Henderson and Levin (2000); Christiano, Eichenbaum and Evans (2005); Hall (2005); Shimer (2005); Gertler and Trigari (2009); Menzio and Shi (2009); Rogerson and Shimer (2011); Schmitt-Grohé and Uribe (2016, 2023), Hurst, Kehoe, Pastorino, and Winberry (2023), Blanco and Drenik (2023), Blanco, Drenik, Moser, and Zaratiegui (2024)*

## Motivating Facts Part 1: Inflation and Labor Market Churn

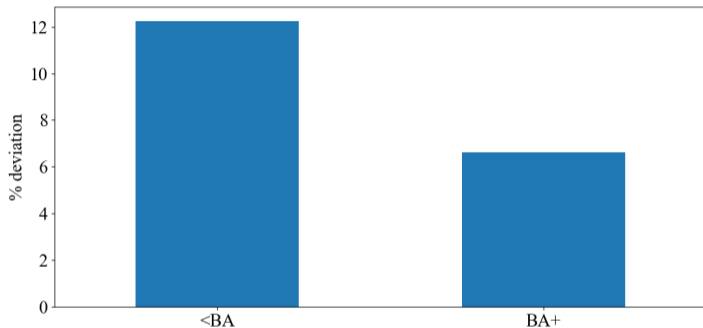
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## RECENT U.S. INFLATION COINCIDES WITH HIGHER JOB-TO-JOB (EE) FLOWS



- *EE flows jumped in US right after inflationary period started*
- Data from CPS, individuals aged 25-54; y-axis is percentage change in EE-flows relative to same month during pooled 2016-2019 period

## ... AND MORE SO AT THE BOTTOM

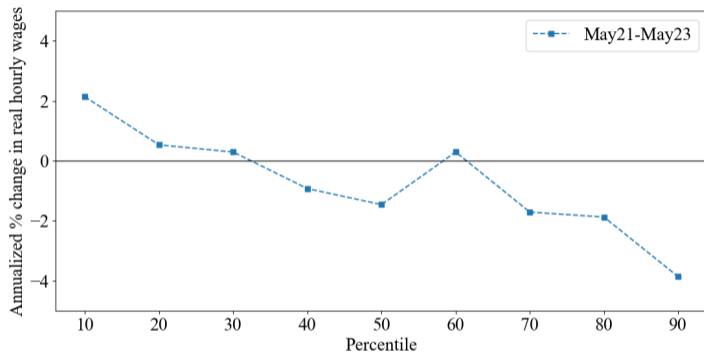


- *EE flows jumped more during 2021M7-2022M12 period (relative to 2016-2019 period) for those with lower education*
- Similar patterns documented in [Autor, Dube, McGrew \(2023\)](#) (and similar to patterns in Argentina after 2002 found in [Blanco, Drenik, Zaratiegui \(2024\)](#))

## Motivating Facts Part 2: Inflation and Wage Inequality

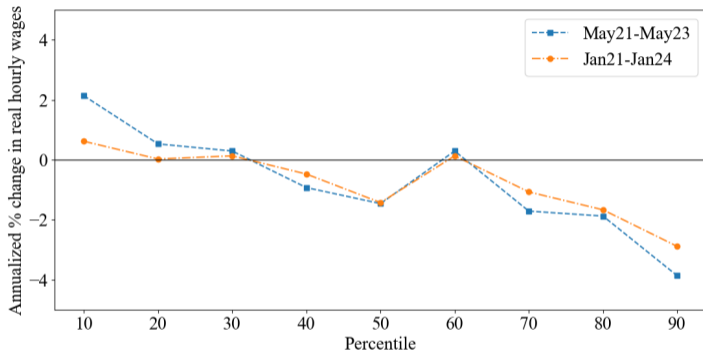
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## RECENT INFLATION: HIGHER WAGE GROWTH AT BOTTOM OF DISTRIBUTION



- *Wage growth between 5/21 and 5/23 higher for low wage workers (CPS data, Ages 25-54)*
- Replicates [Autor, Dube, and McGrew \(2023\)](#)

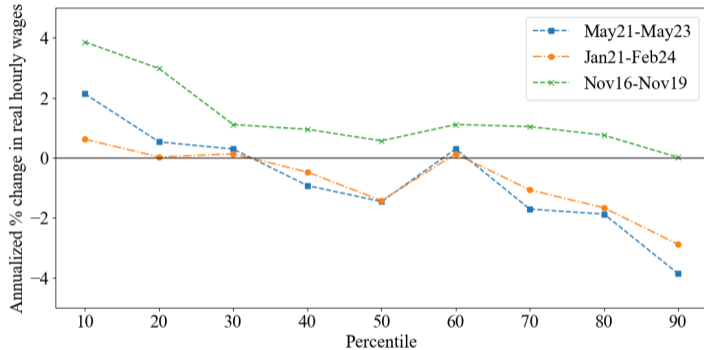
# RECENT INFLATION: HIGHER WAGE GROWTH AT BOTTOM OF DISTRIBUTION



- *Patterns slightly muted when we extend Autor et al (2023) sample from from Jan 21-Jan 24*

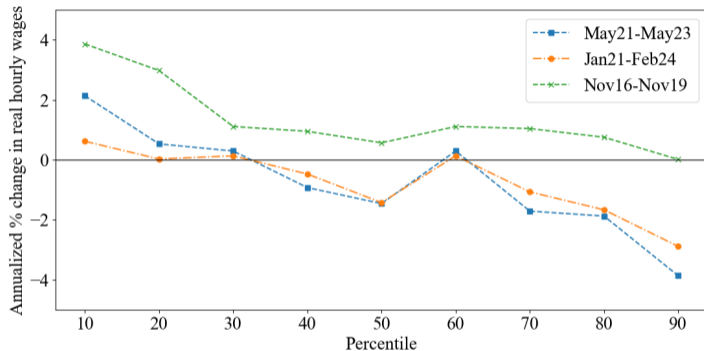


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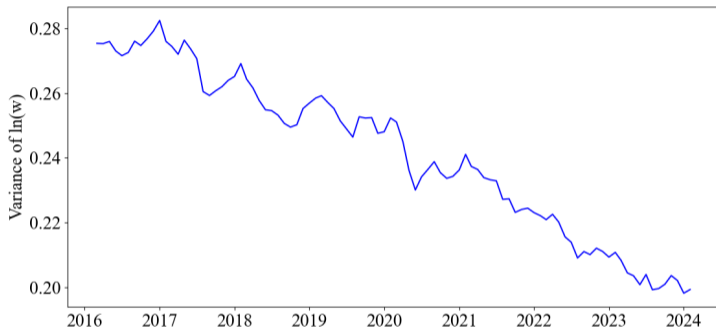
- *But note the pre-trends: Wages were growing faster at the bottom of the distribution during the inflationary period (2017-2019)*

# RECENT INFLATION: HIGHER WAGE GROWTH AT BOTTOM OF DISTRIBUTION



- *Similar patterns found in Argentina after the 2002 devaluation; see Blanco, Drenik, Zaratiegui (2024)*

## DISPERSION OF WAGE GROWTH OVER TIME



- *Inequality in US (as measured by variance of log wages) has been declining in the US since mid 2010s*
- *No noticeable break in trend during inflation period*

Model

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To investigate the distributional effects of inflation on job flows and wage growth, we formulate a search and matching framework with:

- **Nominal wage rigidities:**
  - Introduces a role for inflation to erode wages
  - Workers can increase their wages through EUE, EE, or infrequent renegotiations
- **Heterogeneous outside options & hiring costs to study inflation's impact on:**
  - incentives across the distribution
  - flows across the distribution
  - the distribution of wages and markdowns

## MODEL OVERVIEW AND INGREDIENTS

- Time is continuous and is indexed by  $t \geq 0$
- A unit measure of **heterogeneous** workers engage in directed search
- Employed workers produces with productivity  $Z$
- Unemployed workers with prod.  $Z$  produce  $B = Z^{\beta}$ 
  - $\beta$  captures how home production scales with productivity
- Endogenous measure of **homogeneous** firms post vacancies at cost  $K = Z^{\kappa}$ 
  - $\kappa$  captures how hiring costs scales with productivity

- **Worker's State:**  $E_{it}$ : employed ( $h_{it}$ ) or unemployed ( $u_{it}$ )
- **Worker's Preferences:**  $\mathbb{E}_0 \int_0^{\infty} e^{-\rho t} (C_{i,t} - C(S_{i,t}; Z_{i,t})) dt$  where

$$C(S; Z) = \frac{S^{1+\sigma} - s^{1+\sigma}}{1+\sigma} Z$$

- **Worker's Productivity:**  $Z_{i,t} = \exp(a_i + \hat{z}_{i,t})$ 
  - $a_i$  is a permanent productivity drawn at birth
  - $\hat{z}_{i,t}$  captures idiosyncratic productivity shocks:

$$d\hat{z}_{i,t} = \begin{pmatrix} \epsilon dt + \epsilon dW_{i,t} \\ \eta dt + \eta dW_{i,t} \end{pmatrix}$$

- Employed worker's nominal income:  $W_{i,t}$
- Inflation rate:  $d \ln(P_t) = \pi dt$  determined by the central bank
- Employed worker's (log) real income:  $w_{i,t} = \ln(W_{i,t}/P_t)$
- Fixed nominal wages:  $\Rightarrow$  real wages depreciate with inflation:  $dw_{i,t} = -\pi dt$
- Renegotiation opportunities arrive at Calvo rates  $\theta$  where  $\theta \in (0, 1)$ 
  - New wage is determined with Nash bargaining with weight  $\beta$  for worker



- **Firms post vacancies**  $V$  at cost  $K \times Z^\kappa$ 
  - **Free entry:**  $K \times Z^\kappa =$  firm's expected value of finding a worker
- **Markets:** Indexed by  $(z; w)$ , where  $w$  is real wage and  $z = \ln(Z)$  is log-productivity.
- **Matching function:**  $m(V; S) = S \times V^\alpha$ ,  $\alpha \in (0; 1)$ 
  - Average search intensity:  $S = \int_0^1 S_i(z; w) di$
  - Market tightness:  $\theta(z; w) = \mathcal{V}(w, z) / \mathcal{S}(w, z)$
  - Worker's matching rate:  $S_i f(\theta(z; w)) = S_i \theta(z; w)^\alpha$
  - Firm's matching rate:  $q(\theta(z; w)) = \theta(z; w)$

- Matches are **exogenously dissolved** at Poisson rates
  - : exogenous separations rate
  - : death rate
- Matches are **endogenously dissolved** either by firm (layoff) or worker (quit)
- **Match duration**: Time until first occurrence of any of these events

$$\begin{aligned}
 ( + )U(z;t) = & \underbrace{e^{-\beta z} B}_{\text{flow benefit}} \\
 & + \underbrace{\max_{s,w} f s^* f(t(z;w^*)) (H(w^*;z;t) - U(z;t))}_{\text{gains from finding a job}} \underbrace{u \frac{s^{1+}}{1+s} \frac{s^1}{s} e^z g}_{\text{}} \\
 & + \underbrace{U_t(z;t) + u U_z(z;t) + \frac{u}{2} U_{zz}(z;t)}_{\text{differential value from time and productivity changes}}
 \end{aligned}$$

- $w_u^*(z)$  and  $s_u^*(z)$  are the optimal wage and search effort for the unemployed worker with productivity  $z$

# VALUE FUNCTIONS: EMPLOYED WORKER

$$\begin{aligned}
 H(w; z; t) = & \max^n \left\{ \underbrace{U(z; t)}_{\text{outside option}} ; \underbrace{e^w}_{\text{flow wage}} \right\} \\
 & - \underbrace{\left( \frac{H(w; z; t) - U(z; t)}{z} \right)}_{\text{losses from exog. separation}} - \underbrace{\left( \frac{H(w; z; t)}{z} \right)}_{\text{losses from exog. death}} - \underbrace{\left( \frac{H_w(w; z; t)}{z} \right)}_{\text{losses from inflation}} \\
 & + \underbrace{\left( \frac{H_w(w; z; t)}{z} \right)}_{\text{gains or losses from wage increases or decreases}} \\
 & + \max_{s; w}^n \left\{ \underbrace{s f_t(z; w) (H(w; z; t) - H(w; z; t))}_{\text{gains from on-the-job search}} \right\} \frac{h s^{1+\phi_s}}{1+s} e^z \\
 & + \underbrace{H_t(w; z; t) + e H_z(w; z; t) + \frac{e}{2} H_{zz}(w; z; t)}_{\text{differential value from time and productivity changes}}
 \end{aligned}$$

$$V(w; z; t) = \underbrace{e^{-\kappa z} K}_{\text{vacancy cost}} + q(\underbrace{t(w_{jj}(w; z); z)) \underbrace{(J(w_{jj}(w; z); z; t) - V(w; z; t))}_{\text{expected gains from being matched}})}; \delta(w; z)$$

- Free entry condition:  $V(w; z) = 0$ ;  $\delta(w; z) = 0$  Unmatched firms are indifferent across markets

# VALUE FUNCTIONS: MATCHED FIRMS

$$\begin{aligned}
 J(w; z; t) = & \max^n \left\{ \underbrace{V(w; z; t)}_{\text{outside option (=0)}} ; \underbrace{e^z e^w}_{\text{flow profit}} \underbrace{J_w(w; z; t)}_{\text{gains from wage erosion}} \right. \\
 & \left. + \underbrace{S_e(w(w; z); z) f_t(w_{jj}(w; z)); z}_{\text{losses from separation}} (J(w; z; t) - V(w; z; t)) \right. \\
 & + \underbrace{J_t(w; z; t) + e J_z(w; z; t) + \frac{e}{2} J_{zz}(w; z; t)}_{\text{change in value from wages increases or decreases}} \\
 & \left. + \underbrace{J_t(w; z; t) + e J_z(w; z; t) + \frac{e}{2} J_{zz}(w; z; t)}_{\text{differential value from wage and prod. changes}} \right\}
 \end{aligned}$$

where

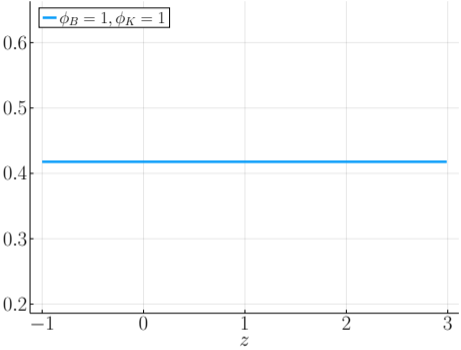
$$J^+(w; z; t) = J(\max f w_b(w; z); w; z; t) \quad J(w; z; t)$$

$$J^-(w; z; t) = J(\min f w_b(w; z); w; z; t) \quad J(w; z; t)$$

## How the Model Works: Role of Heterogeneity

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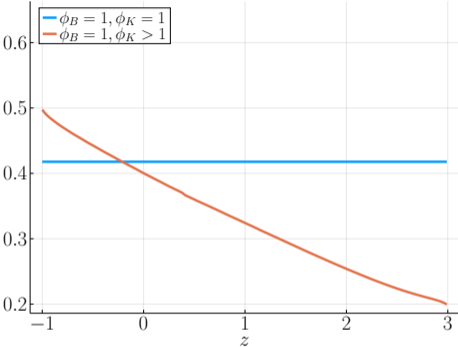
# JOB FINDING RATE OF UNEMPLOYED ACROSS MODELS



(a) Model

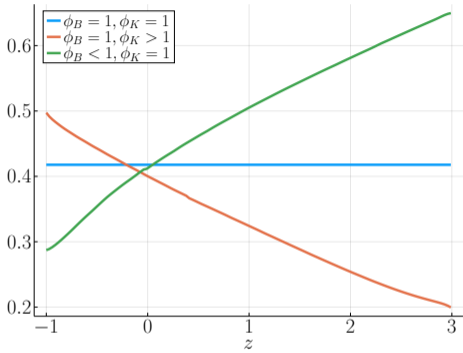


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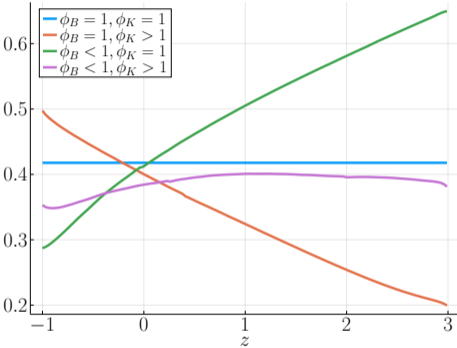
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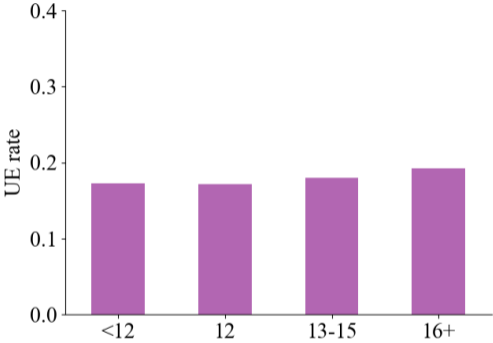


(a) Model

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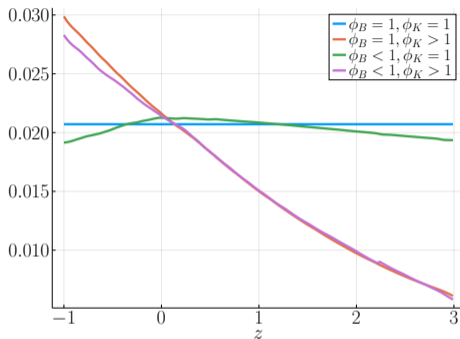
(a) Model



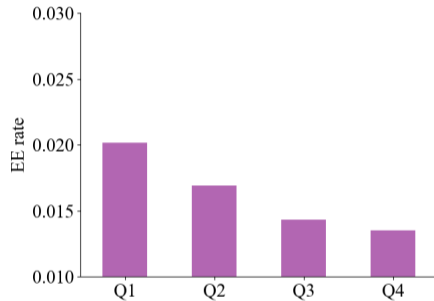
(b) CPS Data 2016-2019

Data suggests we are either in  $\phi_B = \phi_K = 1$  or (more generally)  $\phi_B < 1; \phi_K > 1$

# JOB FINDING RATE OF MEDIAN EMPLOYED WORKER ACROSS MODELS

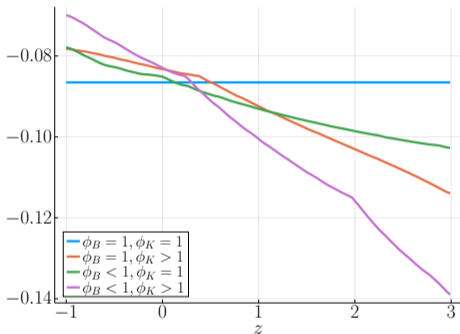


(a) Model

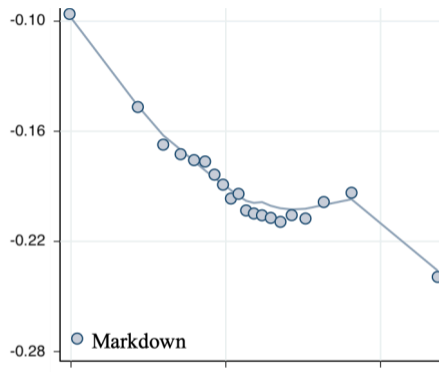


(b) CPS Data, 2016-2019

Data again suggests we are in the region where  $\kappa > 1$



(a) Starting Markdown of the Unemployed



(b) Data, Denmark from Chan et al (2023)

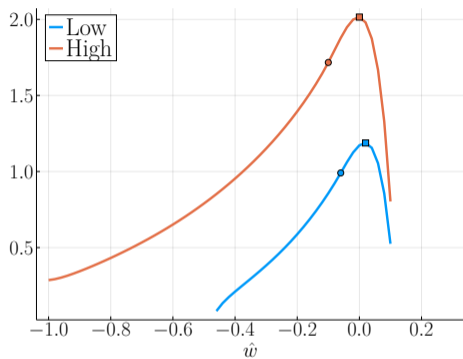
Data again suggests we are in the region where  $\phi_K > 1$  and/or  $\phi_B < 1$

# “CALIBRATION”; KEY PARAMETERS

Parameter	Description	Value
	Trend inflation	0.02/year
$e$	Drift id. prod. — employed	0.024/year
$u$	Drift id. prod. — unemployed	-0.036/year
	Ex. separation rate	0.024/month
$+$	Probability of positive $w$	0.2/month
	Probability of negative $w$	0.01/month
$\kappa$	Scaling factor vacancy cost wrt $z$	1.3
$B$	Scaling factor income during unemployment wrt $z$	0.93

- Define  $\hat{w} = z \cdot w$  (markdown)
- Explore how values evolve for workers with differing markdowns and levels of productivity

## VALUES OF EMPLOYED WORKER AND FIRM: LOW VS. HIGH PRODUCTIVITY

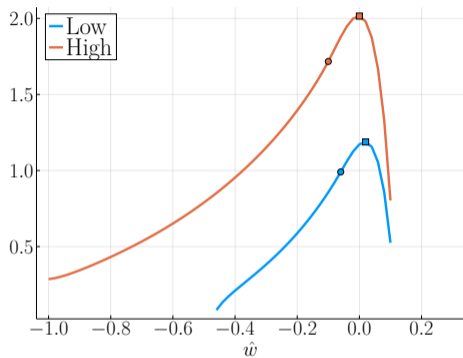


Worker Values vs. Markdowns

1. *Worker value is higher with higher productivity but non-monotonic in markdown because of layoff risk*



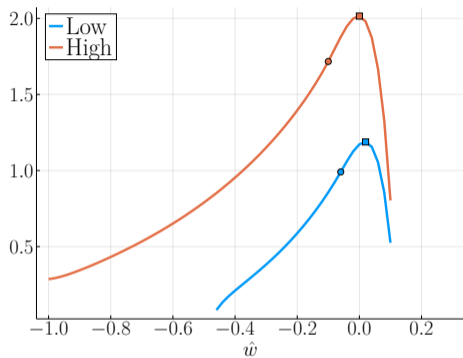
## VALUES OF EMPLOYED WORKER AND FIRM: LOW VS. HIGH PRODUCTIVITY



Worker Values vs. Markdowns

- Workers enter at the circle and climb to the square; markdowns are roughly the same and zero at the top of the job ladder*

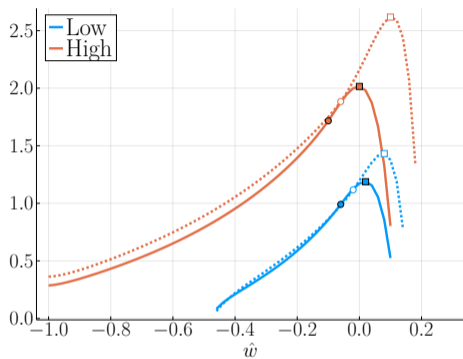
## VALUES OF EMPLOYED WORKER AND FIRM: LOW VS. HIGH PRODUCTIVITY



Worker Values vs. Markdowns

3. *But more productive workers start from wages with  $\hat{w} < 0$  markdowns because they dislike unemployment more and are harder to hire*

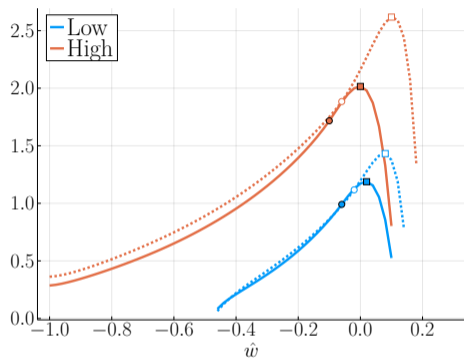
## VALUES OF EMPLOYED WORKER AND FIRM: LOW VS. HIGH PRODUCTIVITY



Firm Values (Dashed = High Inflation)

4. *With higher inflation all workers' asking wages shift to the right; higher inflation erodes wages faster, so workers opt for higher starting wages*

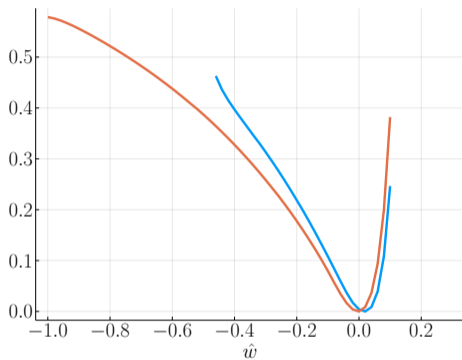
## VALUES OF EMPLOYED WORKER AND FIRM: LOW VS. HIGH PRODUCTIVITY



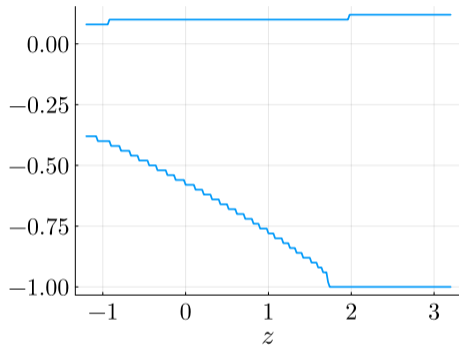
Firm Values (Dashed = High Inflation)

5. Note that higher inflation shifts worker values up and expands the ladder (and the layoff margin)

# SEARCH EFFORT AND CONTINUATION REGIONS



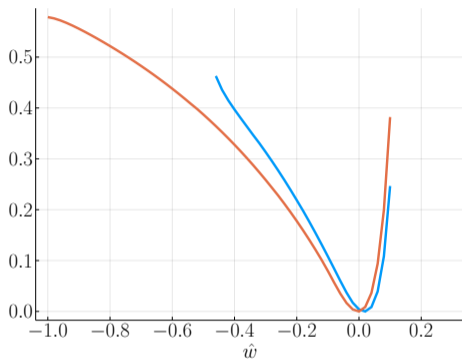
(a) Search Effort



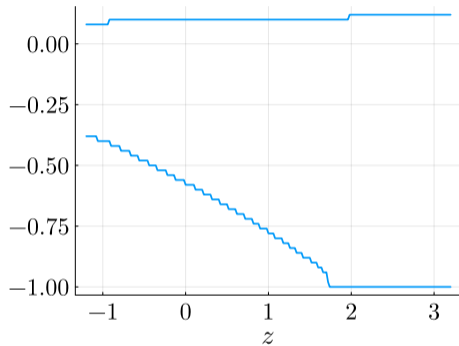
(b) Continuation Regions

© *Workers do not search at the top of their job ladder*

# SEARCH EFFORT AND CONTINUATION REGIONS



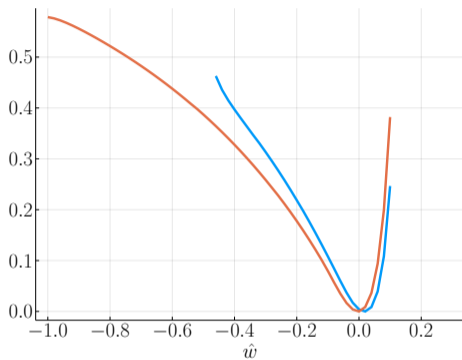
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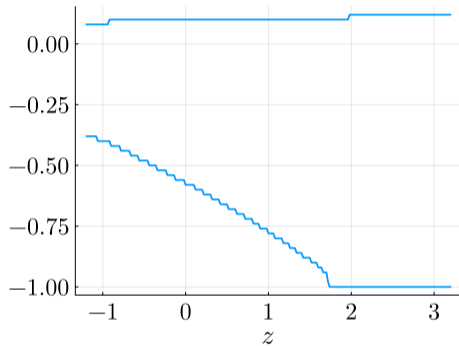
(b) Continuation Regions

© But their search effort increases when their wages deviate from this maximum value

# SEARCH EFFORT AND CONTINUATION REGIONS



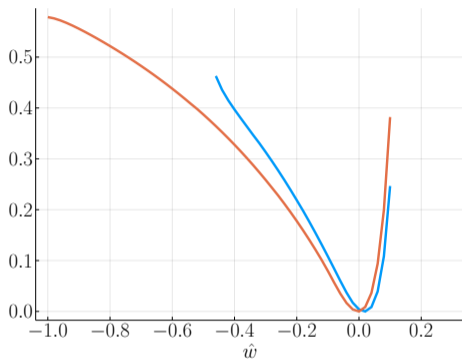
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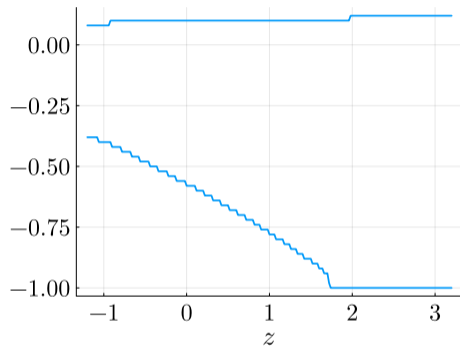
(b) Continuation Regions

© *When wages are lower, they seek higher wages*

# SEARCH EFFORT AND CONTINUATION REGIONS



(a) Search Effort

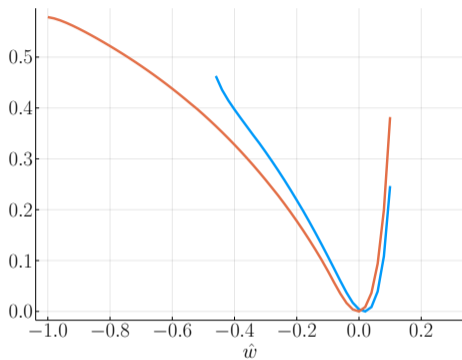


(b) Continuation Regions

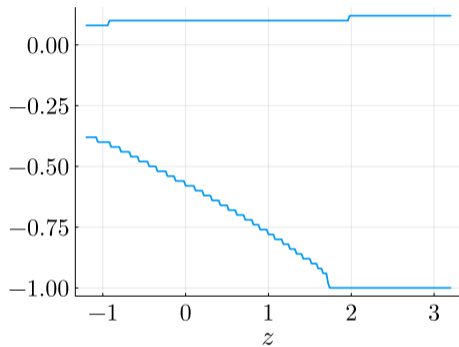
© When wages are higher, they seek new jobs because they are likely to be laid off



# SEARCH EFFORT AND CONTINUATION REGIONS



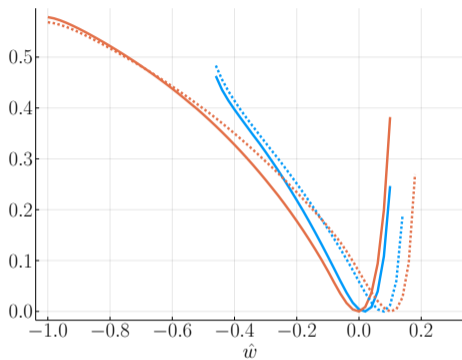
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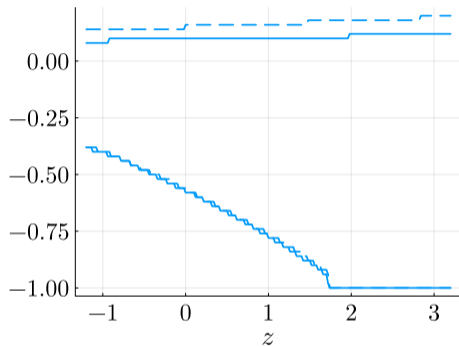
(b) Continuation Regions

∅ Lower productivity workers have smaller continuation regions because they are closer to their outside option seek jobs in tighter markets

# SEARCH EFFORT AND CONTINUATION REGIONS



(a) Search Effort



(b) Continuation Regions

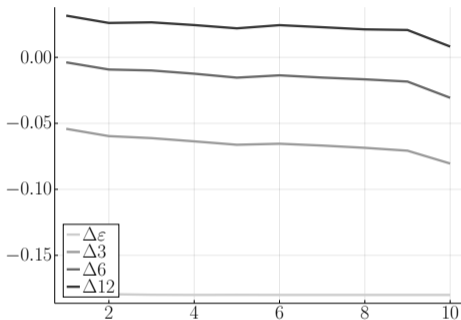
- © Higher inflation shifts search effort towards higher wages
- ∅ Higher inflation the layoff margin

## High and Transitory Inflation:

The experiment is an unexpected one-time increase in the price level of 18% today

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# REAL WAGES AND MARKDOWNS

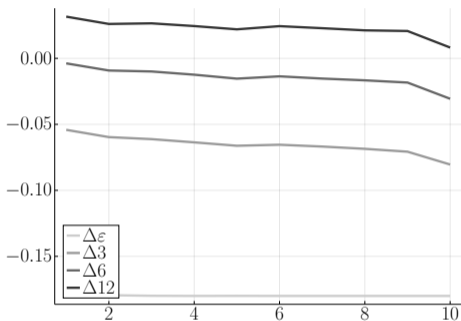


(a) Changes in (Log) Real Income

(b) Changes in Markdowns

1. *On impact, wages of all types fall by 18% (panel (a))... line)*

# REAL WAGES AND MARKDOWNS

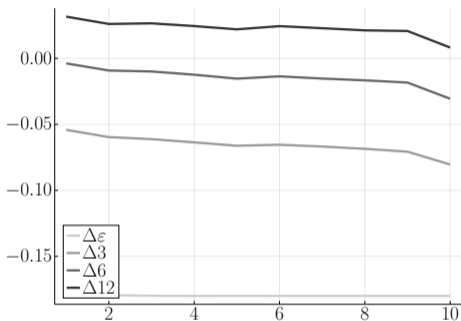


(a) Changes in (Log) Real Income

(b) Changes in Markdowns

2. *Over time, wages recover, but do so faster for those at the bottom of the distribution*

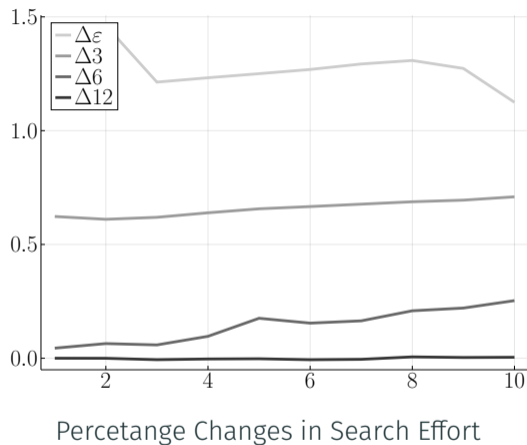
# REAL WAGES AND MARKDOWNS



(a) Changes in (Log) Real Income

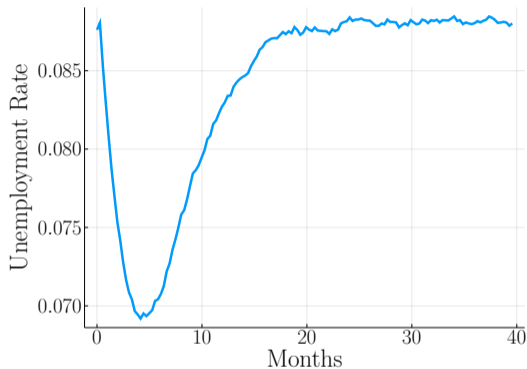
(b) Changes in Markdowns

3. *Markdowns recover within about a year (panel (b)... 12 line)*



- *Search effort increases most (early on) for those with lower productivity*

# UNEMPLOYMENT RATE



Unemployment Rate

- *Unemployment rate temporarily falls with temporary price increase - churn increases but layoffs decrease*



## Changes in Values

1.  $\pi > 0$  : *Inflation unambiguously lowers welfare for all workers (blue line)*  
- *workers hate temporary bursts of inflation!*

## Changes in Values

2. *Increased search is costly to workers (needed to get real wages to catch up with inflation)*

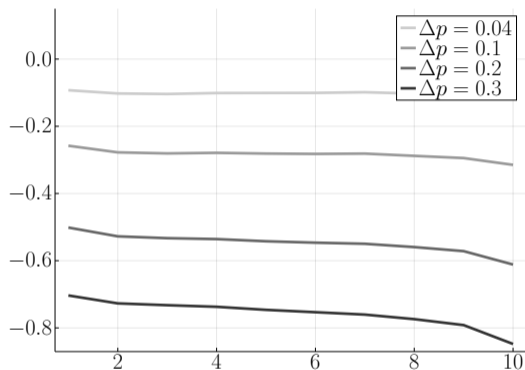
Changes in Values

3. *Welfare losses slightly less for low productivity workers*

Changes in Values

4. *All else equal, temporary inflation makes firms better off (green line)*

## CHANGES IN VALUES OF EMPLOYED WORKERS, DIFFERENT SIZE PRICE INCREASES



Changes in Values for Different Inflation Rates

- *Higher bursts of temporary inflation makes all workers worse off - workers hate inflation more when the temporary burst of inflation is larger*

## Wage Inequality

1. *Large temporary increase in price level (18%) has only a very small temporary effect on inequality*

## Wage Inequality

- Increase in within group inequality partially offsets temporary decline in cross-group inequality*

## Wage Inequality

3. *: Large temporary inflation is not something that meaningful effects inequality; makes all workers worse off by roughly the same amount*



## High and Permanent Inflation:

The experiment is an unexpected permanent increase in the inflation rate to 18% going forward

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(a) Unemployment Rate, Over Time

(b) Changes in Search Effort, By Productivity

1.  $\Psi$  : *Permanent increase in inflation leads to a permanent decline in unemployment; money is not neutral in long-run (panel (a))*

(a) Unemployment Rate, Over Time

(b) Changes in Search Effort, By Productivity

- Job-finding rate increases for all workers – due to increased search effort – making the duration of unemployment spells shorter (panel (b))*

(a) Unemployment Rate, Over Time

(b) Changes in Search Effort, By Productivity

3. *Search effort increases most for high productivity workers which will reduce their welfare (panel (b))*

(a) Changes in (Log) Real Income

(b) Changes in Inequality Over Time

1. *Permanent increase in inflation has no effect on wages on impact, wage growth increases over time (panel (a), line)*

(a) Changes in (Log) Real Income

(b) Changes in Inequality Over Time

- Overtime, wages increase because productivity increases due to less time in unemployment (panel (a), 12 line)*

(a) Changes in (Log) Real Income

(b) Changes in Inequality Over Time

3. *After about a year, no substantive change in wage mark-downs for any type of worker (not shown on figure)*

(a) Changes in (Log) Real Income

(b) Changes in Inequality Over Time

4. *Wage effects similar for all types of workers; therefore no substantive effect on income inequality (panel (b))*



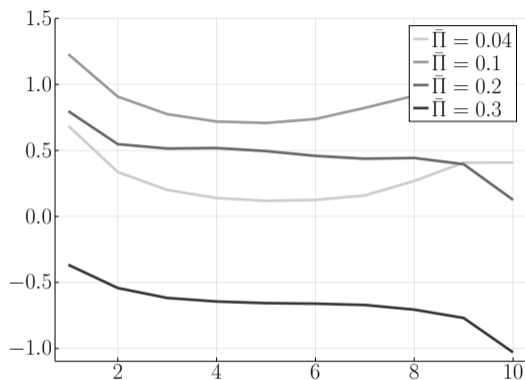
## Changes in Values

- $\Psi$  : Higher permanent inflation has positive welfare effects on all workers; increases worker productivity by reducing time in unemployment

## Changes in Values

- *Welfare gains are higher for low productivity workers (more disutility from increased search for high productivity workers)*

## CHANGES IN VALUES (MONTHLY CONSUMPTION EQUIVALENT)



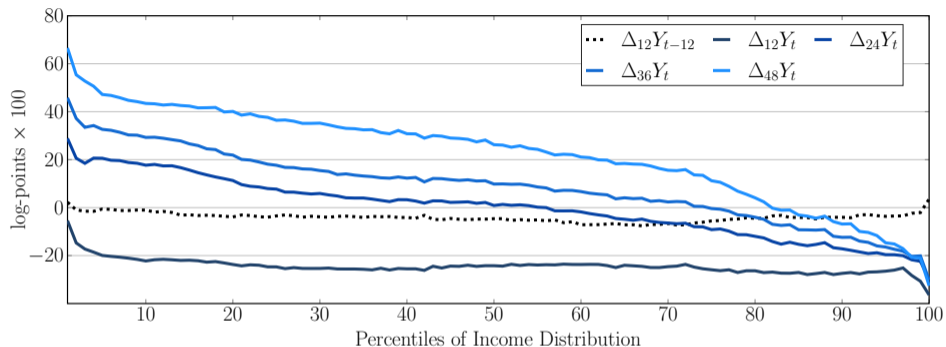
Changes in Values for Different Inflation Rates

- $\yen$  : But these gains are non-monotonic and are overturned by the lower average wages and shortened duration of matches

- Precise calibration
- State-dependent renegotiation
  - But note that this would mitigate inflationary effects even more
- Monetary disturbances do not happen in vacuum
  - Think about joint effects of distributional shocks with a monetary response
  - e.g., supply shocks (both aggregate and distributional)
- Thinking about congestion externalities of one group on the other

- **Main Contribution:** Develop a framework to assess the effects of inflation on worker well-being in a modern macro model of the labor market.
- Inflation does affect labor market flows; additional search behavior makes workers worse off.
- Temporary bursts of inflation make all workers worse off
- Permanent changes in inflation can have long run productivity effects by reducing the time workers spend in unemployment.
- Even in a model with rich worker heterogeneity, both permanent and temporary changes in inflation have essentially no effect on wage inequality.

## 2002 ARGENTINA INFLATION COINCIDED WITH HIGHER WAGE GROWTH AT THE BOTTOM



- *Wage growth after Argentina's 2002 devaluation, per income percentile.*
- Source: Blanco, Drenik, Zaratiegui (2024)

# “CALIBRATION”

Parameter	Description	Value
	Discount factor	0.06/12.0
	Elasticity matching function	0.5
	Trend inflation	0.02/12.0
$\beta$	Worker's bargaining power	0.5
	Death rate	1.0/(30.0*12.0)
$K$	Vacancy cost	1.6
$B$	Income during unemployment	1.5
$z_0$	Mean initial productivity	0.0
$z_0$	Std. initial productivity	0.17
$e$	Drift id. prod. — employed	0.024/12
$e$	Std. id. prod. — employed	0.037
$u$	Drift id. prod. — unemployed	-0.036/12
$u$	Std. id. prod. — unemployed	0.037
	Ex. separation rate	0.024
$e$	Search cost scale — employed	1.2
$u$	Search cost scale — unemployed	1.0
$K$	Scaling factor vacancy cost wrt $z$	1.3
$B$	Scaling factor income during unemployment wrt $z$	0.93
$+$	Probability of positive $w$	0.2
	Probability of negative $w$	0.01

## Appendix

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