Session 1: Labor Market and Maximum Employment

Moderator: Stephanie Aaronson, Federal Reserve Board
Presenter: Ayşegül Sahin, Princeton University
Discussant: Erik Hurst, University of Chicago Booth School of Business

Thomas Laubach
RESEARCH CONFERENCE

Assessing Maximum Employment
A Flow-Based Approach

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Second Thomas Laubach Conference
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BoG

What is Maximum Employment?

> *The maximum level of employment is a broad-based and inclusive goal that is not directly measurable and changes over time owing largely to nonmonetary factors that affect the structure and dynamics of the labor market. Consequently, it would not be appropriate to specify a fixed goal for employment; rather, the Committee's policy decisions must be informed by assessments of the shortfalls of employment from its maximum level, recognizing that such assessments are necessarily uncertain and subject to revision. The Committee considers a wide range of indicators in making these assessments.*

Statement on Longer-Run Goals and Monetary Policy Strategy

What is Maximum Employment?

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Statement on Longer-Run Goals and Monetary Policy Strategy

A Flow Approach

Flow approach provides a more accurate picture of the labor market and the additional richness it delivers captures important implications of labor market mechanisms for macroeconomics.

Blanchard & Diamond (1990)

- Provides a unified framework to link **a wide range of indicators**.
- Connects **directly** to the underlying labor market dynamics.
- Helps identify **nonmonetary factors**.
- Distinguishes mechanisms that support a **broad-based and inclusive** goal.

Maximum employment is shaped by both unemployment and participation rates:

$$\Delta EPOP_t = \underbrace{-\overline{LFPR}_t \Delta u_t}_{\textit{unemployment term}} + \underbrace{(1 - \overline{u}_t)\, \Delta LFPR_t}_{\textit{participation term}}$$

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Changes in the LFPR have ≈ 1.6 times larger effect than changes in the unemployment.

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When $\Delta LFPR_t \approx 0$, unemployment fluctuations drive movements in employment.

Full-employment unemployment rate

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$$\Delta EPOP_t = \underbrace{-\overline{LFPR}_t \Delta u_t}_{\textit{unemployment term}} + \underbrace{(1 - \overline{u}_t)\, \Delta LFPR_t}_{\textit{participation term}}$$

Trends in participation make it harder to evaluate cyclical progress in EPOP.

Recoveries following the Great recession and the pandemic

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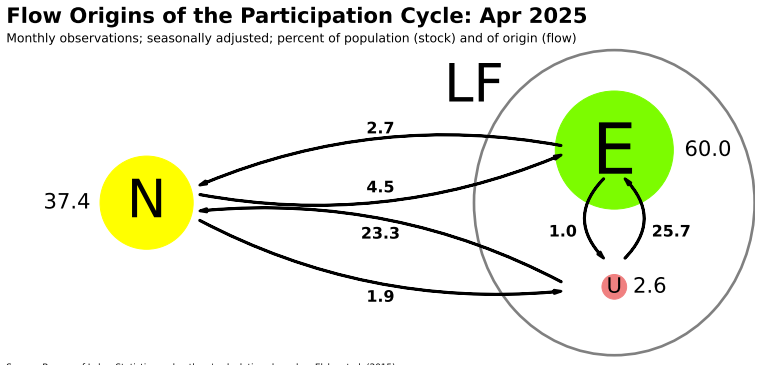
Prevailing narrative: Participation is mildly procylical driven by discouraged workers leaving the labor force during recessions and re-entering as the labor market recovers.

Perry (1971) and Okun (1973)

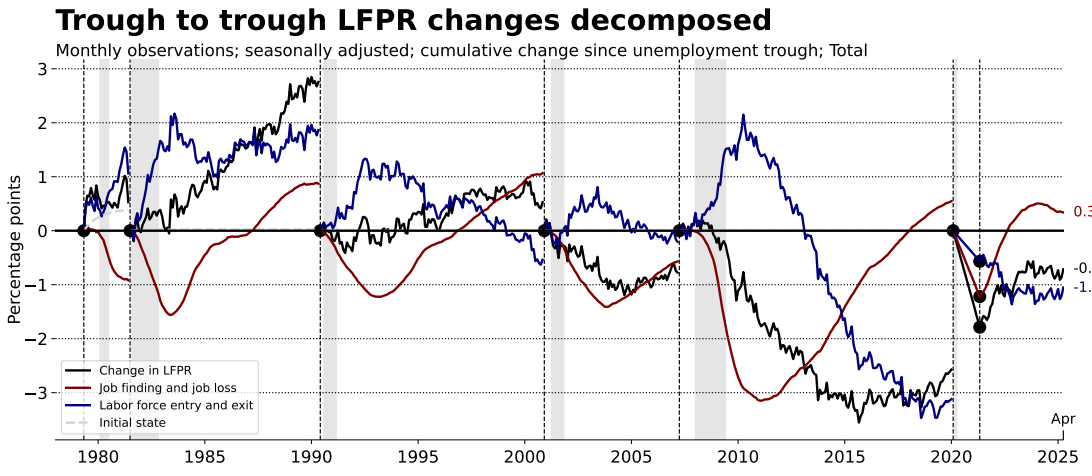
Unemployment and Participation driven by the same flows



- Flows >> Net changes in stocks
  - Large flows in and out of labor force
- Unemployed are less attached than the employed
  - *Attachment wedge:* 2.8% vs. 25%

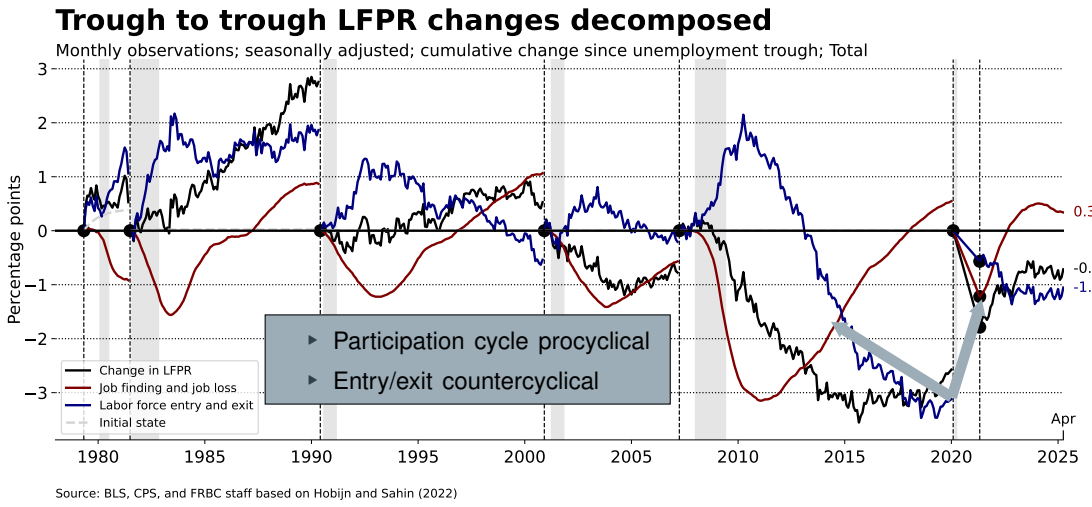
Key Intuition: When someone moves from U to E, they are more likely to remain in the labor force going forward. This simple mechanism (*the participation cycle*) is the sources of procyclicality of participation, *not* labor force entry and exit.

Participation cycle driven by job loss/finding



Source: BLS, CPS, and FRBC staff based on Hobijn and Sahin (2022)

Note: Seasonally adjusted monthly data. Cumulative effect on LFPR from every trough in the unemployment rate. Entry is contribution from $P_{N,U}$ and $P_{N,E}$, exit is contribution from $P_{U,N}$ and $P_{E,N}$, and cycle from flows between U and E, i.e. $P_{E,U}$ and $P_{U,E}$.



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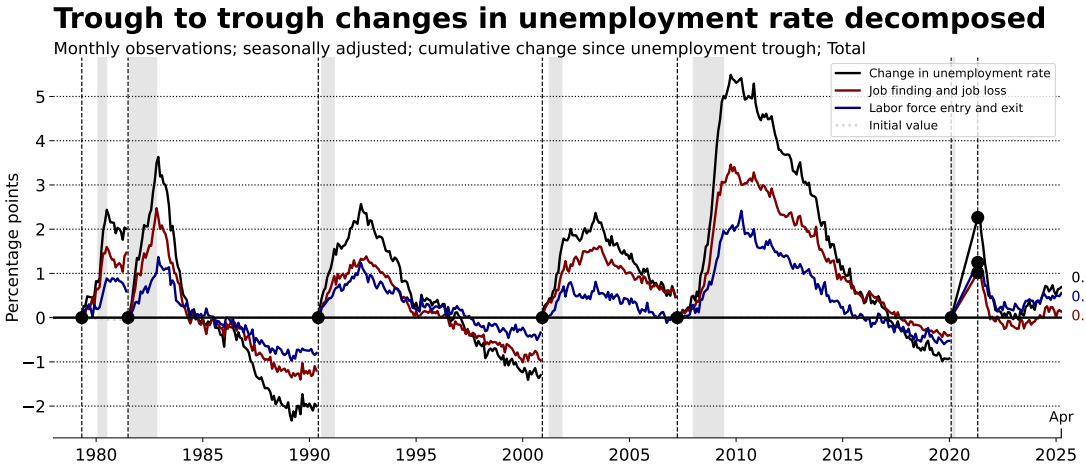

Source: BLS, CPS, and authors' based on Elsby et al. (2019)

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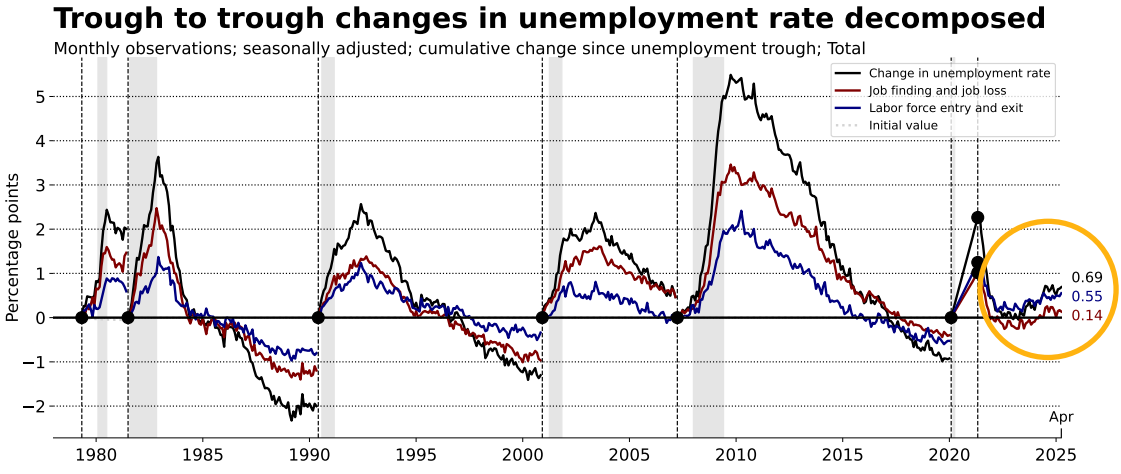

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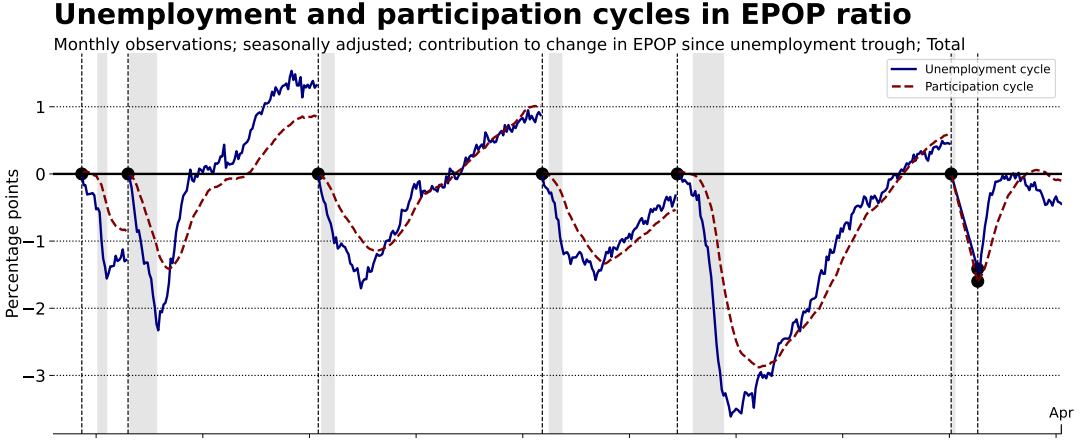
The cyclical change in the employment-to-population ratio is the sum of unemployment and participation cycles:

$$\Delta EPOP_t^c = \underbrace{-\overline{LFPR}_t \Delta u_t}_{\text{unemployment cycle}} + \underbrace{(1-\overline{u}_t)\,\Delta LFPR_t^c}_{\text{participation cycle}}$$

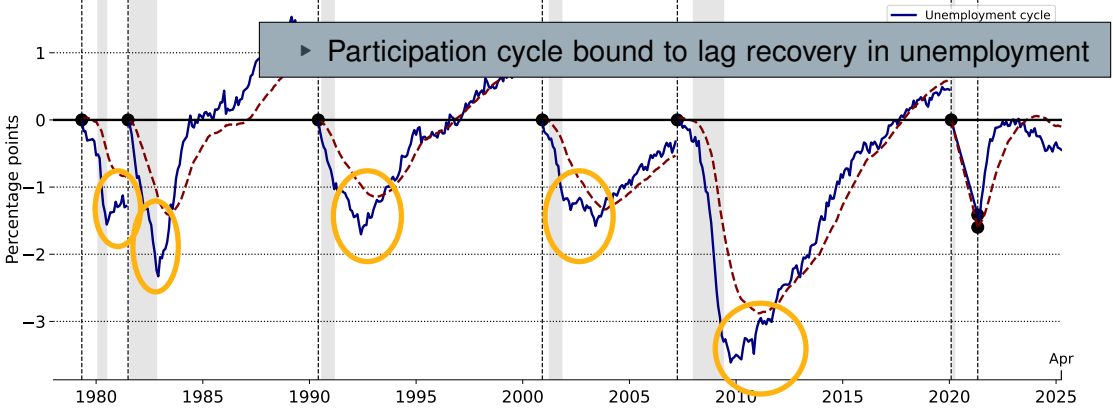


Source: BLS, CPS, and authors' based on Hobijn and Şahin (2022)

Note: Unemployment cycle is cumulative sum of $-\overline{LFPR}_t \Delta u_t$ and LFPR cycle is cumulative sum of $(1 - \bar{u}_t)\, \Delta LFPR_t^c$. Projections

Unemployment and participation cycles in EPOP ratio

Monthly observations; seasonally adjusted; contribution to change in EPOP since unemployment trough; Total



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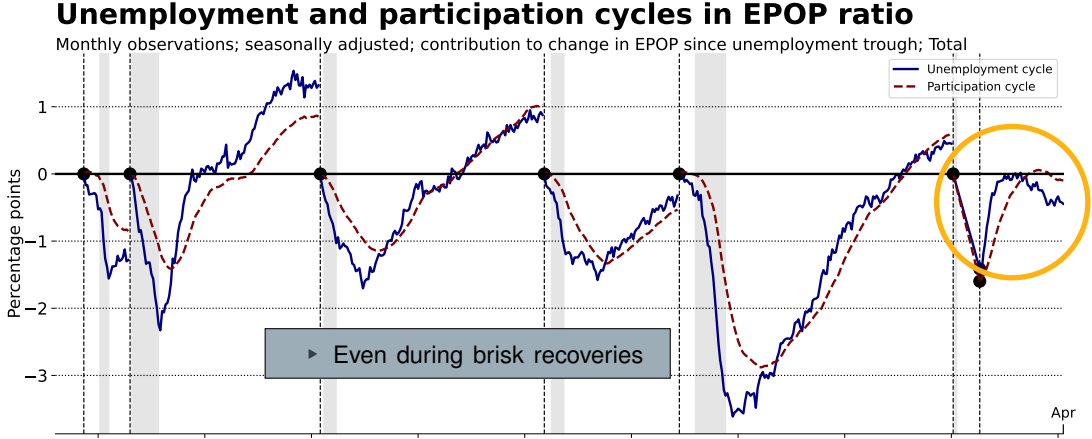

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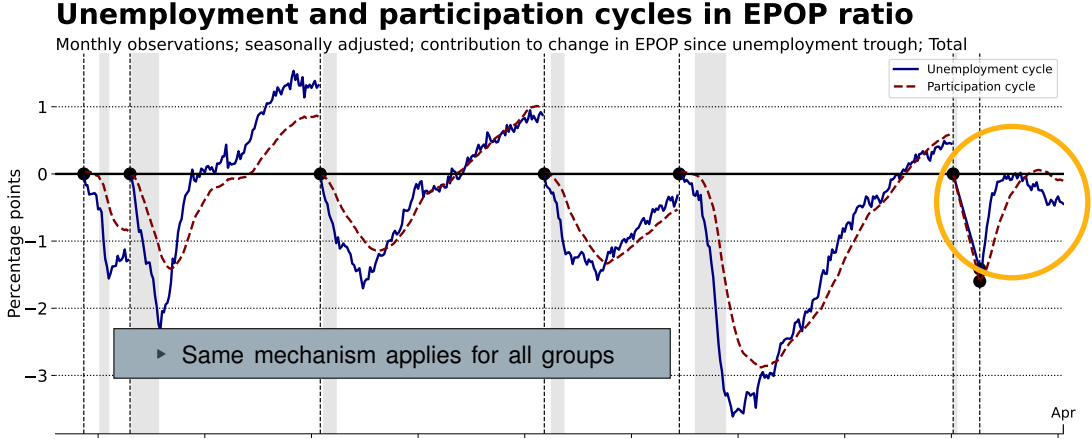

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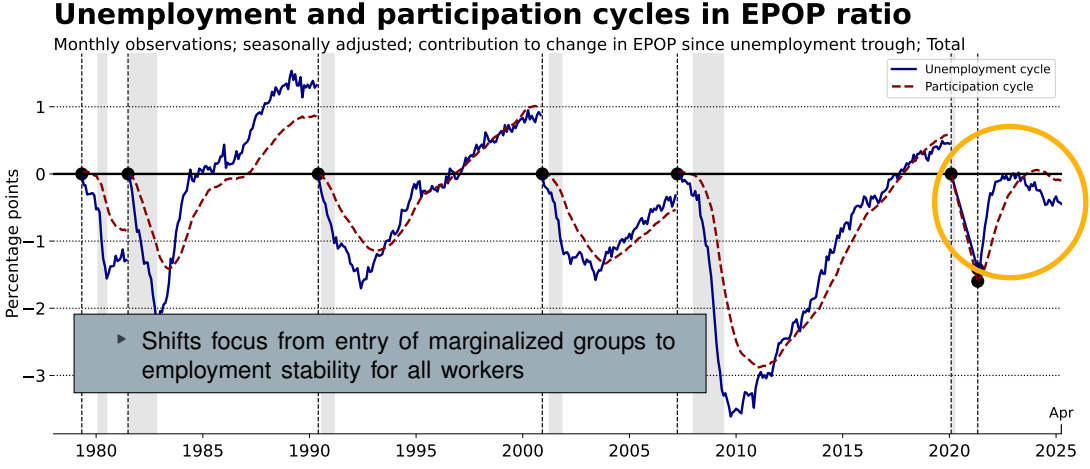

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Statement on Longer-Run Goals and Monetary Policy Strategy

Natural rate of unemployment a là Friedman (1968)

Natural rate of unemployment:

$$u_t^* = \bar{u}_t + \tilde{u}_t$$

- Consistent with stable level of inflation
- Driven by non-monetary factors and time varying

Natural rate of unemployment a là Friedman (1968)

Natural rate of unemployment:

$$u_t^* = \bar{u}_t + \tilde{u}_t$$

- $\bar{u}_t$: secular trends—such as demographics, female labor force participation
- $\tilde{u}_t$: temporary labor market shifts—such as mismatch, on-the-job search intensity

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Unemployment gap:

$$x_t = u_t - u_t^*$$

- Captures degree of inflationary pressures
- Affected by business cycle conditions and monetary policy

Nominal wages are ‘sticky’ and inflation reflects current and *future* labor market conditions as measured by the unemployment gap.

Galí (2011)

$$\pi_t = \underbrace{\pi_t^* - \kappa x_t - \kappa\beta\mathbb{E}_t \sum_{T=t}^{\infty} \beta^{T-t} x_{T+1}}_{\text{Underlying inflation}} + \underbrace{\mathbb{E}_t \sum_{s=t}^{\infty} \beta^{s-t} g_{a,t}}_{\text{Temporary ‘supply shocks’}}$$

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π_t: inflation

π_t^*: long-run inflation expectations

$g_{a,t}$: productivity and markups

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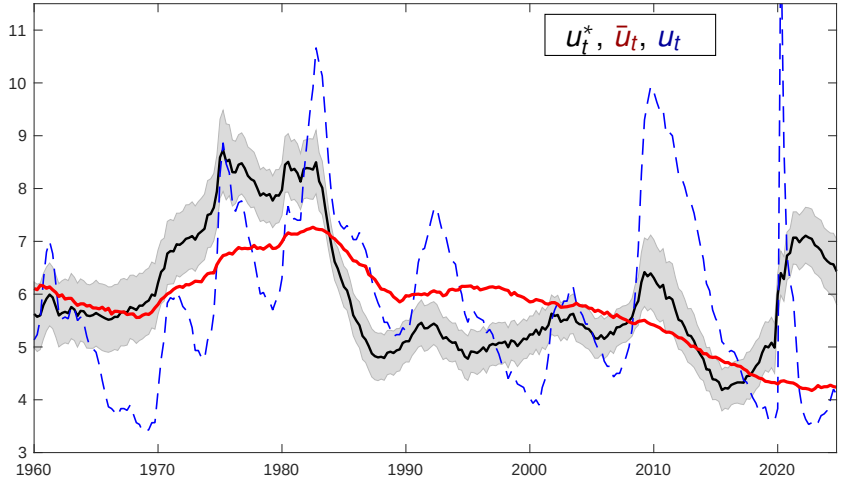
Estimate u_t^*:

1. Unemployment rate u_t and flows to estimate $\bar{u}_t$
3. Federal Reserve Bank of Cleveland's median CPI inflation (π_t)
4. Five measures of labor compensation
5. Inflation expectations: Five-to-ten years ahead (π_t^*) and six-months ahead

Natural rate of unemployment u_t^*



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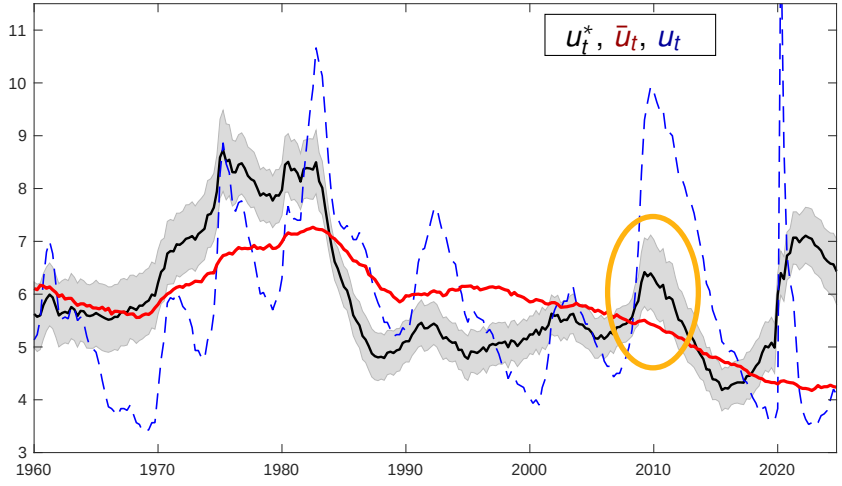

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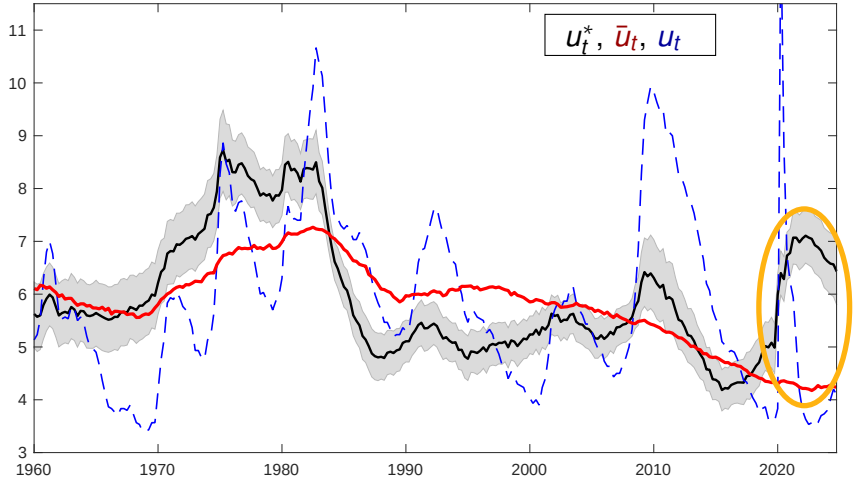
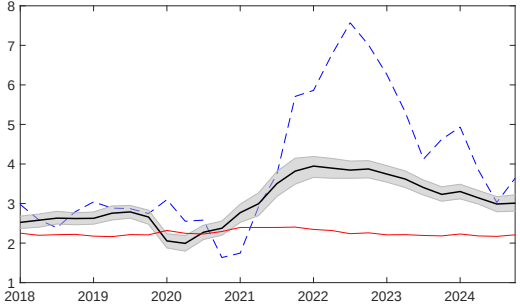
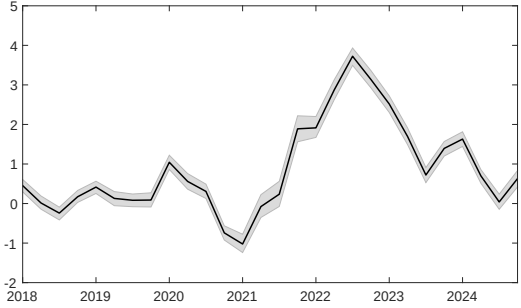


Recent Inflation Surge

Underlying inflation, CPI and π_t^*



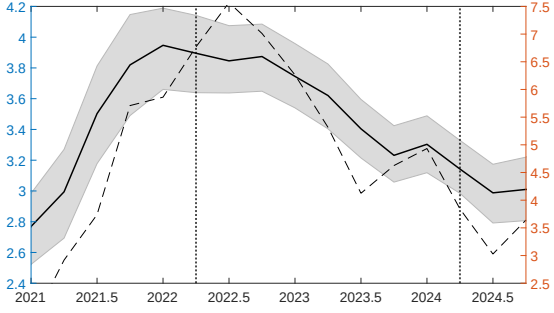
Supply shocks



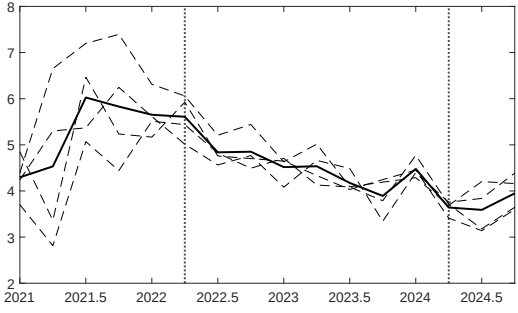
Large and persistent negative unemployment gaps contributed to recent surge in inflation

Soft Landing: Disinflation with little increase in u

CPI and Underlying inflation



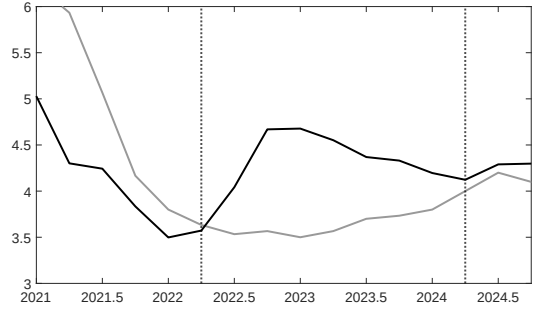
Wage Inflation measures



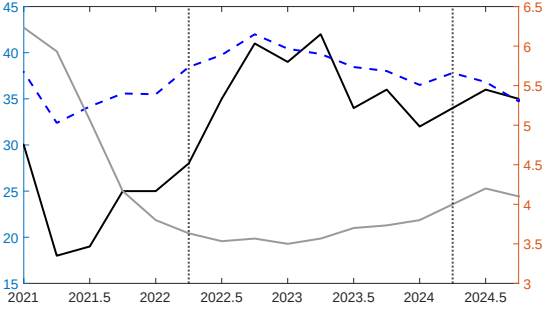
Bulk of the decline in price and wage inflation occurred between 2022Q2 and 2024Q2.

Soft Landing: The role of Expectations

BCEI forecast and unemployment



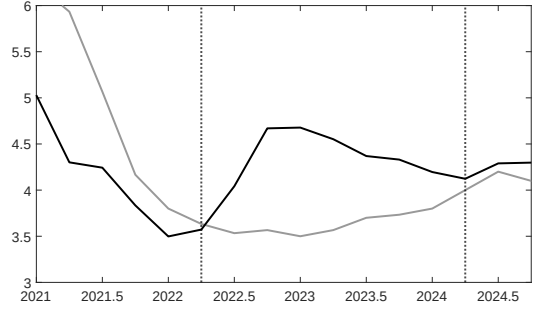
SCE/Michigan forecasts and *unemployment*



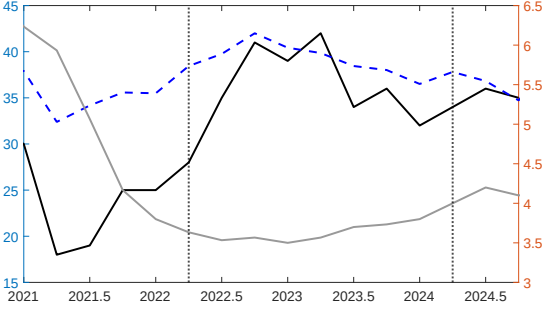
- Increase in unemployment expectations of forecasters and households....
- ...while the unemployment rate remained low.

Soft Landing: The role of Expectations

BCEI forecast and unemployment



SCE/Michigan forecasts and *unemployment*



$$\textit{Underlying inflation} = \pi_t^* - \underbrace{\kappa x_t}_{\textit{slack}} - \underbrace{\kappa\beta\mathbb{E}_t \sum_{T=t}^{\infty} \beta^{T-t} x_{T+1}}_{\textit{expected slack}}$$

Employment evolves as workers separate and vacancy positions get filled:

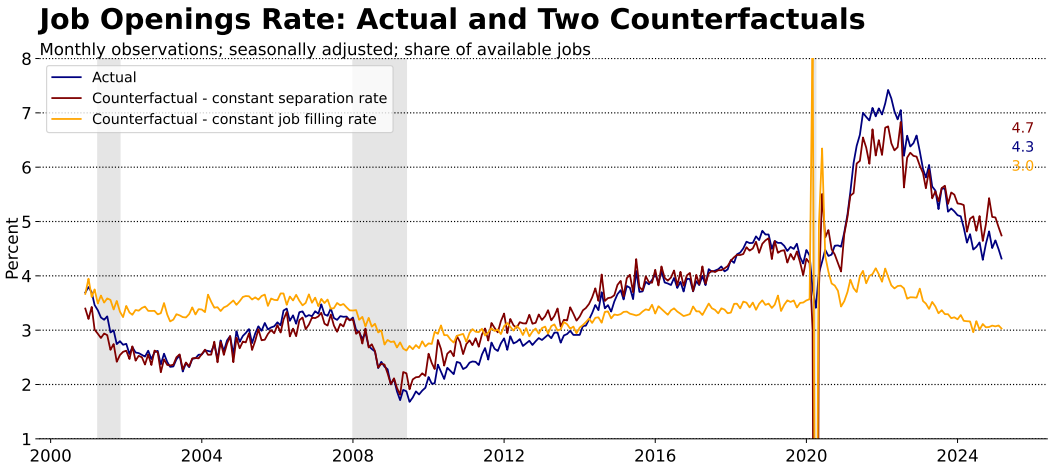
$$E_{t+1} = E_t - \underbrace{s_t E_t}_{\text{separations}} + \underbrace{q_t V_t}_{\text{hires}}$$

Vacancy rate depends on employment growth g_t, separations s_t and the job-filling rate q_t:

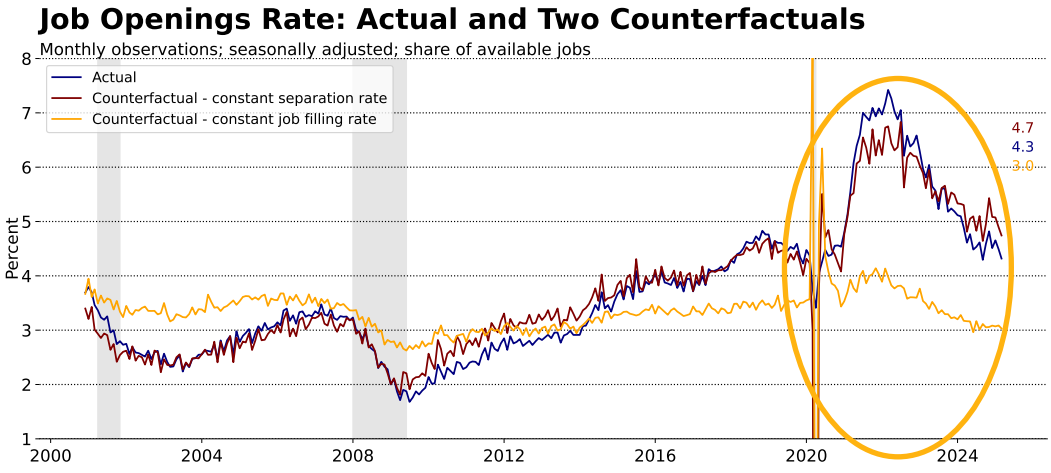
$$V_t = \frac{1}{1+\frac{q_t}{g_t+s_t}}$$

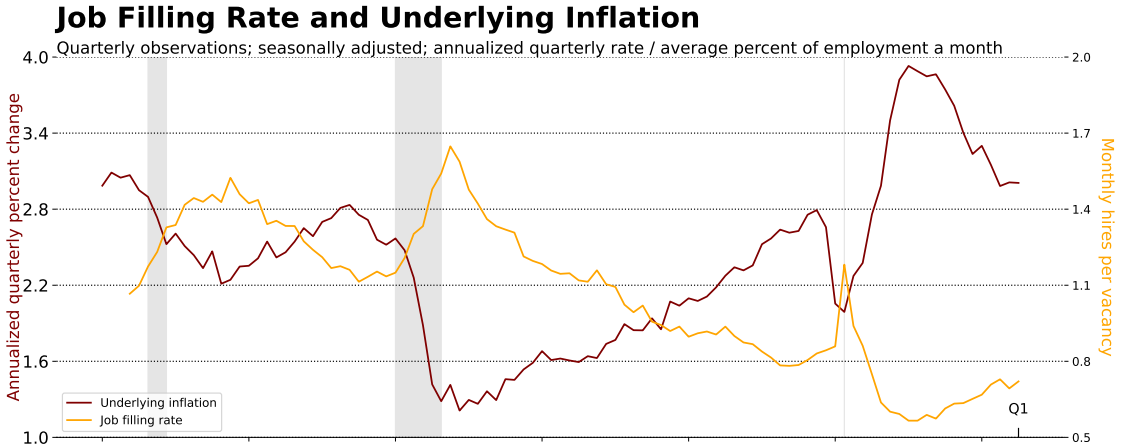
With $g_t \approx 0.067\%$ and $s_t \approx 3.6\%$, vacancy rate predominantly determined by how quickly separations are replaced, s_t/q_t.

Vacancies are driven by job filling and separations



Vacancies are driven by job filling and separations




Job Filling Rate and Underlying Inflation
Quarterly observations; seasonally adjusted; annualized quarterly rate / average percent of employment a month
Annualized quarterly percent change
Monthly hires per vacancy
4.0
3.4
2.8
2.2
1.6
1.0
2.0
1.7
1.4
1.1
0.8
0.5
2000
2004
2008
2012
2016
2020
2024
Underlying inflation
Job filling rate
Q1
Source: Bureau of Labor Statistics, BEA, and authors' calculations
Forecast

Key takeaways

The flow approach offers a unified framework for interpreting a wide range of labor market indicators.

- Highlights employment stability across all groups to support the broad-based and inclusive goal.
- Offers two real-time indicators—the unemployment cycle and the participation cycle to assess shortfalls from maximum employment.

The flow approach also creates a bridge to understanding price stability.

- Connects to nonmonetary factors and underlying economic mechanisms.
- Helps identify the natural rate of unemployment.

References

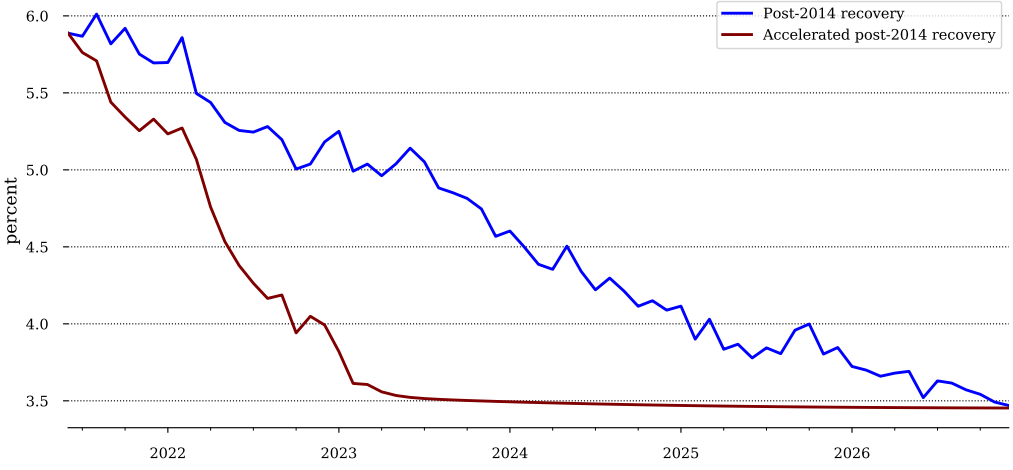
Blanchard, Olivier J., & Diamond, Peter. 1990. The cyclical behavior of the gross flows of U.S. workers. *Brookings papers on economic activity*, **21**(2), 85–155.

Galí, Jordi. 2011. The return of the wage Phillips curve. *Journal of the european economic association*, **9**(3), 436–461.

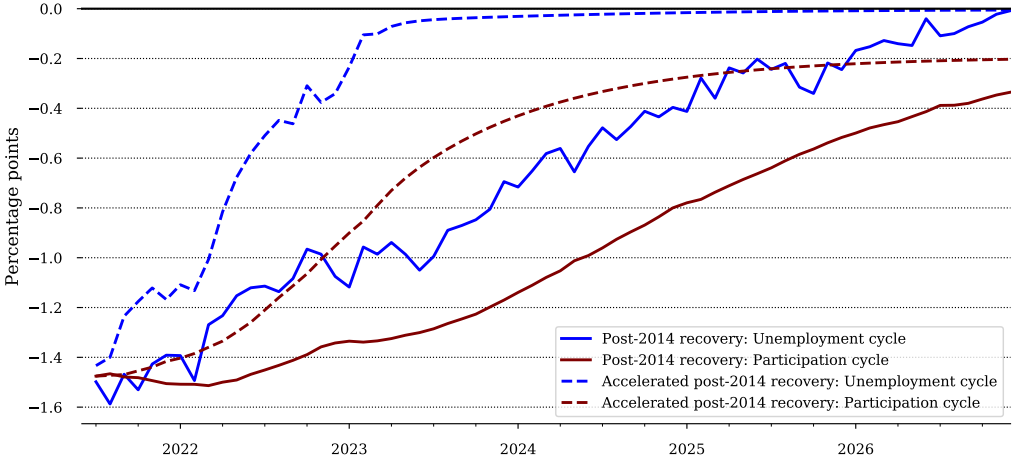
Okun, Arthur M. 1973. Upward mobility in a high-pressure economy. *Brookings papers on economic activity*, **1973**(1), 207–261.

Perry, George L. 1971. Labor Force Structure, Potential Output, and Productivity. *Brookings papers on economic activity*, **3**(3), 533–578.

Unemployment projections



UNEMPLOYMENT AND PARTICIPATION CYCLES



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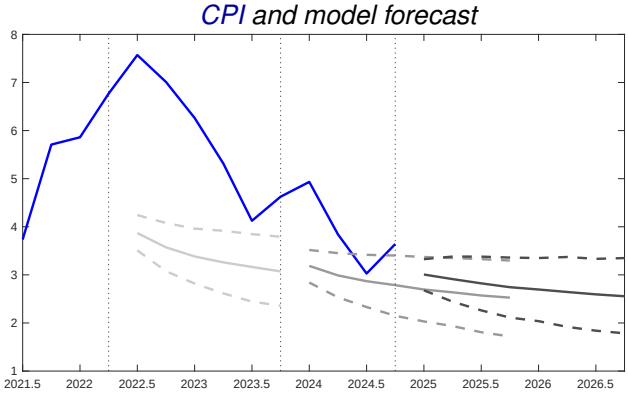
Is the Model Useful? Inflation Forecast Since 2022



- Forecasts taken in 2022Q2, 2023Q3 and 2024Q4 respectively
- Model forecast predicts sluggish inflation adjustment since 2022

Back

Discussion of "Assessing Maximum Employment: A Flow Based Approach"

Erik Hurst

Thomas Laubach Conference

Federal Reserve Board

May 2025

Overview

- I agree strongly with the points Aysegul made regarding the usefulness of a flow-based framework to evaluate real-time short falls from maximum employment.

- My goal is to provide some complementary discussion.

- Launching off point for my comments:
  - Job finding and job filling are done by both the unemployed (U-E flows) and by the employed (*E-E flows*).

- *If we want to learn about future real wage and inflation pressures, the composition between E-E hires and U-E hires can be informative.*

Comment 1:
Caution against blindly using V/U ratio in New Keynesian models

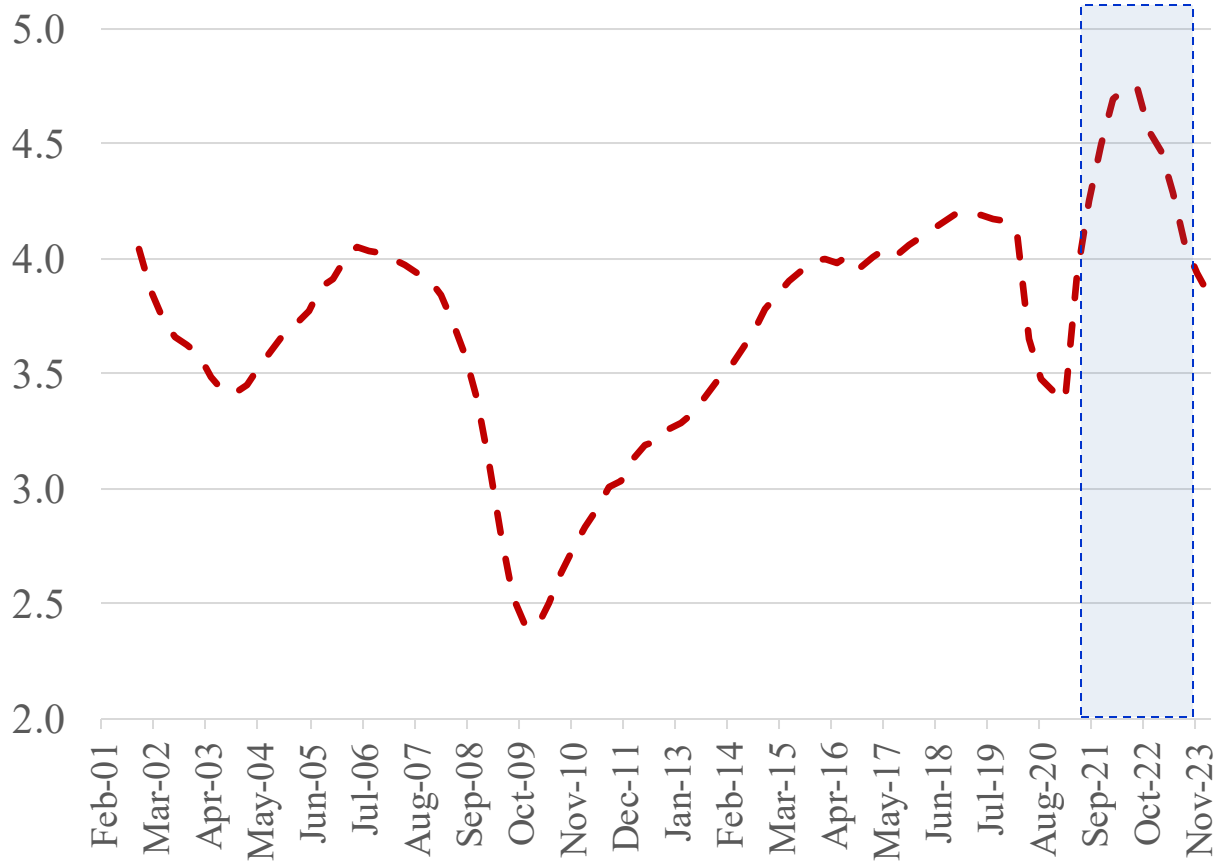
Echo Aysegul and Stefano's Comment from Paper

"Lastly, in our view the vacancy rate, on its own, should not be interpreted as a pure measure of labor demand since its fluctuations also reflect changes in job-filling and worker turnover rates. Therefore, using V/U, as recently has been suggested, as a better measure of labor market tightness could be misleading.." (page 29)

- New Keynesian researchers have been pushing the use of the V/U rate in Phillips curve models. $\uparrow V/U \rightarrow \uparrow W/P \rightarrow \uparrow \pi$ *(with sticky prices)*

- Macro-Labor researchers have been consistently warning against using V/U in such a way. See: Afrouzi, Blanco, Drenik and Hurst (2025), Moscarini and Postel-Vinay's (2023), Bagga, Mann, Sahin and Violante (2025), and Cheremukhin and Restrepo-Echaverria (2023)

Quarterly E-E Flows Since 2000 (LEHD)



- In 2022, the E-E rate was at its highest level since 2000.
- In 2022, the E-E rate was about 20% higher than prior peeks.
- In 2022, not much change in the U-E rate relative to pre-2020 periods (or flows to/from out of labor force).

Potential Drivers of Increasing E-E Flows Relative to UE Flows

1. *Sectoral productivity shifts*: Some sectors get more productive than others (spirit of Moscarini and Postel-Vinay) ↑ ***Real Wage & Price Pressure***

2. *Sectoral amenity shifts*: Some employers allow working from home. Workers re-sort within labor market in response to some employers allowing this option. (Bagga et al.). ↓ ***Real Wage & Price Pressure***

3. *The inflation itself causes additional churn*: Models of worker sorting with sticky wages implies that bursts of inflation cause additional worker E-E flows. (Afrouzi et al.). ↔ ***Real Wage & Price Pressure***

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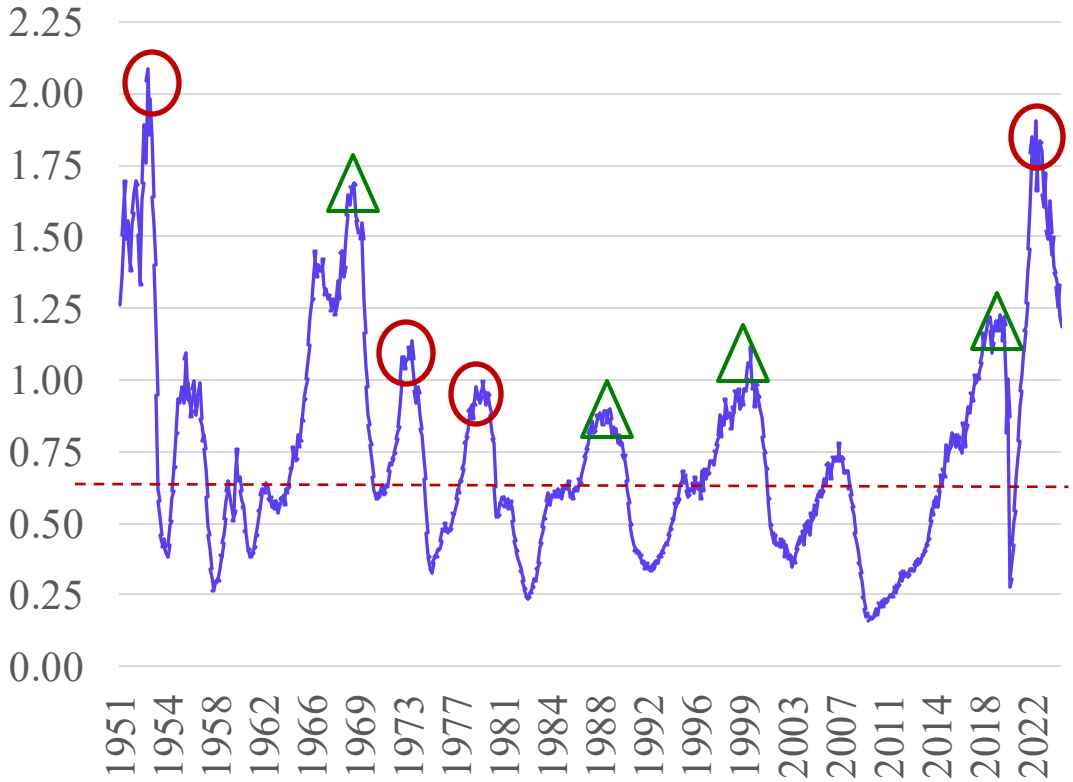
- *Data suggests that stories (2) and (3) were important during the recent 2021-2023 period.*

Inflation and Labor Market Flows: An Identification Problem

- **Common narrative**: Labor market flows predict upward pressure on wages and prices. ($\uparrow V/U \rightarrow \uparrow \pi$)
- **Reverse causality**: Inflation causes upward pressure on labor market flows. ($\uparrow \pi \rightarrow \uparrow V/U$)
- **Intuition for the latter**: Endogenous worker flows with sticky wages. Inflation lowers real wages incentivizing workers to search for a new job.
- *This is the framework in Afrouzi et al. (2025). Identification problem is much worse during periods of "aggregate supply shocks".*

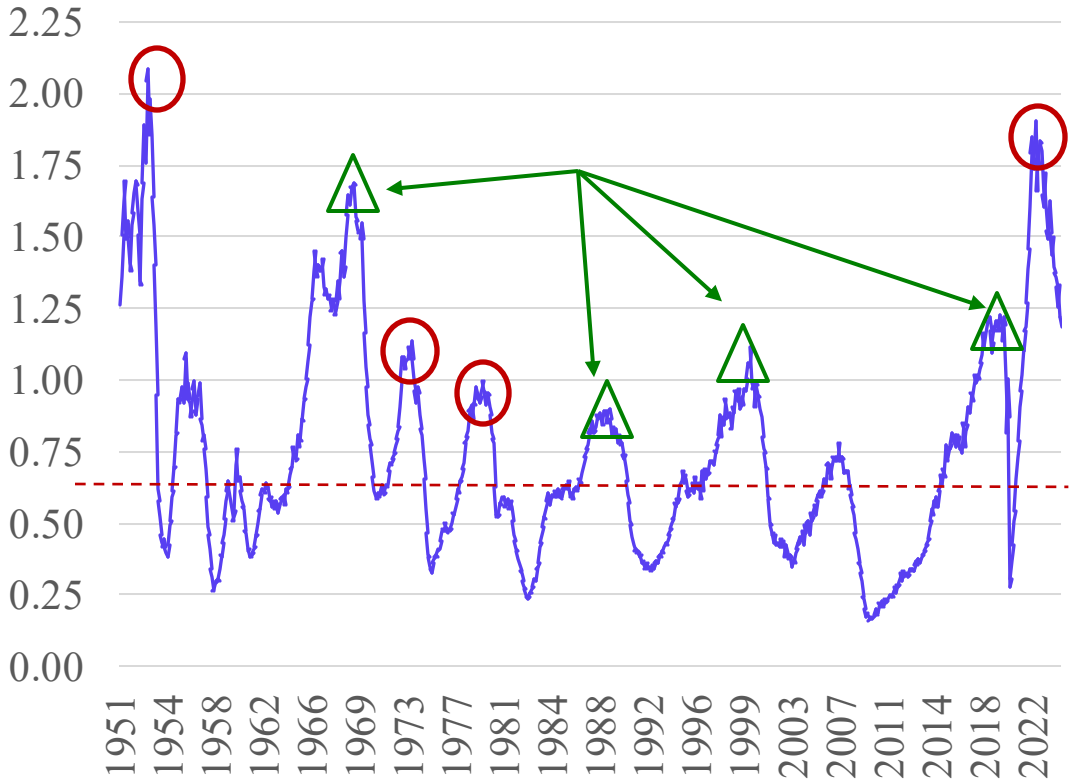
Comment 2:
Flow data can be useful in identifying underlying shocks driving the aggregate economy.

Vacancy-to-Unemployment Rate Over Time



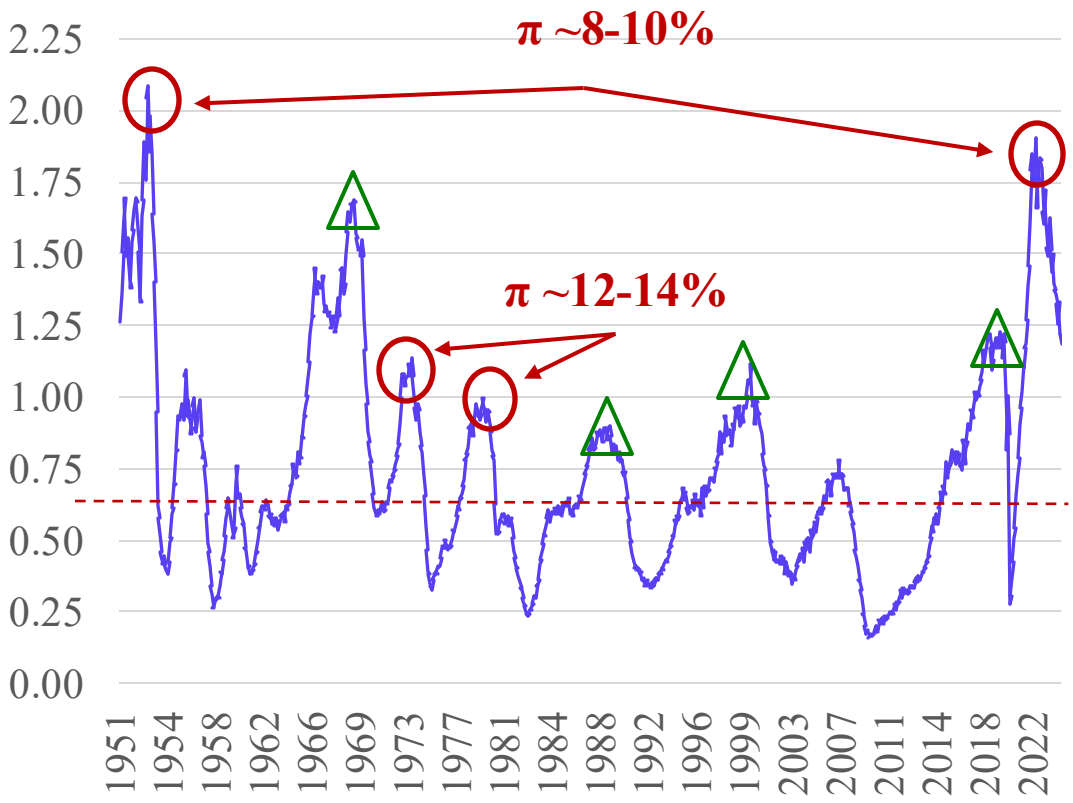
- Use vacancy data from Conference Board's Help Wanted Index for 1951-2000 (Barnichon (2010))
- 9 periods since 1950 with spikes in the V/U rate

Vacancy-to-Unemployment Rate Over Time



- **Green triangles**: Periods where the economy:
  - **Is moving along a relatively stable Beveridge curve.**
  - Has a sharply declining unemployment rate as the V/U rate increased sharply.
  - Has low and relatively stable inflation throughout the period when V/U was increasing.

Vacancy-to-Unemployment Rate Over Time



- **Red Circles**: Periods where:
  - **The Beveridge curve shifted upward**
  - Unemployment declined only slightly while the V/U rate was increasing sharply.
  - Inflation was rising sharply at the same time that V/U was increasing. (Inflation rates in all these periods exceeded 8% at some point)

Shifts in "Price Phillips Curve" and Shifts in Beveridge Curve

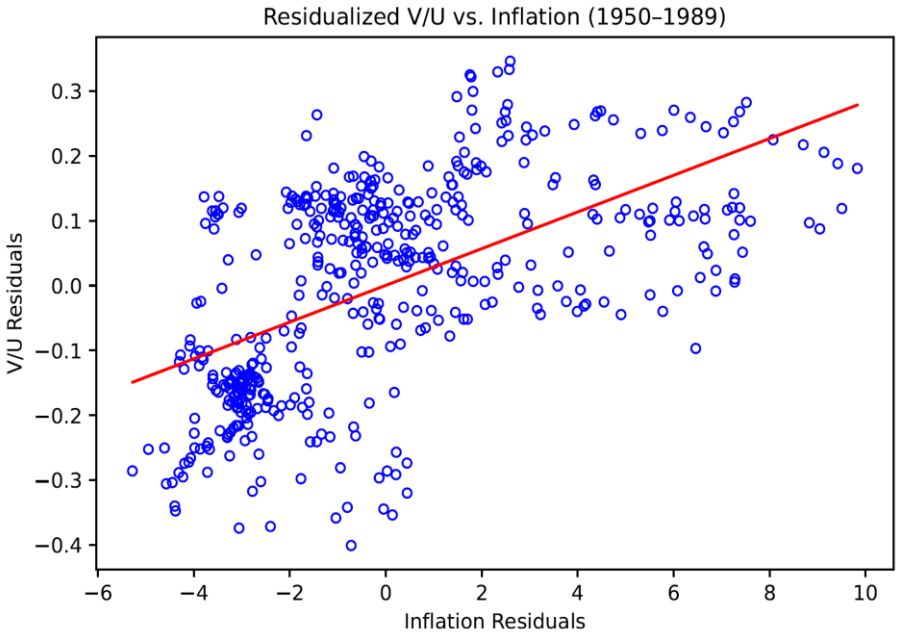
- Estimate the following two simple regressions on data from a given period:

  1. $\pi_t = \alpha_\pi + \beta_1 u_t + \beta_2 u_t^2 + \varepsilon_\pi$ (Simple "Phillips Curve")
  2. $v/u = \alpha_{v/u} + \gamma_1 u_t + \gamma_2 u_t^2 + \varepsilon_{v/u}$ (Beveridge Curve)

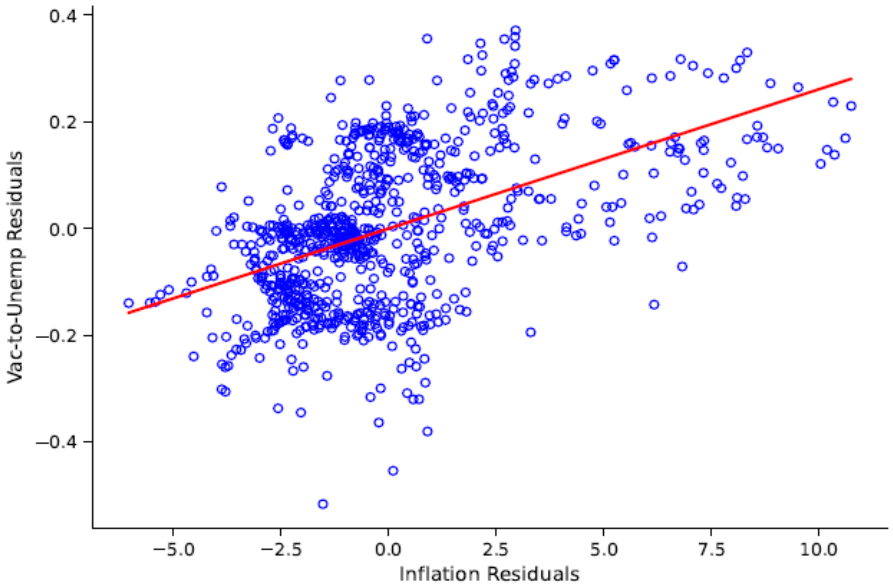
- Take residuals from both equations – represent "shifts" in the respective curves.

- ***Ask the questions***: *(i) Are the ε_π's and the $\varepsilon_{v/u}$'s correlated?*
  (ii) Can "aggregate supply shocks" explain some of the correlation?

Correlation of Errors in Phillips Curve (ε_π) and Beveridge Curve ($\varepsilon_{v/u}$)



Time Period: 1950-1989



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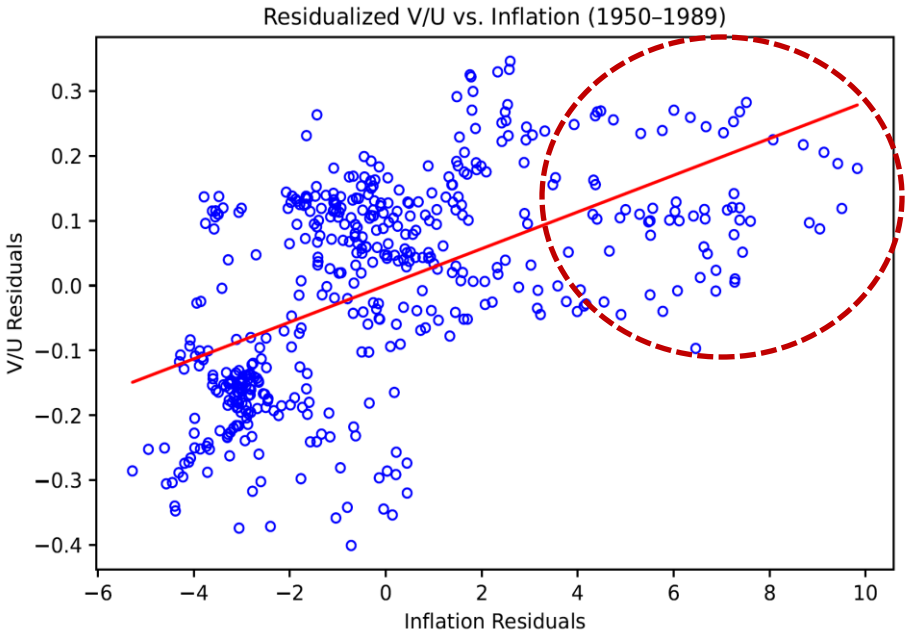

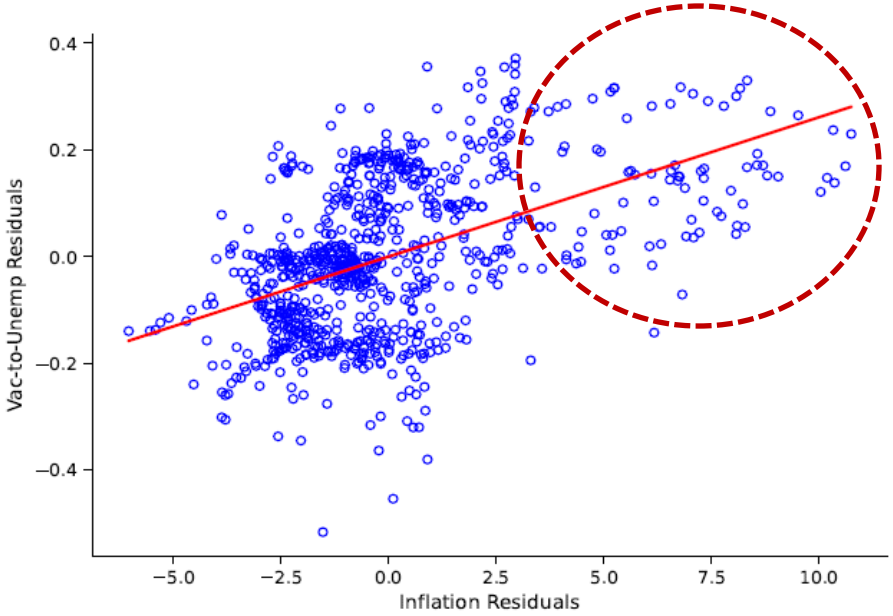

Time Period: 1950-1989

Time Period: 1950-2019

Red Circles Contain Points from early 1950s, mid-1970s, and late 1970s

"Supply Shocks" Systematically Cause Shifts in Both the Philips Curve and the Beveridge Curve

	1950-1989		1950-2024	
	OLS	IV	OLS	IV
Inflation Residual	0.028 (0.002)	0.015 (0.004)	0.035 (0.002)	0.021 (0.005)

Regress: $\varepsilon_{v/u} = \psi_0 + \psi_1 \varepsilon_\pi + \eta$

Instrument: *Use oil price movements to instrument for* ε_π

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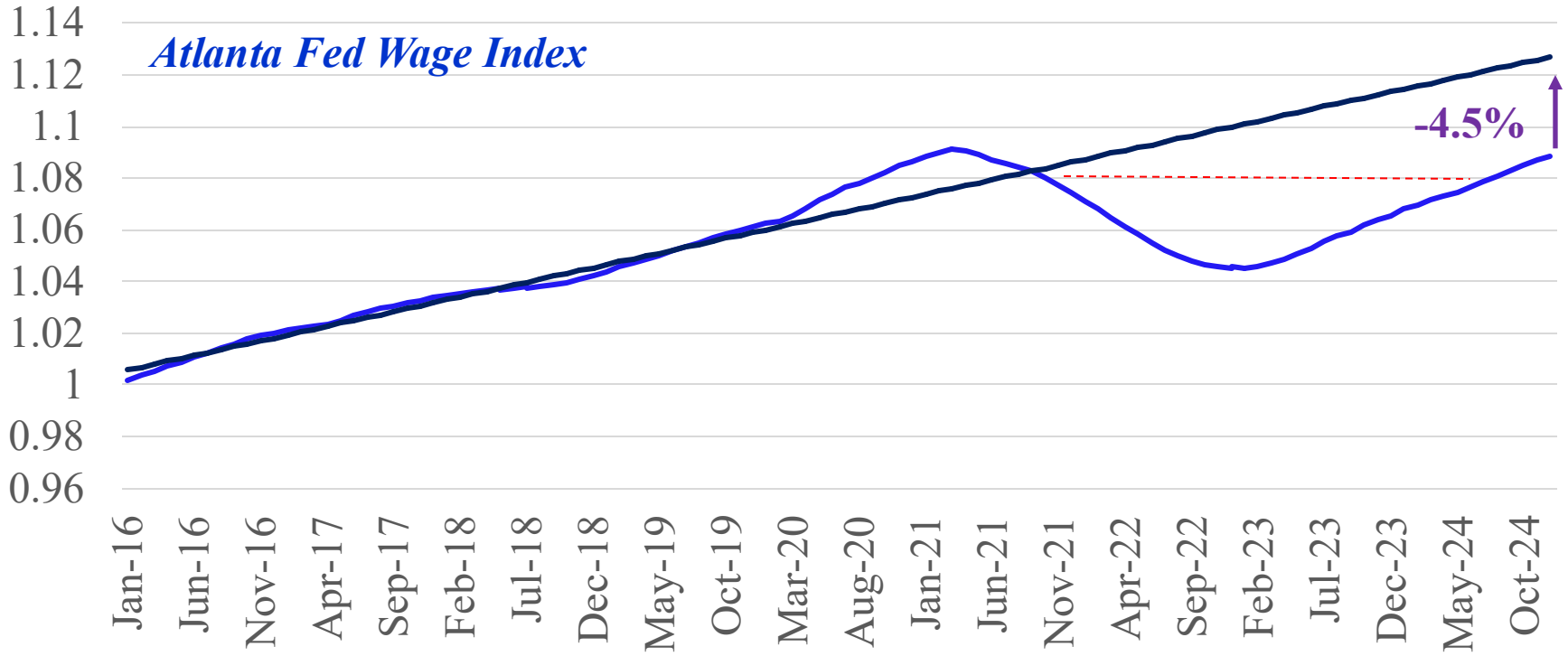
Instrument: *Use oil price movements to instrument for* ε_π

Conclusion: *Periods of supply shocks are associated with shifts in both Phillips Curve and Beveridge Curve*

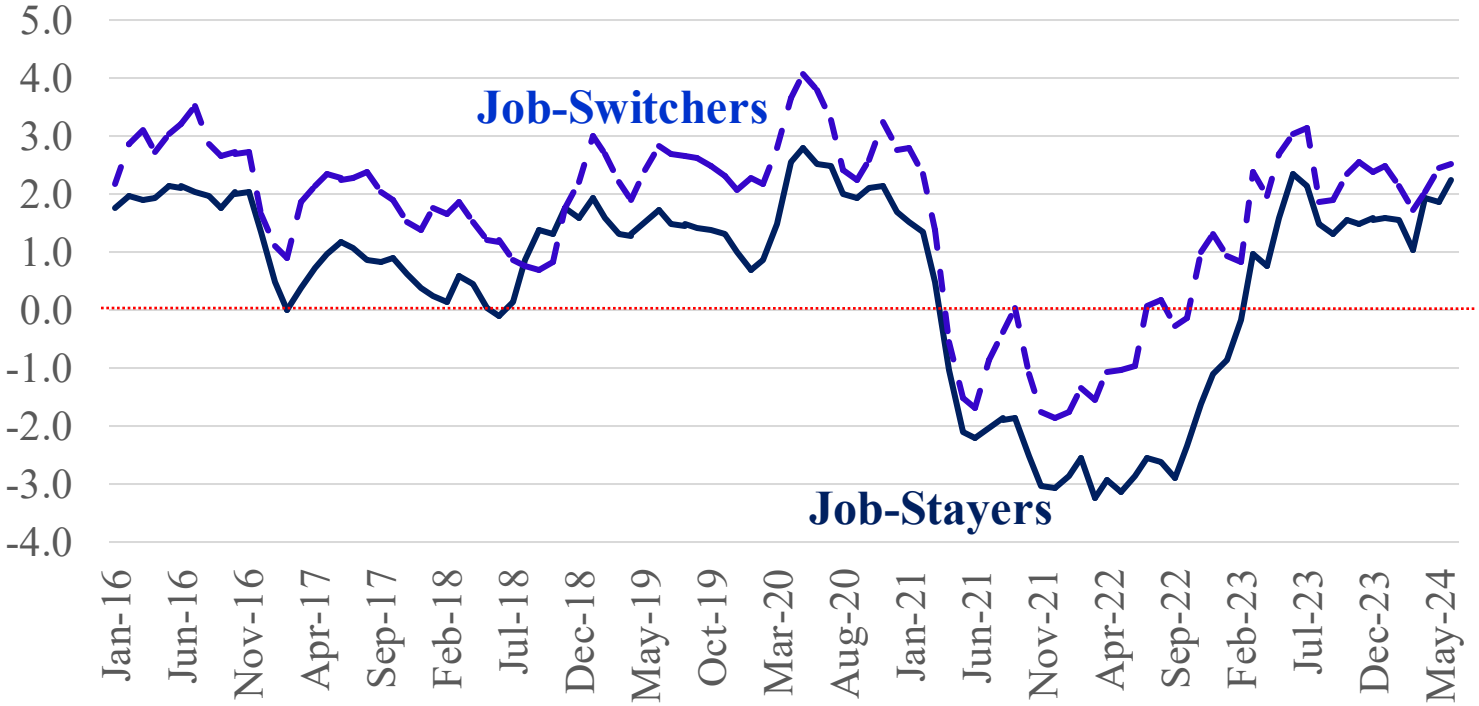
Comment 3:
Wage data can be informative about future price pressures when combined with flow data.

Real Wage Index 2016M1-2024M12



- **"Hot Labor Market"? Real wages fell sharply as V/U rate spiked!**

Real Wage Growth of Switchers vs Stayers



- *Data from Atlanta Fed Wage Tracker. Real wages of both fell – More so for job-stayers!*

Vacancy Increase and Real Wage Declines Pervasive Across Sectors

	% Change in Vacancies	% Change in Real Wages
Manufacturing	94%	-2.3%
Education and Health	76%	-3.7%
Leisure and Hospitality	64%	-1.5%
Trade and Transportation	60%	-1.6%
Construction and Mining	50%	-3.0%
Finance and Bus. Services	47%	-2.3%

- Columns 1 and 2: JOLTS Data, Compare 2016M1-2019M12 avg. to 2021M4-2023M5 avg.
- Column 3: Atlanta Fed Data, Compare 2021M4 to 2023M5

Concluding Thoughts

- Labor market flows can be informative of potential future inflationary pressures.
- Need to distinguish between E-E flows and U-E flows when thinking about potential future price pressures.
- Periods of aggregate supply shocks can cause both shifts in Phillips curves and Beveridge curves.
- Information in real wage movements (overall, by group, between job-stayers and job-changers) can help distinguish the causes of changes in labor market flows.

Session 1: Labor Market and Maximum Employment

Q&A

Moderator: Stephanie Aaronson, Federal Reserve Board
Presenter: Ayşegül Sahin, Princeton University
Discussant: Erik Hurst, University of Chicago Booth School of Business

Thomas Laubach
RESEARCH CONFERENCE