Some Like It Hot:

Inclusive Monetary Policy Under Okun's Hypothesis

Felipe Alves

Bank of Canada

Gianluca Violante

Princeton University

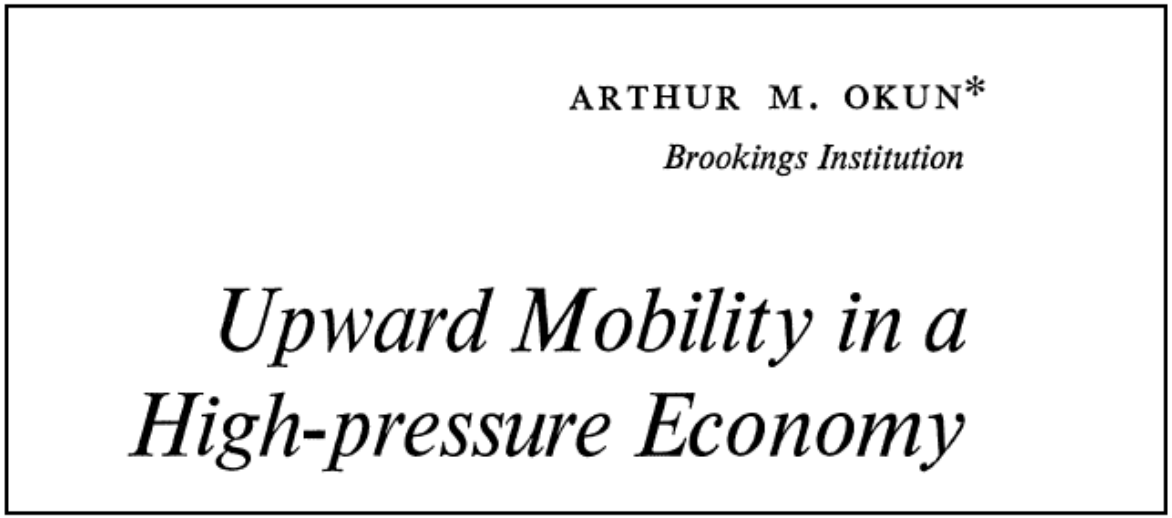
Iariw-Bank of Italy Conference

Central Banks, Financial Markets, and Inequality

The views expressed in this paper solely reflect those of the authors and do not necessarily represent those of the Bank of Canada or its Governing Council

PRINCETON UNIVERSITY

Okun's (1973) Hypothesis



ARTHUR M. OKUN*

Brookings Institution

Upward Mobility in a High-pressure Economy

- A high-pressure economy has the potential to persistently improve the economic circumstances of less advantaged workers, by allowing them to find steady employment, build their skills, and climb the job ladder

- *The sacrifice of upward mobility must be carefully reckoned as one high cost of accepting slack as an insurance policy against inflation*

The New Monetary Policy Framework of the Fed

- New features of maximum employment mandate:

  1. Maximum employment is a broad-based and inclusive goal

  2. Policy is informed by shortfalls of employment from maximum level

- Powell (2020): *One clear takeaway from the* **Fed Listens** *events was the importance of sustaining a strong job market, particularly for people from low- and moderate-income communities. Everyone deserves the opportunity to participate fully in our society and in our economy.*

- Is the Fed embracing more inclusive monetary policy?

Three Questions

1. How do we formalize Okun's hypothesis within a macro model?

2. Can monetary policy run an economy hot for longer, and generate a persistent inflation-inclusion trade-off?

3. Quantitatively, how favorable is this trade-off?

This Paper Addresses These Questions

1. We build a quantitative HANK model which features
    - Three-state model (E,U,N) of a frictional labor market
    - Okun's hypothesis at work through several mechanisms
2. Calibrate the model and filter demand and supply shocks (1990-2019)
3. Simulate counterfactuals under various 'inclusive' monetary policy rules
4. Quantify the key trade-off:

    inflation vs distributional (and aggregate) labor market outcomes

Preview of Our Answers

1. *How do we formalize Okun's hypothesis within a macro model?*
    - We build extensively on recent micro evidence

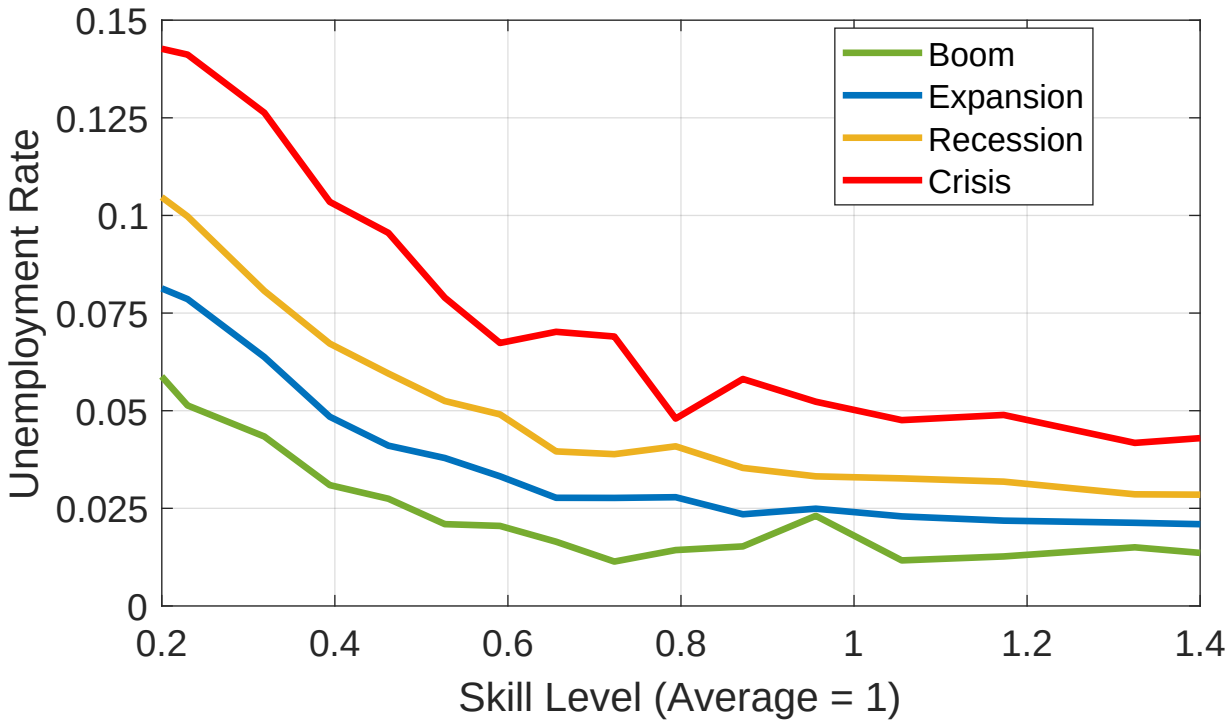
2. *Can monetary policy run an economy hot for longer, and generate a persistent inflation-inclusion trade-off?*
    - If rules are asymmetric (e.g., shortfall rules, but not AIT)
    - If additional inflation becomes ingrained in agents' expectations only slowly/partially

3. *Quantitatively, how steep is this trade-off?*
    - We assess the inflation cost of achieving certain gains

The Mechanics of Okun's Hypothesis

Mechanism I: Exposure

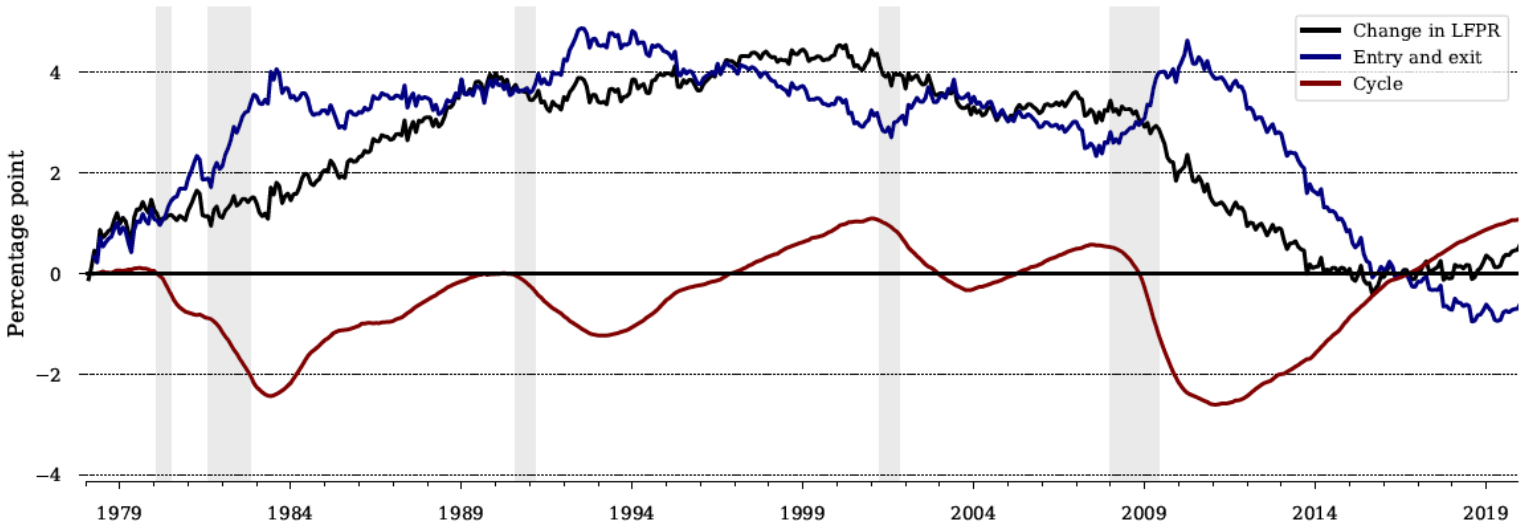
- Uneven effects of business cycles (Aaronson et al., 2019)
  - Low-skill workers are much more sensitive to the cycle



- *High-pressure economy is especially beneficial to low-income groups*

Mechanism II: Attachment

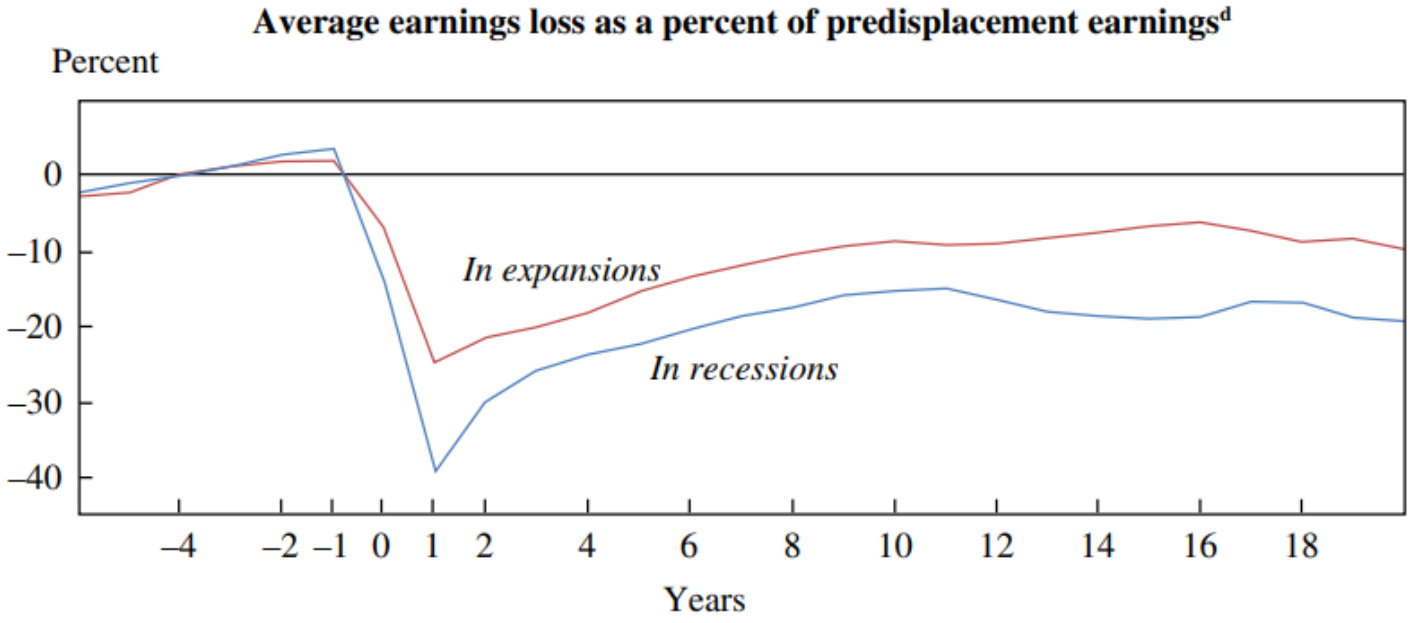
- Participation cycle (Hobijn-Sahin, 2021)
  - Labor force participation falls when the economy is weak
  - Unemployment is the key driver of this cyclicality ($UN >> EN$)



- *High-pressure economy sustains attachment to the labor force*

Mechanism III: Persistence

- Human capital accumulation (Davis-von Wachter, 2011)
  - Stable employment leads to earnings growth
  - Earnings losses upon displacement are large, persistent & cyclical



- *High-pressure economy can raise (limit the loss of) human capital*

The Model

Individual Skill and Labor Market Dynamics

- Skill level: z
- Labor market state: s

$$s = \begin{cases} e, & \text{employed} \\ u_0, & \text{unemployed, ineligible for UI} \\ u_1, & \text{unemployed, eligible for UI} \end{cases} \qquad \begin{array}{ll} n_0, & \text{passive non-participant} \\ n_1, & \text{active non-participant} \end{array}$$

- Transition across labor market states:
  - Exogenous $e \to u$, $u \to e$, $n_1 \to e$ as a function of skills z
  - Exogenous switch into and out of passive non-participation n_0
  - Endogenous participation choices: $n_1 \to u, \quad u, e \to n_1$

Individual Skill and Labor Market Dynamics

- State-dependent skill dynamics:

$$d \log z_t = \left\{ -\theta \log z_t + \mathbb{I}_{\{s_t = e\}} \, \delta_z^+ - \mathbb{I}_{\{s_t \neq e\}} \, \delta_z^- \right\} dt + \sigma_z dW_t$$

- Workers who do not remain employed see:

  1. their skills depreciate
  2. their job finding and separation rates deteriorate

$\Rightarrow$ Slippery slope leading to long-lasting impact of job displacement

Individual Problem

- Period utility:

$$u^s(c,h) = \log c - \psi \frac{h^{1+\frac{1}{\sigma}}}{1+\frac{1}{\sigma}} - \kappa^s, \qquad s \in \{e, u_0, u_1, n_0, n_1\}$$

- Budget constraint:

$$\begin{aligned} c_t + \dot{a}_t &= r_t a_t + \phi_t + (1-\mathfrak{t}_t) w_t z_t h_t, && \text{if } s = e \\ c_t + \dot{a}_t &= r_t a_t + \phi_t + (1-\mathfrak{t}_t) b(z_t), && \text{if } s = u_1 \\ c_t + \dot{a}_t &= r_t a_t + \phi_t, && \text{if } s \in \{u_0, n_0, n_1\} \end{aligned}$$

- Borrowing constraint: $a_t \geq 0$

- Choices:
  - consumption / saving (optimal control)
  - participation (optimal stopping)

Firms and Mutual Fund

Firms

- Continuum of monopolistic intermediate-good producers
- Linear technology $y_{it} = n_{it}$
- Flexible prices and sticky wages
- Competitive final good producer with CES aggregator over $\{y_i\}$
- Price inflation = wage inflation

Mutual Fund

- Fund owns firms' equity and government bonds
- Household wealth = shares of the mutual fund

Wage Setting

We follow Erceg et al. (2000), Auclert et al. (2019)

- Labor unions set nominal wage rate on behalf of the employed
- Quadratic adjustment costs à la Rotemberg for nominal wages

$$\Theta_t = \frac{\theta}{2}\left(\frac{\dot{w}_t}{w_t} - \pi^*\right)^2$$

- Wage Phillips curve determines inflation

$$\pi_t = \frac{\dot{w}_t}{w_t}$$

  as a function of deviations of MRS of the employed from the real wage

Government

- Fiscal authority issues debt, taxes, and spends on transfers

$$\dot{B}_t + \mathfrak{t}_t w_t N_t = r_t B_t + \int_{s=u_1} b(z)\, d\mu^s + \phi_t$$

- Passive fiscal policy rule

$$\mathfrak{t}_t = \mathfrak{t}^* + \phi_b (B_t - B^*), \quad \phi^b > 1$$

- Monetary authority follows an Inflation Targeting (IT) rule for nominal rate

$$i_t = \max \left\{ i^* + \beta_\pi (\pi_t - \pi^*) + \beta^y \log \left(\frac{Y_t}{Y^*} \right), 0 \right\}, \quad \beta_\pi > 1$$

Out of Steady-State

Sources of Aggregate Fluctuations

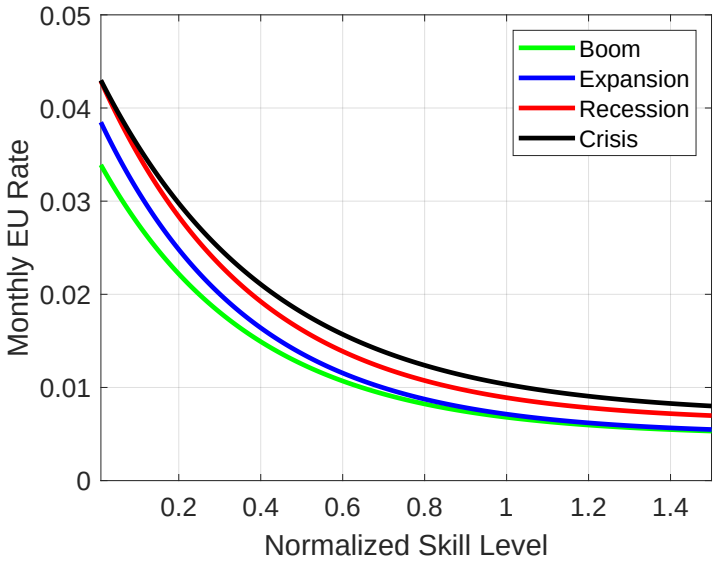
- Wedge in the Euler equation (demand shocks)
- Wedge in the wage Phillips Curve (supply shocks)

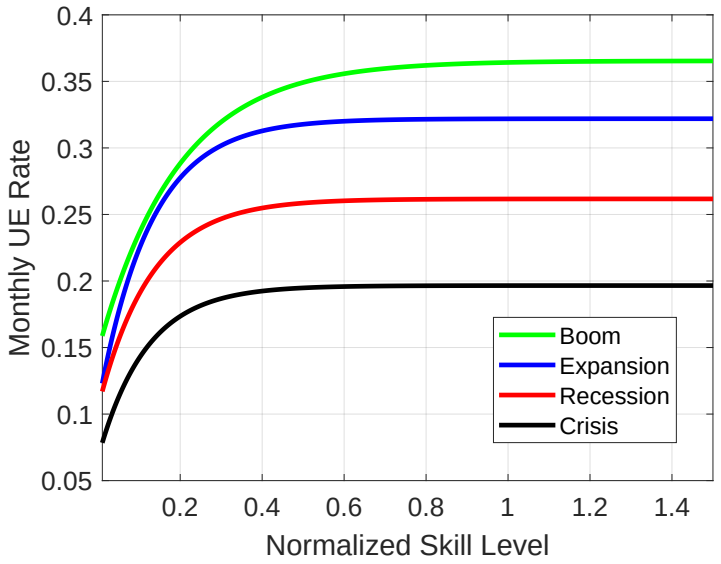
Cyclical Labor Market Transition Rates

- Function of average hours per worker out of steady state

The Labor Market Through the Lenses of the Model

Mechanism I: Uneven Incidence of Business Cycles

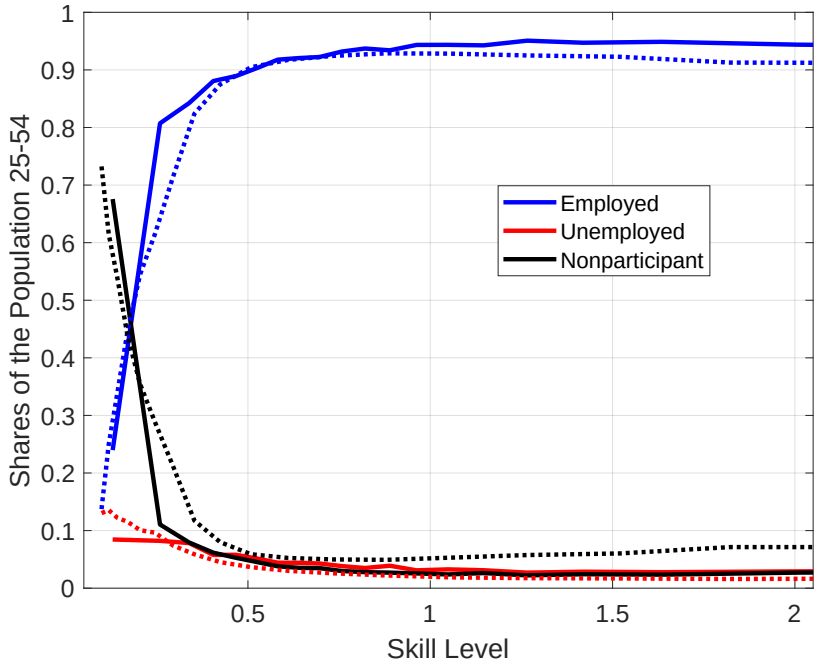




- Elasticity of EU/UE rates to aggregate hours by skill set to match data

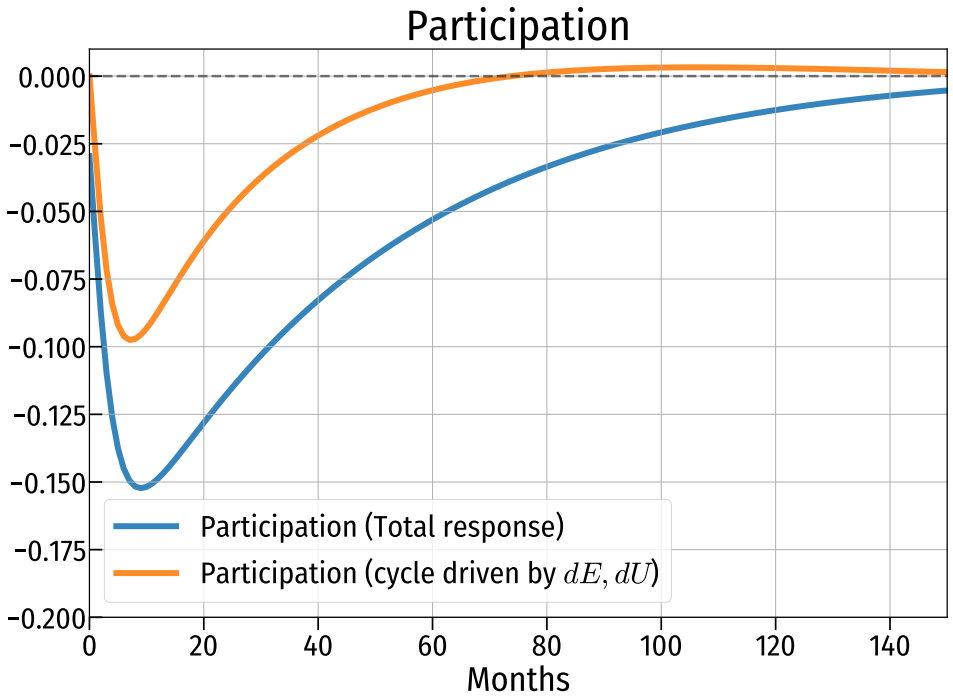
Mechanism II: Participation Cycle

	Data	Model
EU	0.017	0.017
EN	0.011	0.011
UE	0.242	0.304
UN	0.189	0.202
NE	0.065	0.043
NU	0.064	0.077



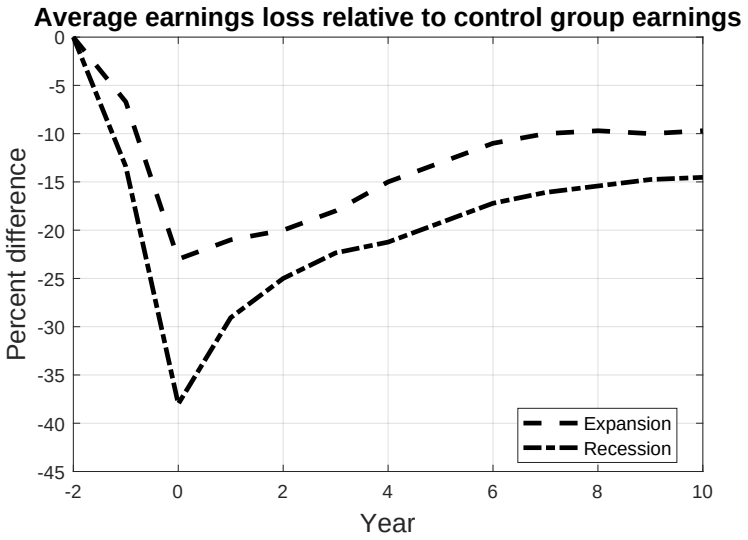
- We match both average worker flows, and stocks by skill level
- $UN >> EN$ instrumental to obtain the participation cycle

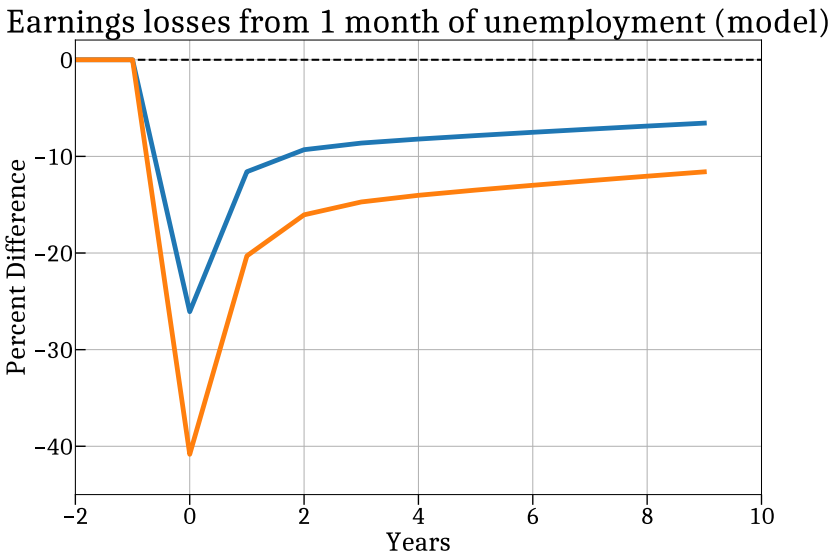
Mechanism II: Participation Cycle



- Larger unemployment pool in recession drives down participation

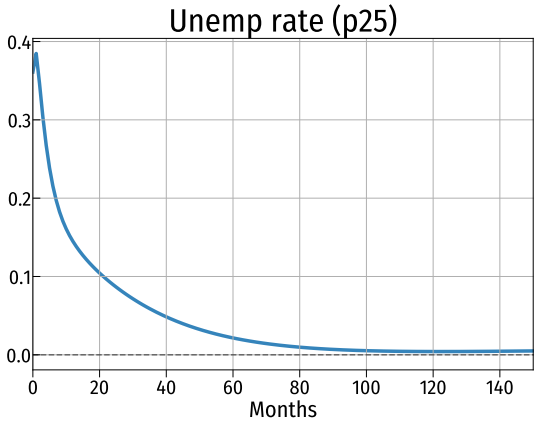
Mechanism III: Earnings Losses from Displacement

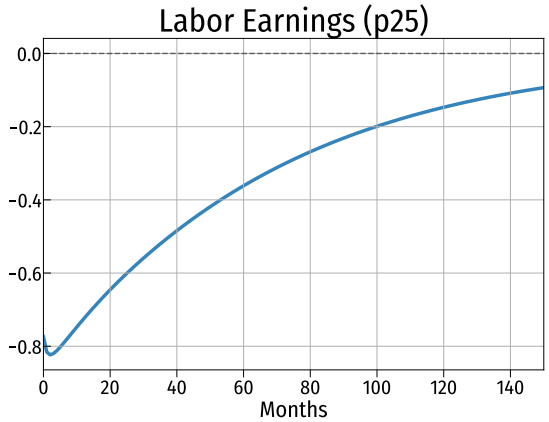


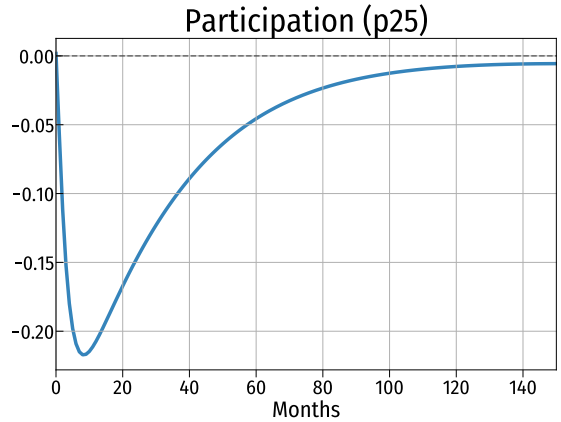


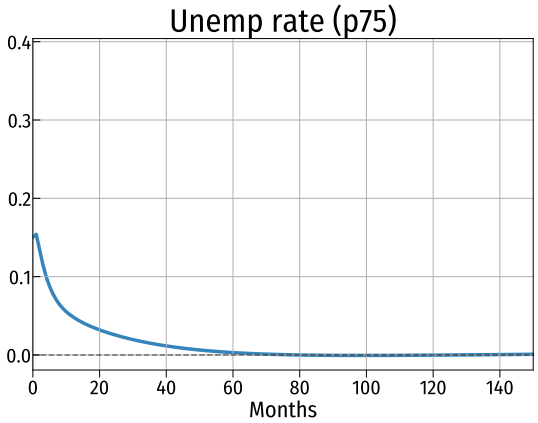
- Losses from displacement are large, persistent, and countercyclical

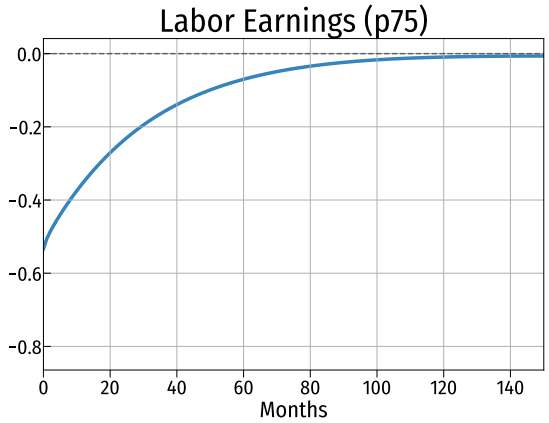
Combining All Mechanisms

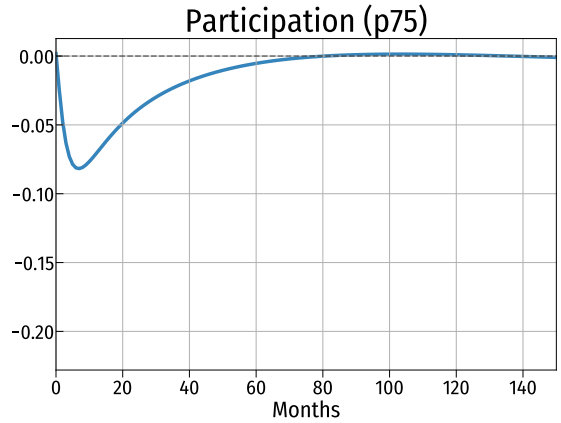












- Fluctuations at P25 of the skill distribution are both larger and more persistent than at P75

Counterfactual Policy Experiments

Design of Counterfactual Experiments

How would the US labor market and inflation dynamics have looked like, had the Fed followed a more inclusive rule in the 1990-2019 period?

Higher Infl. Target $\quad i_t = i^{**} + 1.25(\pi_t - \pi^{**}) + 0.05 \log\left(\frac{Y_t}{Y^*}\right)$

Avg. Infl. Target $\quad i_t = i^* + 1.25(\pi_t - \pi^*) + 0.05 \log\left(\frac{Y_t}{Y^*}\right) + 2.00\Gamma_t^\pi$

$\Gamma_t^\pi = (1 - \frac{1}{48})\pi_t + \frac{1}{48}\Gamma_{t-1}^\pi$

Shortfall $\quad i_t = i^* + 1.25(\pi_t - \pi^*) + 0.0 \log\left(\frac{Y_t}{Y^*}\right)^+ + 0.05 \log\left(\frac{Y_t}{Y^*}\right)^-$

Dovish $\quad i_t = i^* + 1.25(\pi_t - \pi^*) + 0.0 \log\left(\frac{Y_t}{Y^*}\right)^+ + 0.1 \log\left(\frac{Y_t}{Y^*}\right)^-$

Design of Counterfactual Experiments

How would the US labor market and inflation dynamics have looked like, had the Fed followed a more inclusive rule in the 1990-2019 period?

Higher Infl. Target $\quad i_t = i^{**} + 1.25(\pi_t - \pi^{**}) + 0.05 \log\left(\frac{Y_t}{Y^*}\right)$

Avg. Infl. Target $\quad i_t = i^* + 1.25(\pi_t - \pi^*) + 0.05 \log\left(\frac{Y_t}{Y^*}\right) + 2.00\Gamma_t^\pi$

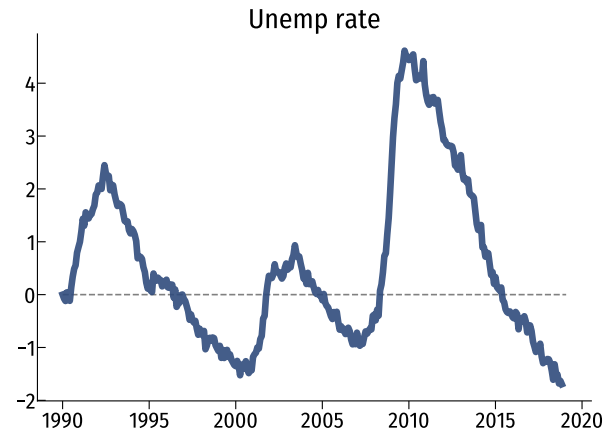
$\Gamma_t^\pi = (1 - \frac{1}{48})\pi_t + \frac{1}{48}\Gamma_{t-1}^\pi$

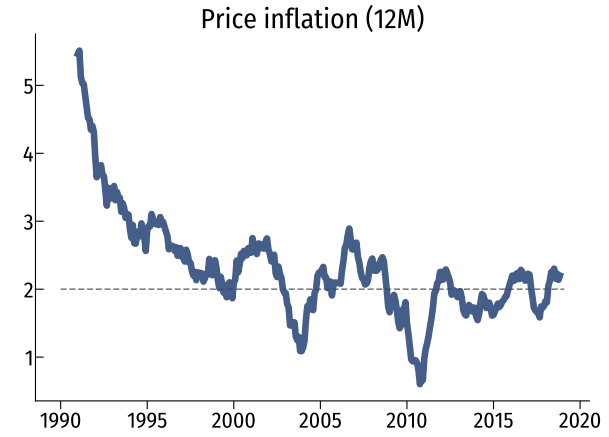
Shortfall $\quad i_t = i^* + 1.25(\pi_t - \pi^*) + 0.0 \log\left(\frac{Y_t}{Y^*}\right)^+ + 0.05 \log\left(\frac{Y_t}{Y^*}\right)^-$

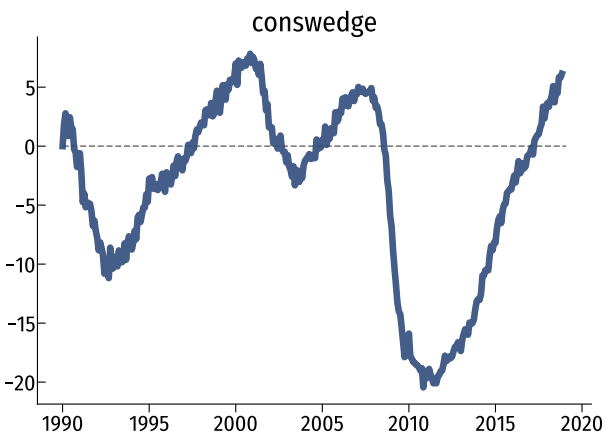
Dovish $\quad i_t = i^* + 1.25(\pi_t - \pi^*) + 0.0 \log\left(\frac{Y_t}{Y^*}\right)^+ + 0.1 \log\left(\frac{Y_t}{Y^*}\right)^-$

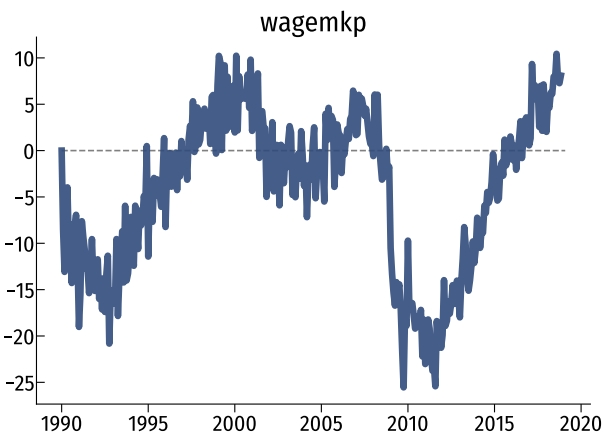
We also impose the ZLB on all these rules, i.e. $i_t \geq 0$

Aggregate Shocks

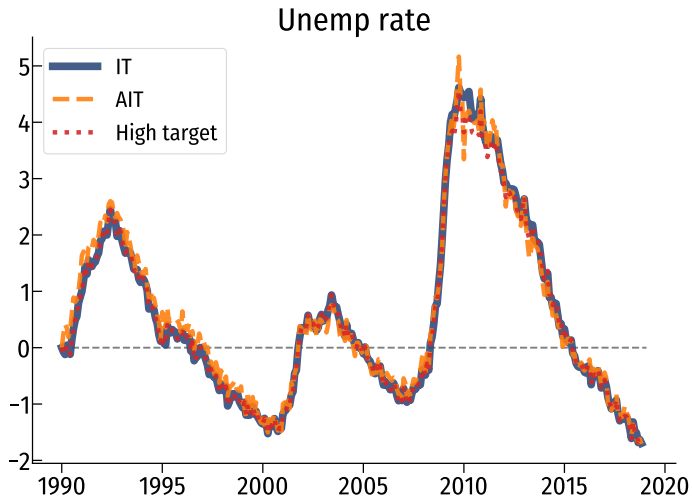


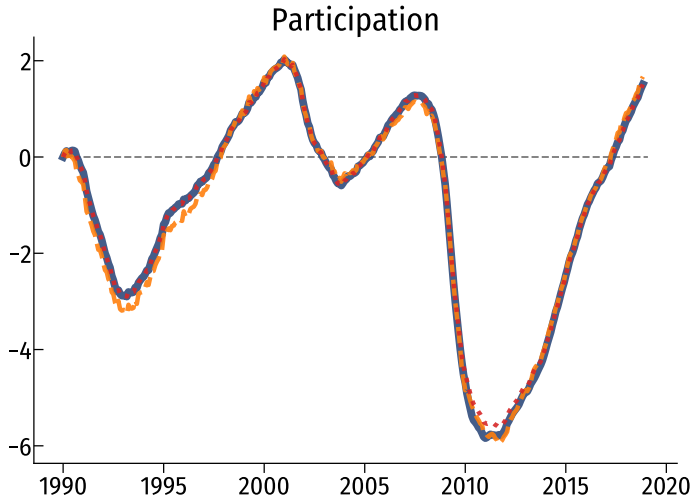


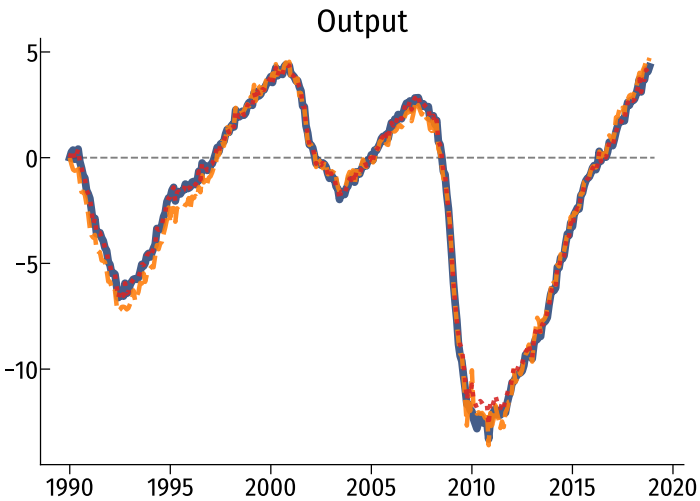


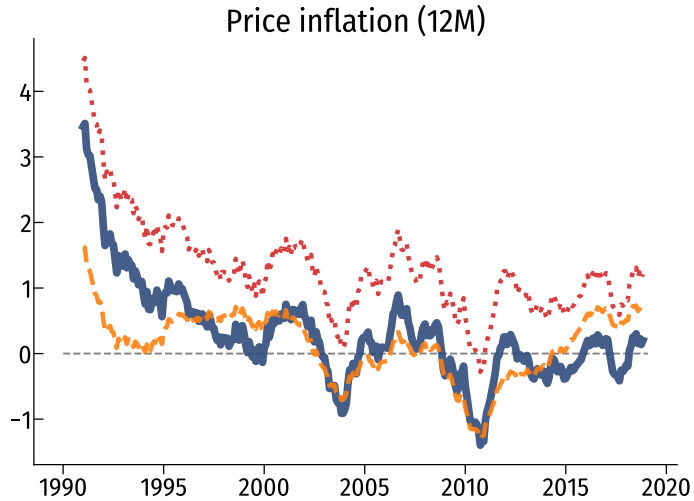


Aggregate Implications of Different IT Rules

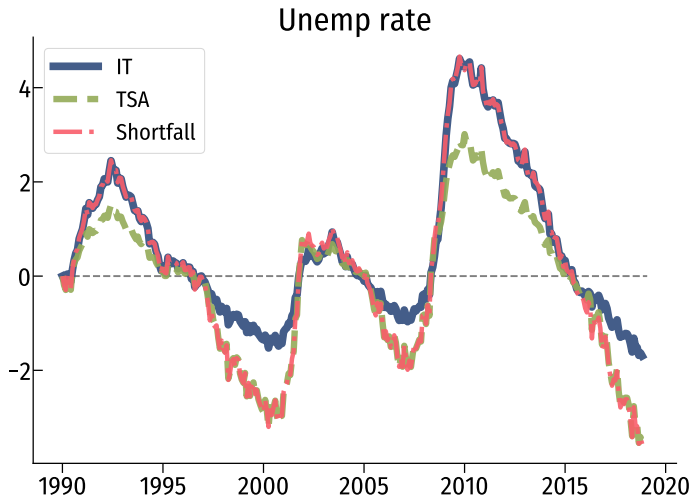




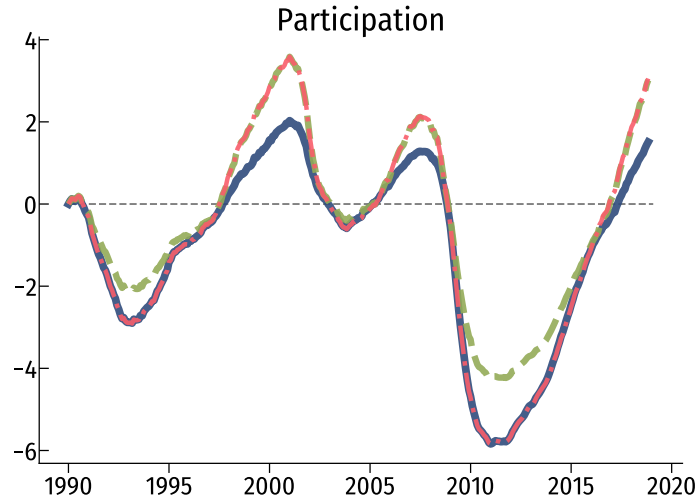




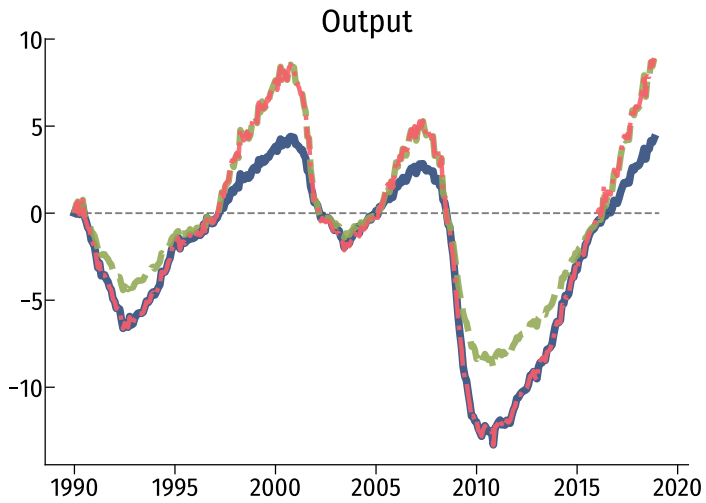
Aggregate Implications of Inclusive Rules



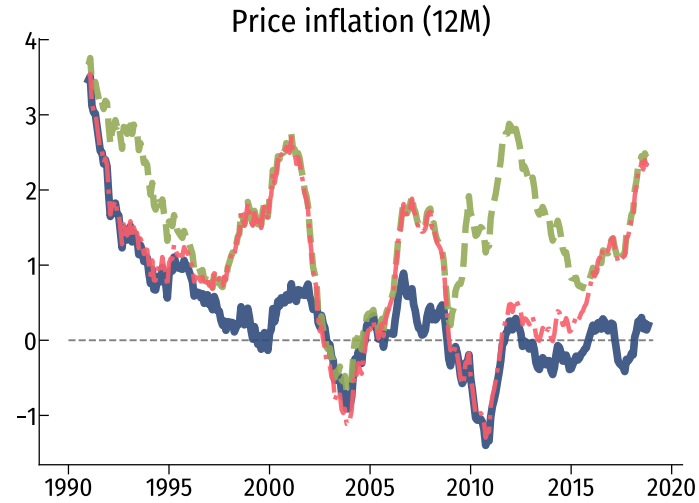
Diff. =-0.3, -0.7



Diff. =0.3, 0.6

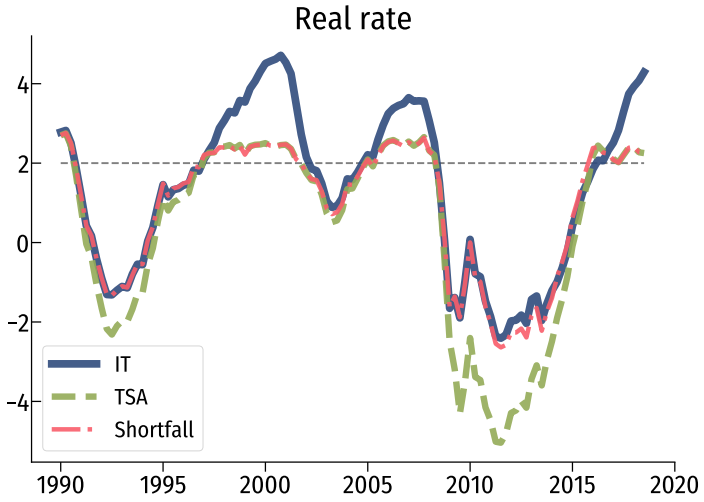


Diff.= 0.8, 1.7

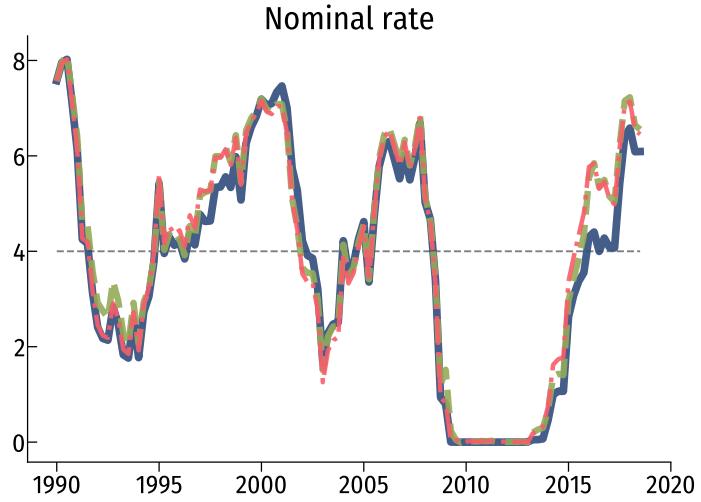


Diff.= 0.6 ppt, 1.2 ppt

Implications of Inclusive Rules for *r* and *i*



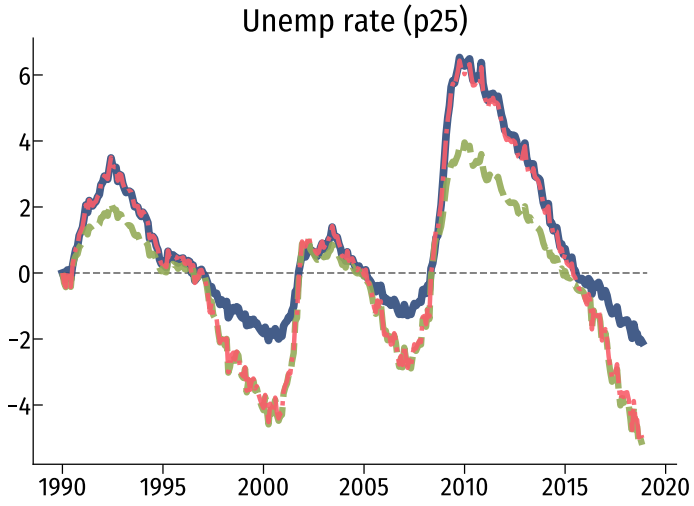
Diff. =-0.4, -0.9



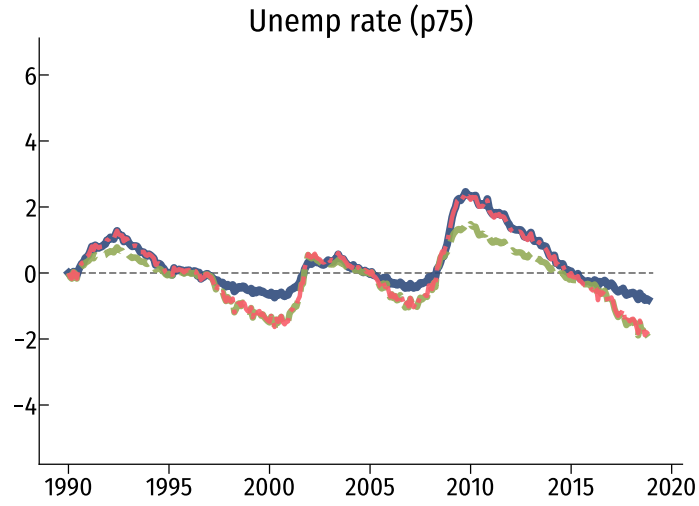
Diff. =0.2, 0.2

- Lower real rates: higher aggregate demand
- Higher nominal rate: further away from the ZLB

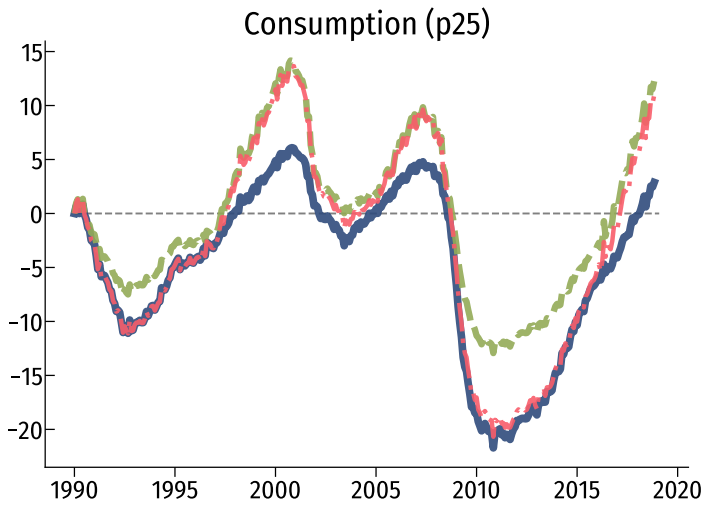
Distributional Implications of Inclusive Rules



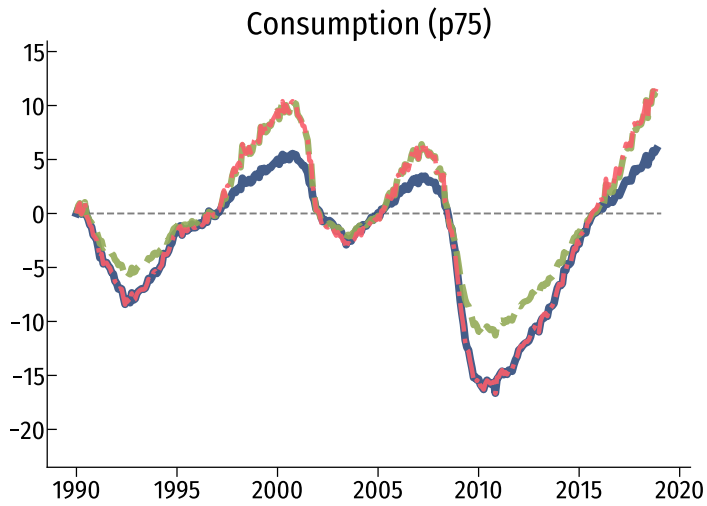
Diff. =-0.5, -1.1



Diff. =-0.2, -0.4

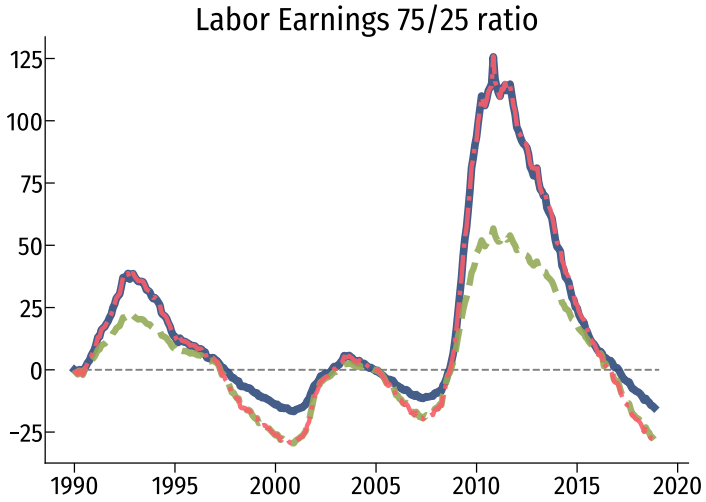


Diff. =2.0, 4.3

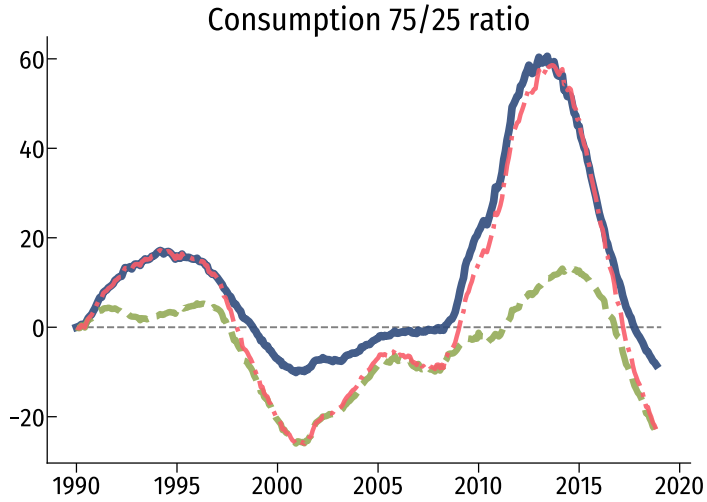


Diff. =1.0, 2.0

Implications of Inclusive Rules for Inequality



Diff. =-3%,-12%

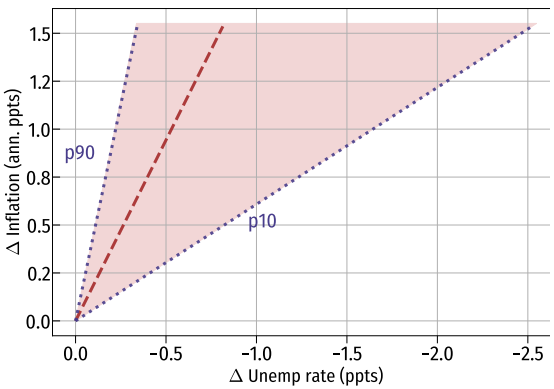


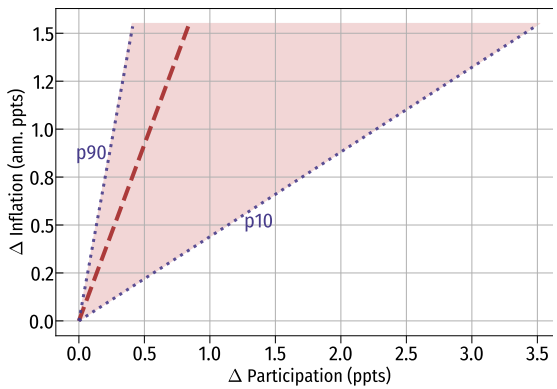
Diff. =-5%,-16%

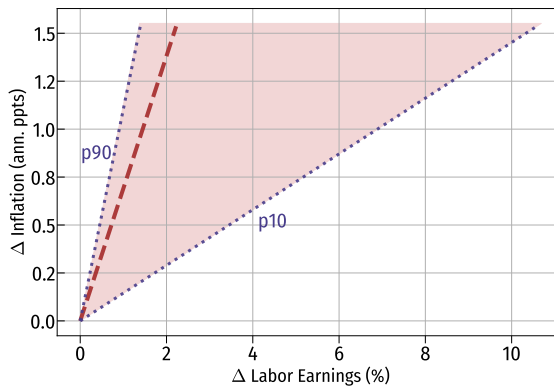
Assessing the trade-off: Okun's cones

- Okun (BPEA, 1973): *The sacrifice of upward mobility must be carefully reckoned as one high cost of accepting slack as an insurance policy against inflation*

- Varying the coefficients in our Dovish rule traces out this trade-off relative to baseline IT rule



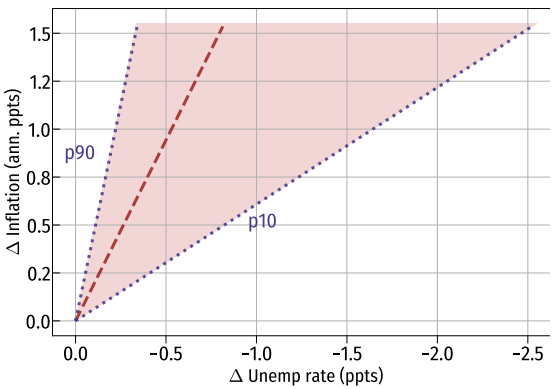


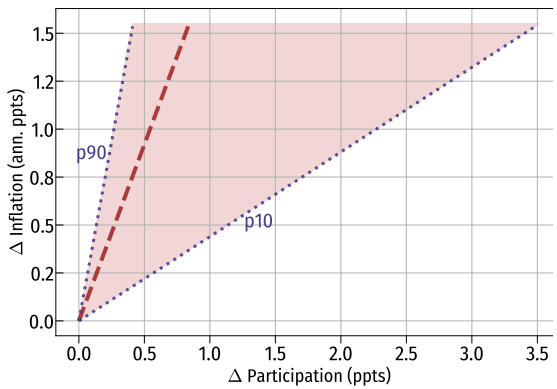


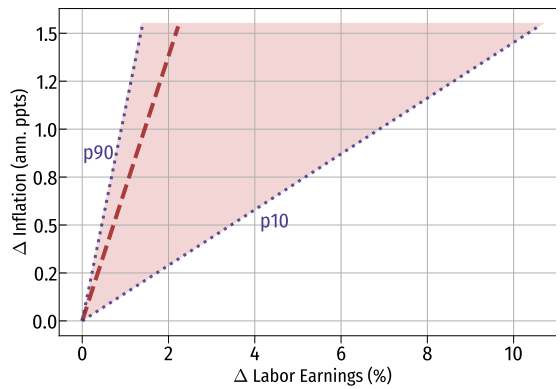
Assessing the trade-off: Okun's cones

- Okun (BPEA, 1973): *The sacrifice of upward mobility must be carefully reckoned as one high cost of accepting slack as an insurance policy against inflation*

- Varying the coefficients in our Dovish rule traces out this trade-off relative to baseline IT rule







- Monetary policy can run a high-pressure economy that improves labor market prospects of low-skill workers at the cost of higher inflation

Indexation

Role of Indexation

- Some rules generate a persistent gap between average inflation and π^*
- What if wage setters respond by indexing wage growth to past inflation?
- Rotemberg adjustment cost with indexation becomes:

$$\Theta_t = \frac{\theta}{2}\left(\frac{\dot{w}_t}{w_t} - \tilde{\pi}_t\right)^2, \quad \tilde{\pi}_t = (1-\gamma)\pi^* + \gamma\left(\int_{t-1}^{t} \pi_j dj\right)$$

- Wage Phillips curve

$$\rho(\pi_t - \tilde{\pi}_t) - \partial_t(\pi_t - \tilde{\pi}_t) = \frac{\varepsilon}{\theta}\mathbb{E}_t\left[-\partial_h u^e(c_{it}, h_t)\, h_t - \left(\frac{\varepsilon - 1}{\varepsilon}\right)\partial_c u^e(c_{it}, h_{it})\, \tilde{y}_{it} \middle| s_{it} = e\right]$$

Role of Indexation

- Differences between Dovish + indexation and baseline IT rule

- Real effect of 100bp of additional inflation generated by the TSA rule for different levels of indexation to past inflation

	$\gamma = 0$	$\gamma = 0.25$	$\gamma = 0.50$	$\gamma = 1.00$
Δ real rate	-0.810	-0.605	-0.393	-0.112
Δ output	1.466	1.034	0.629	0.130
Δ unemployment	-0.555	-0.391	-0.237	-0.046
Δ participation	0.549	0.388	0.237	0.053
Δ unemployment at P25	-0.968	-0.680	-0.411	-0.079
Δ earnings at P25	4.675	3.292	1.994	0.402
Δ consumption at P25	3.648	2.569	1.555	0.316

Indexation Undermines the Trade-Off

- As Fed heats economy with inclusive rules, it generates more inflation
- Indexation amplifies this inflation and makes it more persistent
- Indexation akin to a cost-push shock
- This force, through the Taylor rule, pushes towards higher real rates

$\Rightarrow$ For same level of inflation, labor market gains relative to IT are smaller

Going Forward

- Compute measures of upward mobility
- COVID counterfactual
- Active ‘asymmetric‘ fiscal rules paired with passive monetary policy
- Separate paper: who bears the cost of inflation? Many channels.

Thanks!