# $u^* = \sqrt{uv}$

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October 2023

Available at https://pascalmichaillat.org/13/

# US GOVERNMENT'S EMPLOYMENT MANDATE

- Employment Act of 1946
  - "policy and responsibility of the federal government…to promote maximum employment, production"
  - vaguer, weaker requirement than full employment (Weir 1987)
- Federal Reserve Reform Act of 1977
  - responsibility of the Federal Reserve "to promote effectively the goals of maximum employment, stable prices"
- Full Employment and Balanced Growth Act of 1978
  - "policy and responsibility of the federal government to use all practicable means…in a manner calculated to foster and promote…full employment and production"

# HOW TO INTERPRET LEGAL CONCEPT OF FULL EMPLOYMENT?

- no official value or series for full employment
  - unlike inflation target of 2%
- Full Employment and Balanced Growth Act: $u^*$ = 4% in 1983
  - but not enforced ($u$ = 9.6% in 1983) and not explained
- Boston Fed's Rosengren (2014): $u^*$ = CBO's NRU
  - but just a slow-moving average $\rightsquigarrow$ not socially desirable
- Fed's Powell (2022): $u^*$ = NAIRU
  - but inconsistent with dual mandate
- FOMC (2012, 2023): $u^*$ is determined by "nonmonetary factors that affect the structure and dynamics of the labor market" and it "may change over time and may not be directly measurable"

## IN THIS PAPER:

- interpret full employment as efficient unemployment
  - allocation of labor that maximizes production (Hosios 1990)
  - given voluntary labor-force participation (Rees 1957)
- obtain easily applicable formula for $u^*$
  - simplification of Michaillat-Saez (2021) formula for US economy
  - can be applied to historical data
  - can be applied in real time
- argue that employment mandate might coincide with price mandate
  - divine coincidence appears in US data (Benigno, Eggertsson 2023)

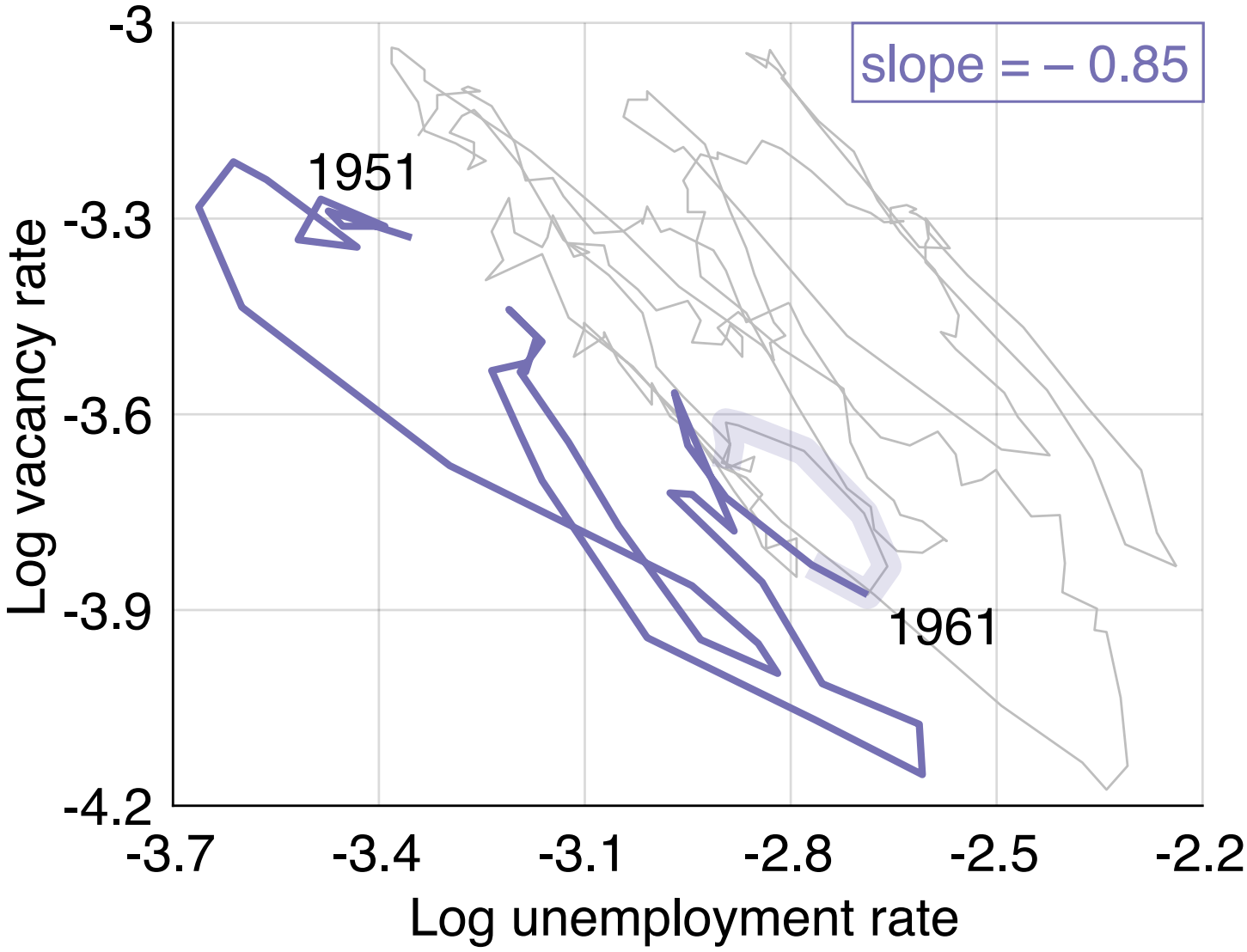
# THEORY OF FULL EMPLOYMENT

# COMPOSITION OF LABOR FORCE

1. share $u$ of labor force is unemployed
   - no home production (Borgschulte, Martorell 2018)
2. share $v$ of labor force is employed and recruiting
   - one worker per vacancy (National Employer Survey 1997)
3. share $1 - (u + v)$ of labor force is employed and producing

- labor force participation rate
- marginal attachment rate

# US BEVERIDGE CURVE ≈ HYPERBOLA




▸ Time series on log scale

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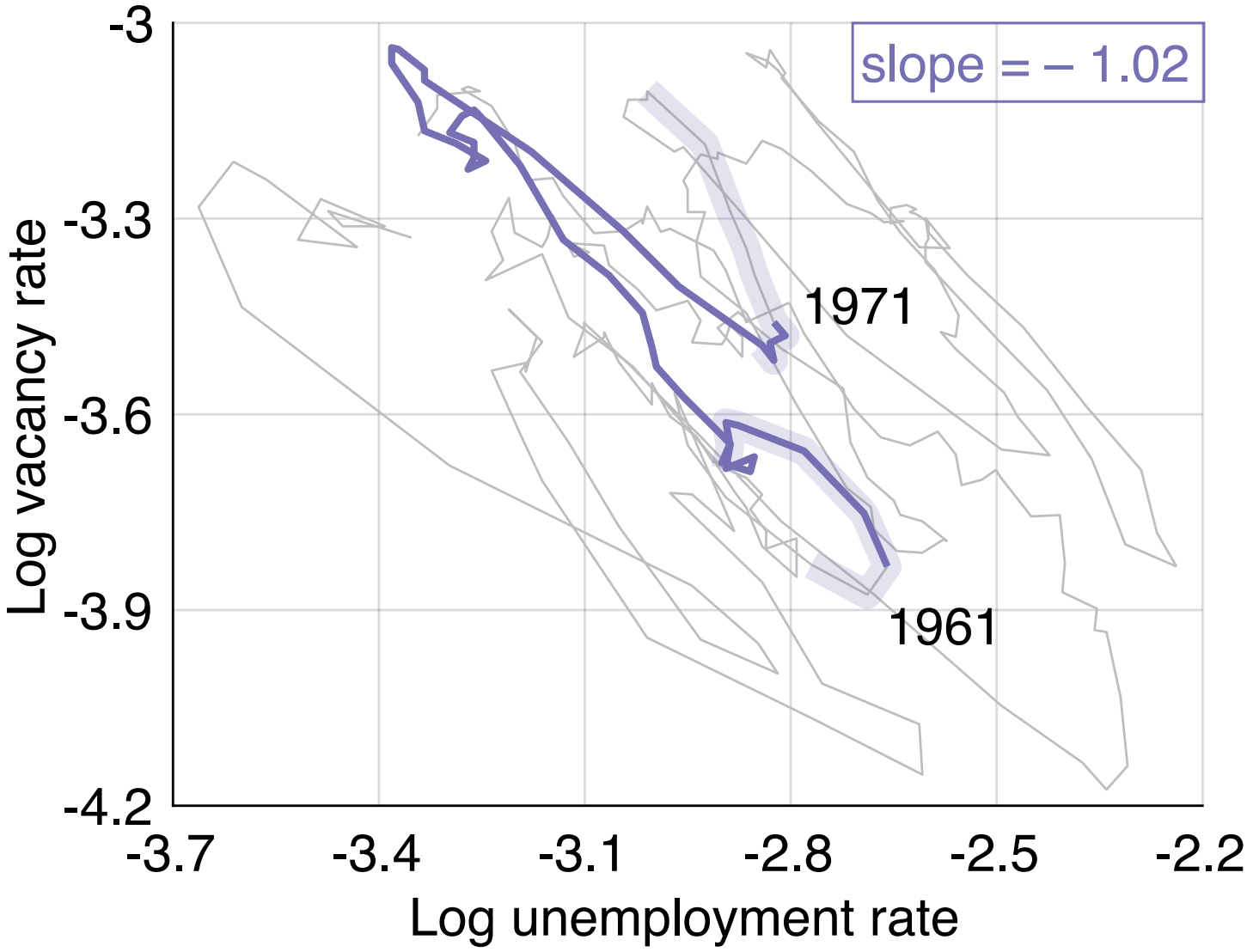


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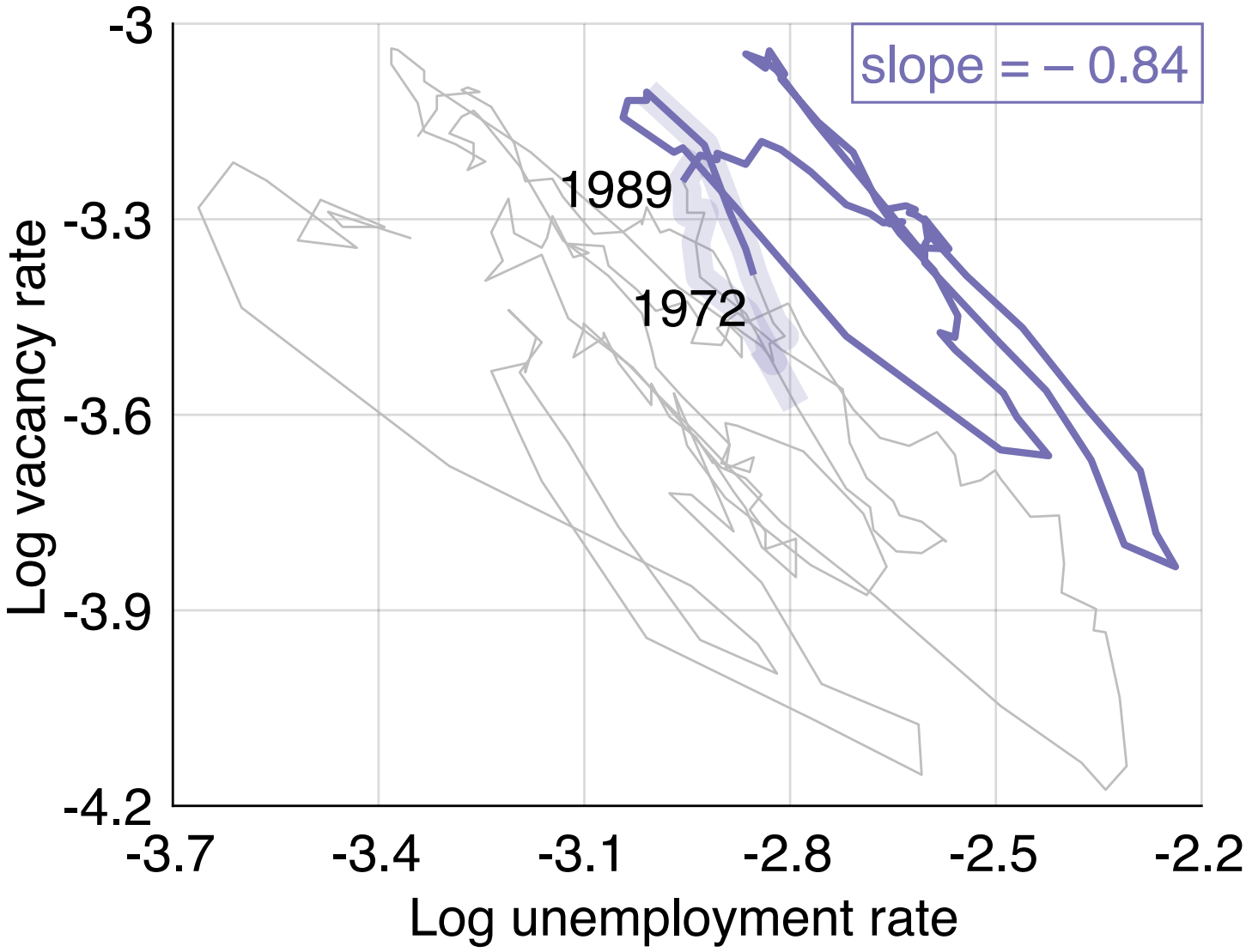


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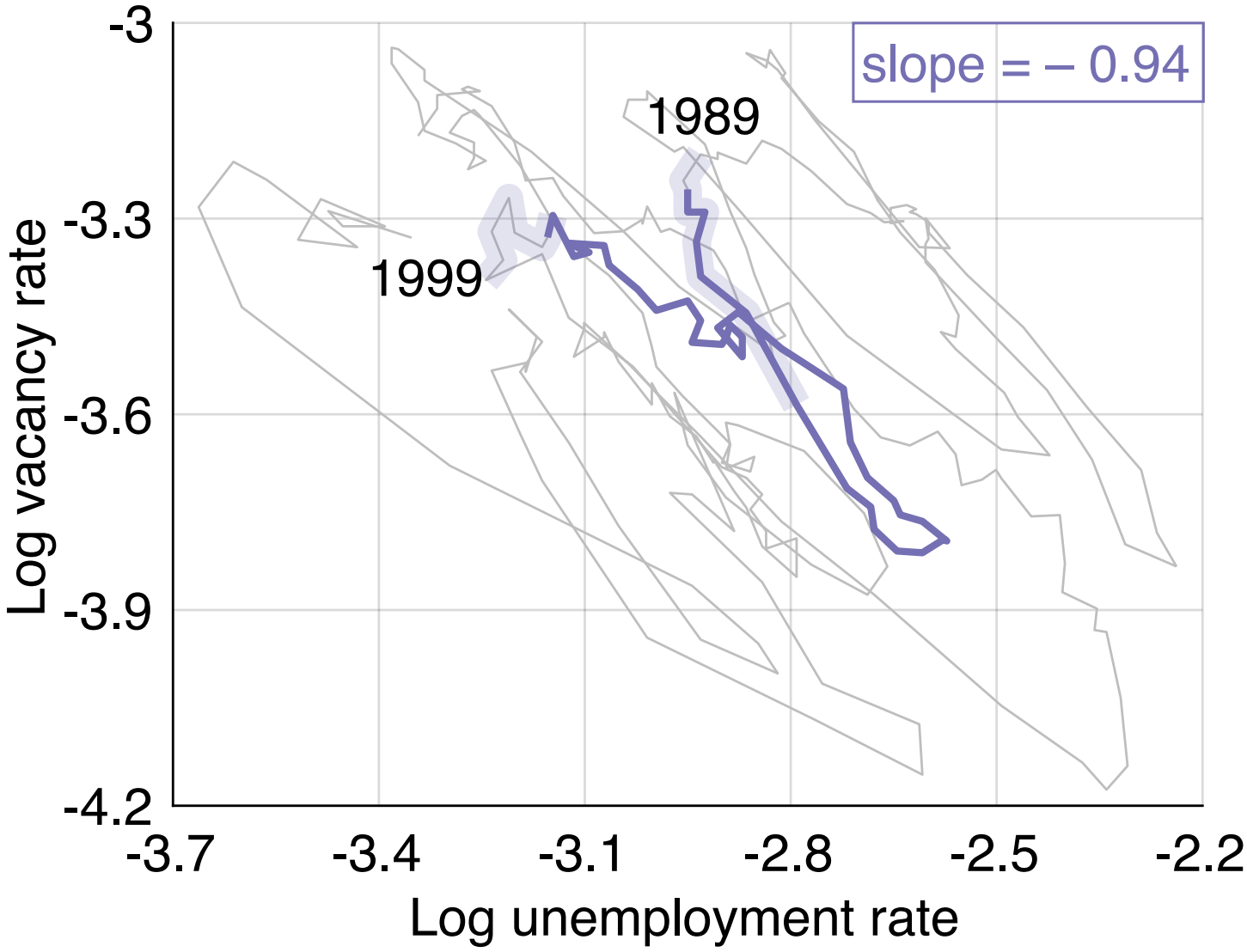


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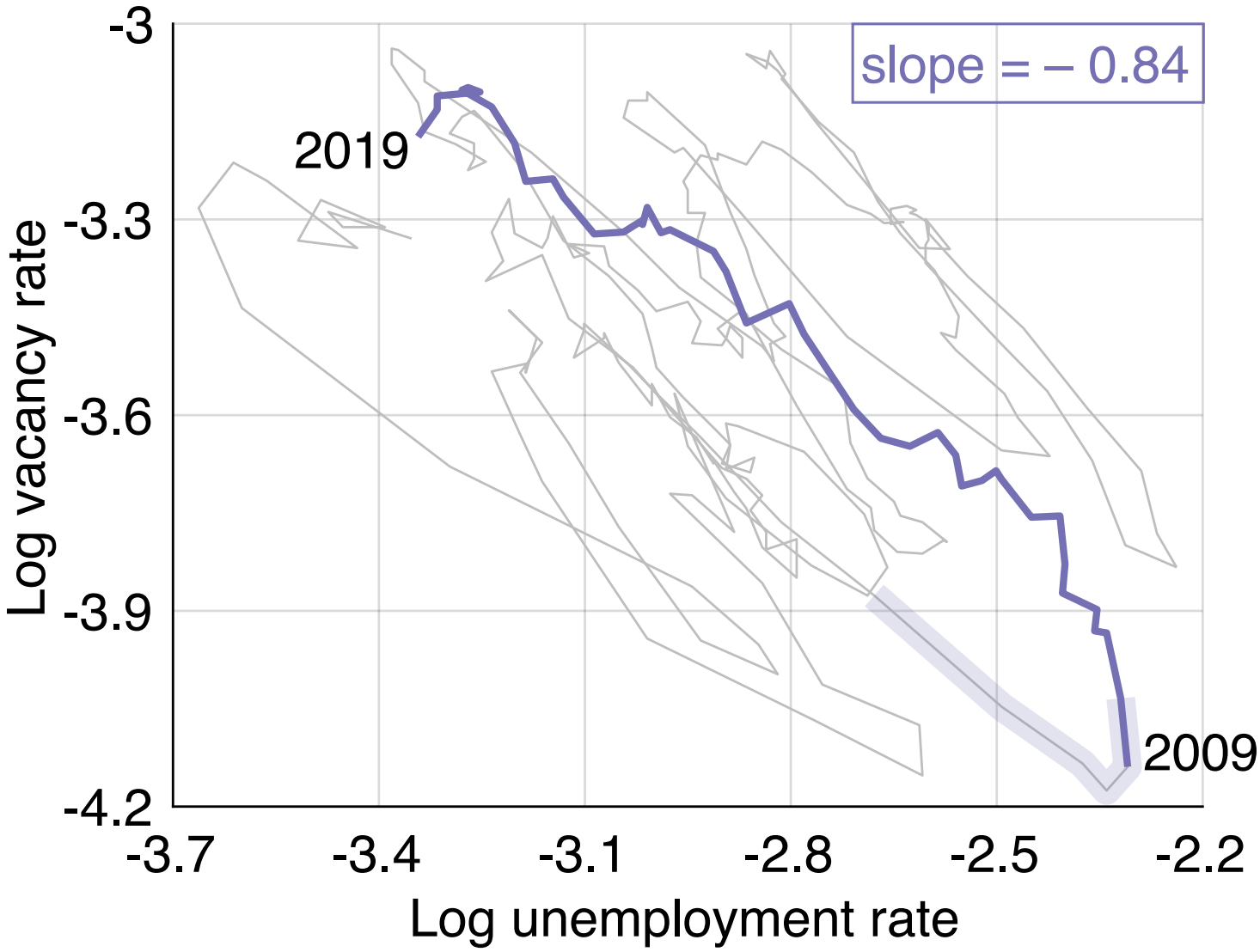



▸ Time series on log scale

# SOCIAL PLANNER MAXIMIZES PRODUCTION

- minimize nonproductive use of labor $u + v$
- subject to hyperbolic Beveridge curve $uv = A$
- unconstrained minimization with convex objective: $u + A/u$
- first-order condition is necessary and sufficient to find solution:

$$\frac{d[u + A/u]}{du} = 0 \implies 1 - A/u^2 = 0 \implies u = \sqrt{A}$$

- solution is efficient unemployment rate:

$$u^* = \sqrt{uv}$$

# CRITERION FOR FULL EMPLOYMENT, EFFICIENCY

- $u^* = \sqrt{uv}$ is full-employment, efficient unemployment rate
  - geometric average of $u$ and $v$
- economy is above full employment—inefficiently tight—when $u < u^*$
  - ⇝ inefficiently tight when $u < v$
- economy is below full employment—inefficiently slack—when $u > u^*$
  - ⇝ inefficiently slack when $u > v$

# THEORETICAL FOUNDATION FOR OLD IDEAS ABOUT FULL EMPLOYMENT

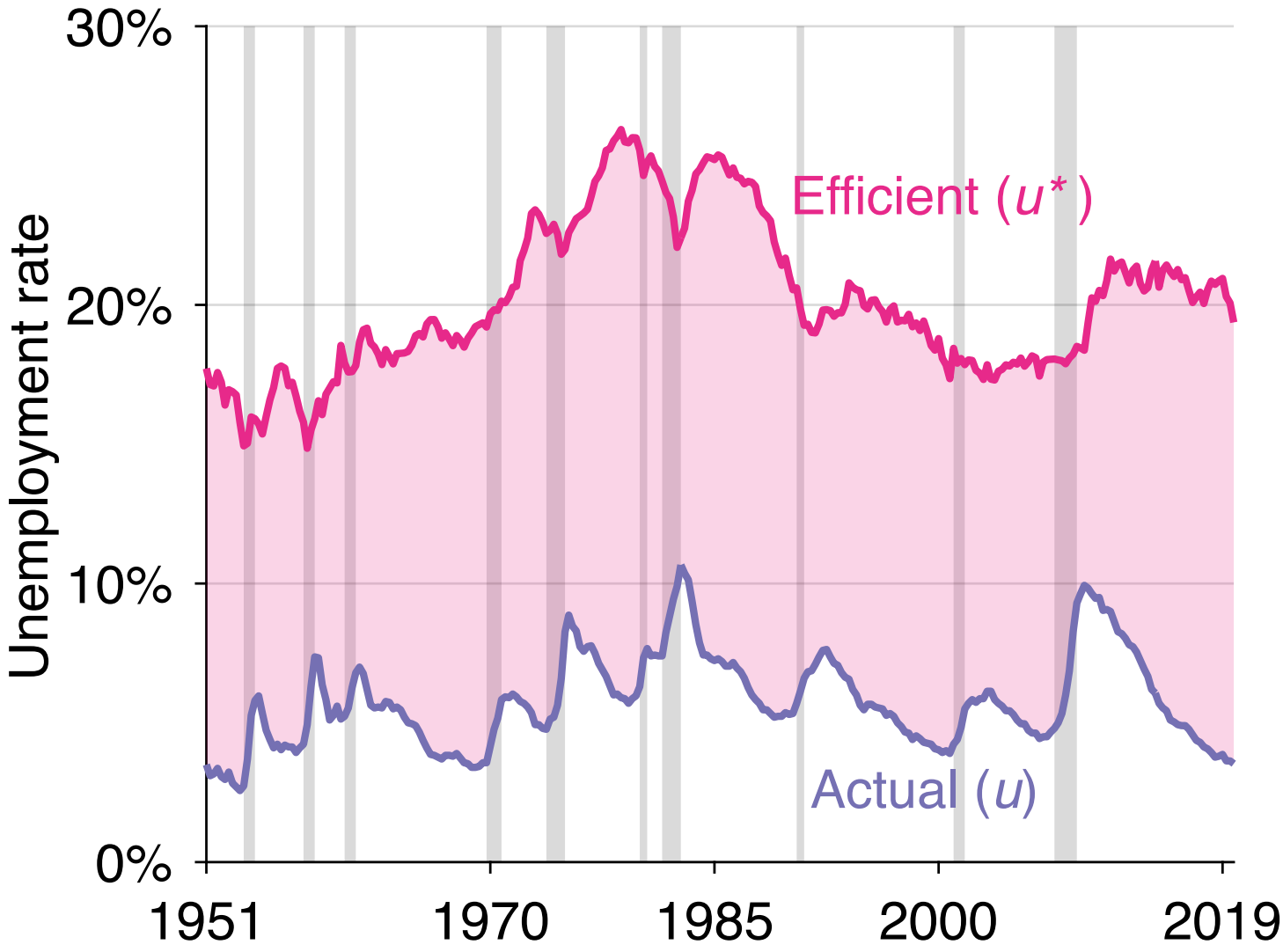
- Beveridge (1944) report
  - full employment when $u \leq v$
- US Bureau of Labor Statistics
  - flag when jobseekers per vacancy $u/v > 1$
- Japanese Ministry of Health, Labour, Welfare
  - monitor “balanced unemployment”, which occurs when $u = v$
- Fed’s Powell (2022)
  - a “pretty good number” is when $v/u = 1$

# MORE GENERAL FORMULA (MICHAILLAT, SAEZ 2021)

- home production per unemployed worker: $0 \to \zeta$
- # recruiters per vacancy: $1 \to \kappa$
- Beveridge curve: $v = A/u \to v = A/u^{\epsilon}$
- efficient unemployment rate:

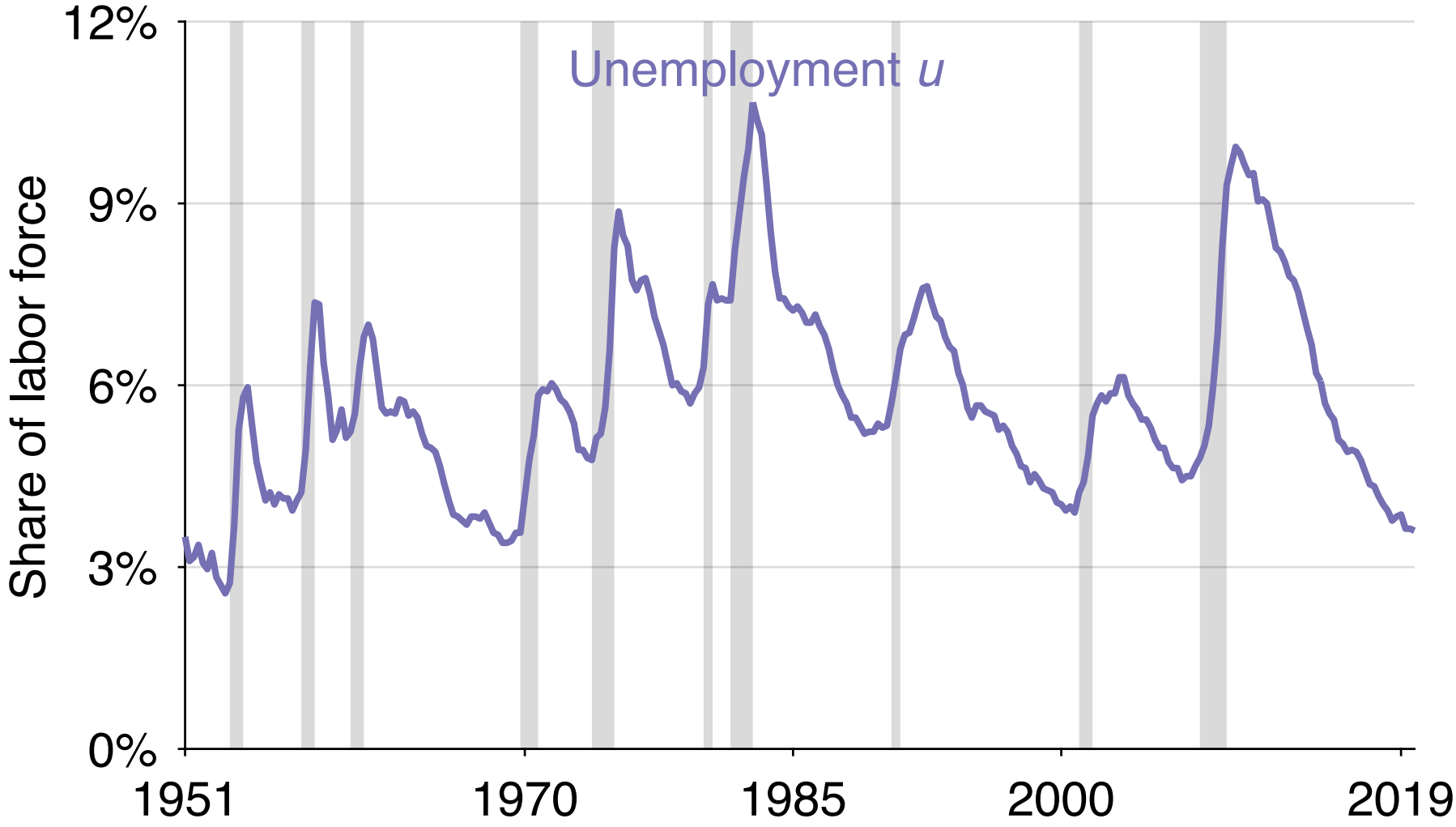
$$u^* = \sqrt{uv} \quad \to \quad u^* = \left( \frac{\kappa \cdot \epsilon}{1 - \zeta} \cdot v \cdot u^{\epsilon} \right)^{1/(1+\epsilon)}$$

# $u^*$ WITH $\zeta = 0.96$ (HAGEDORN, MANOVSKII 2008)

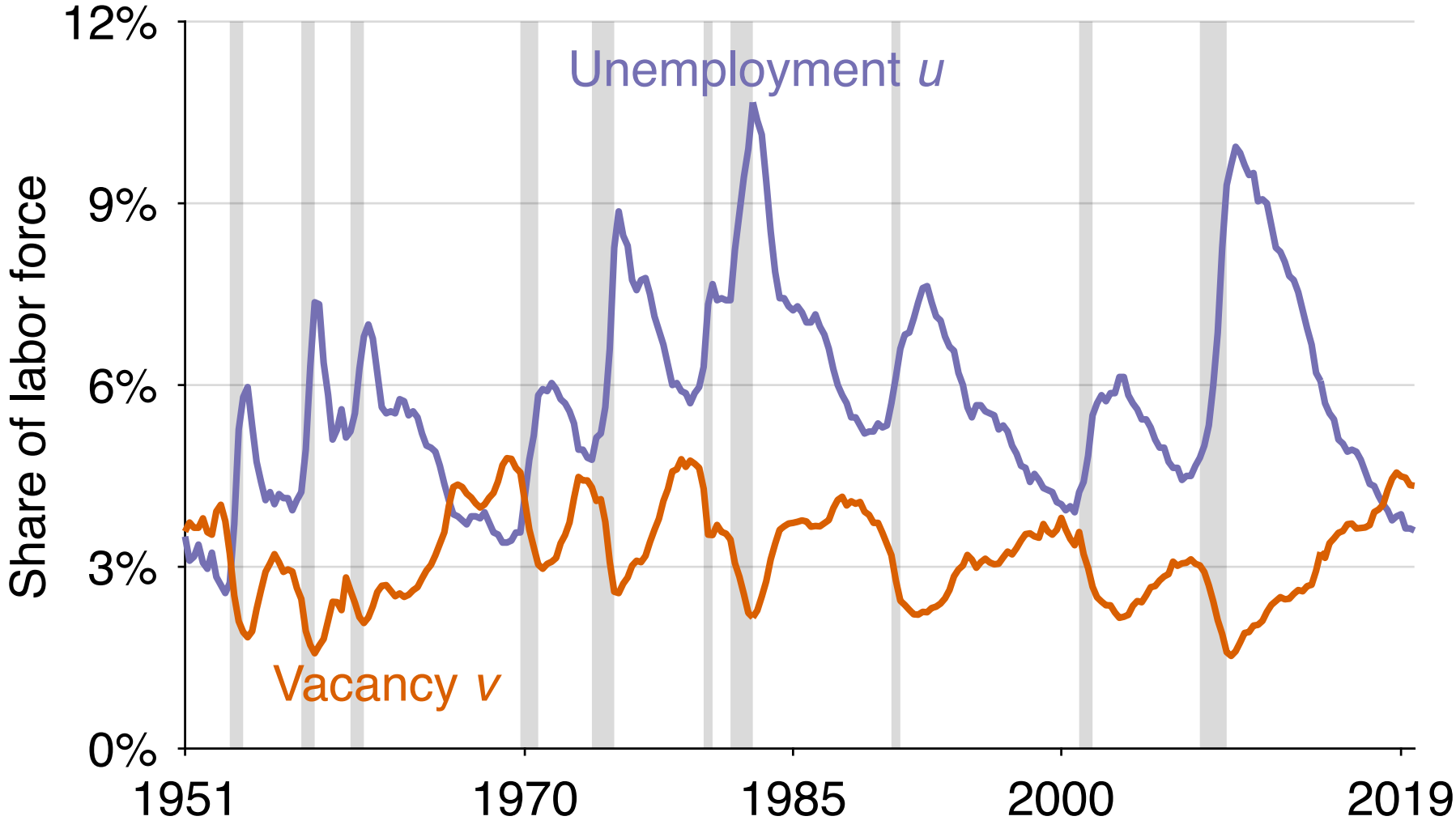


# POSTWAR IN THE UNITED STATES

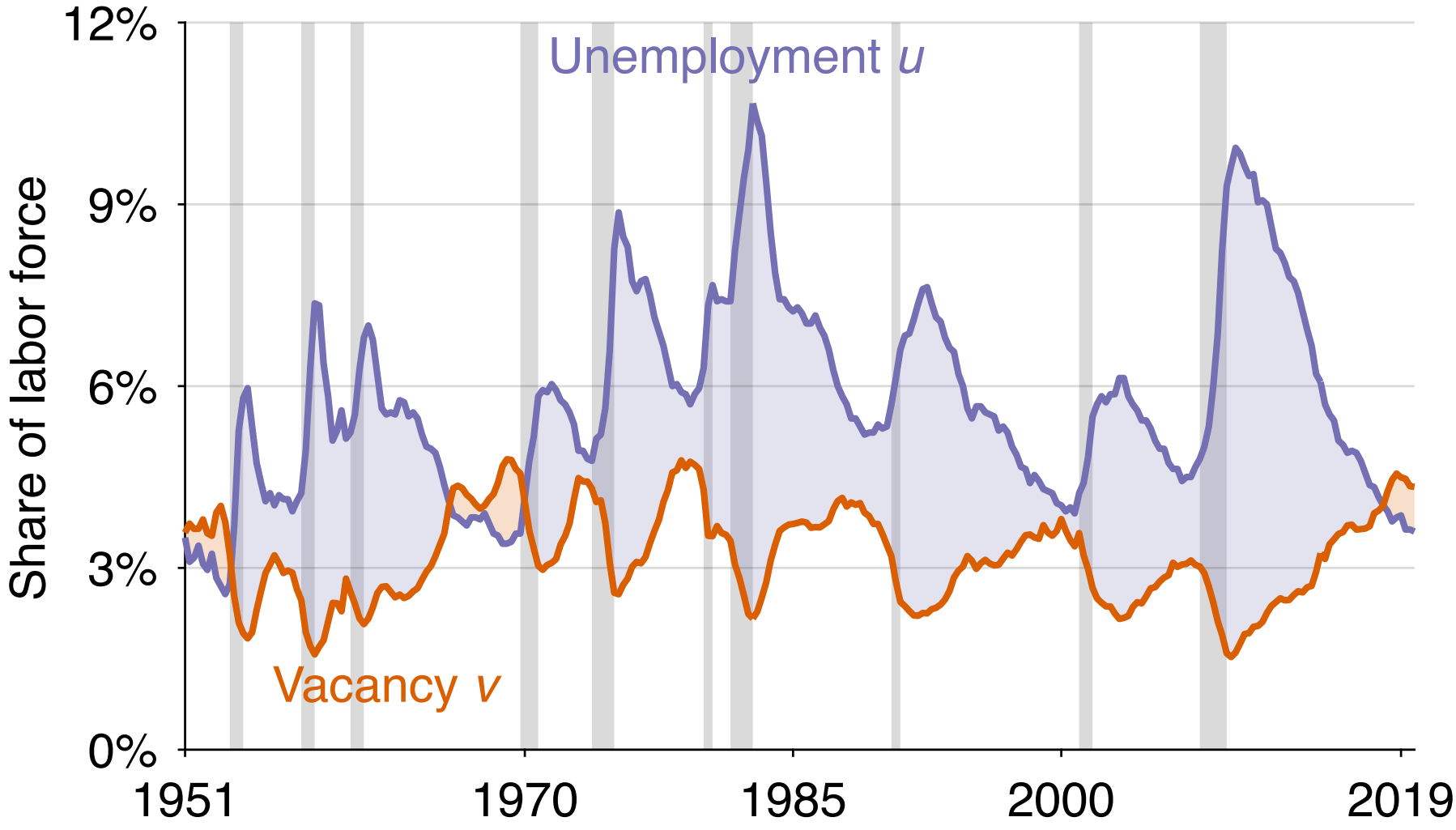
# UNEMPLOYMENT RATE (CPS)



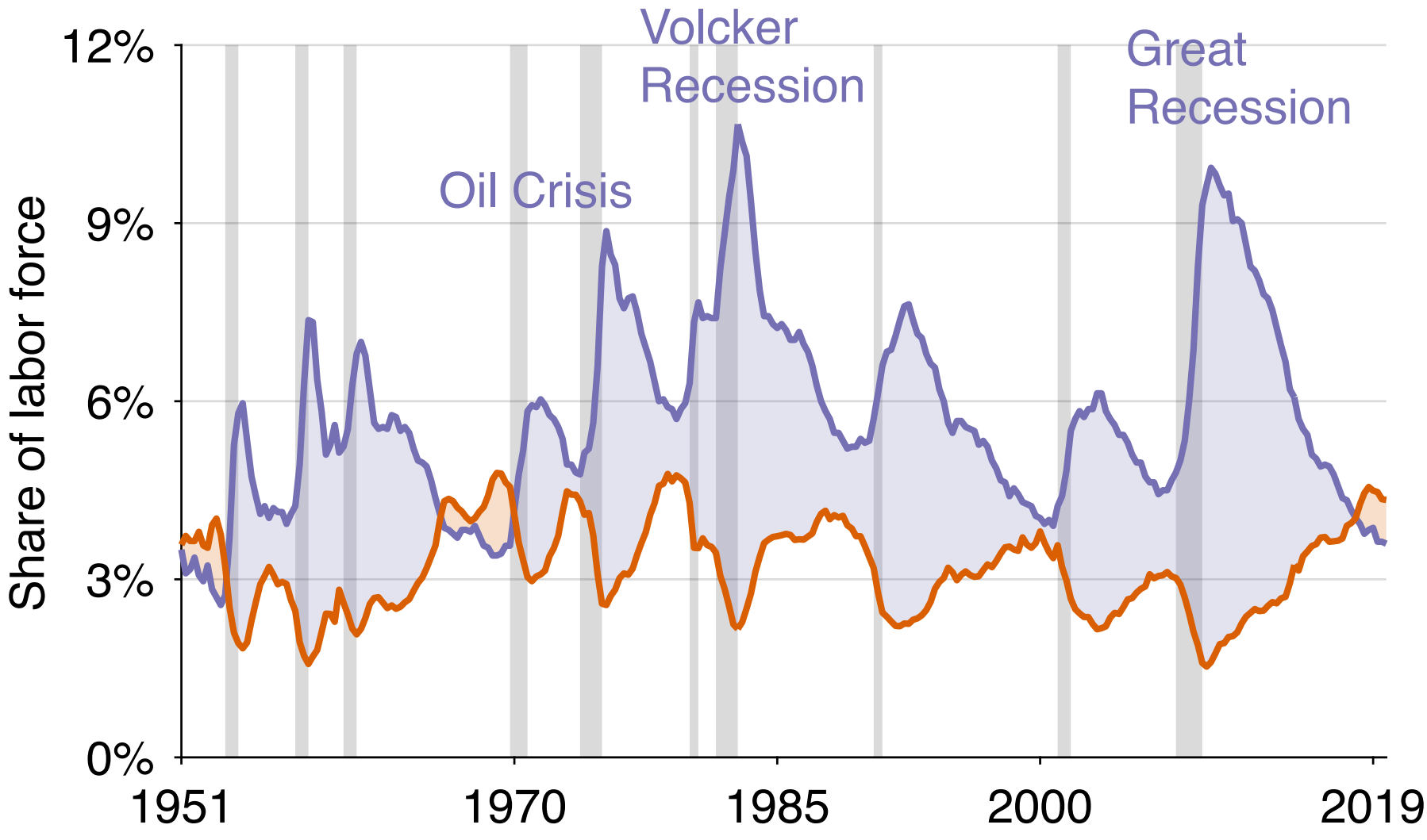
# VACANCY RATE (BARNICHON 2010, JOLTS)



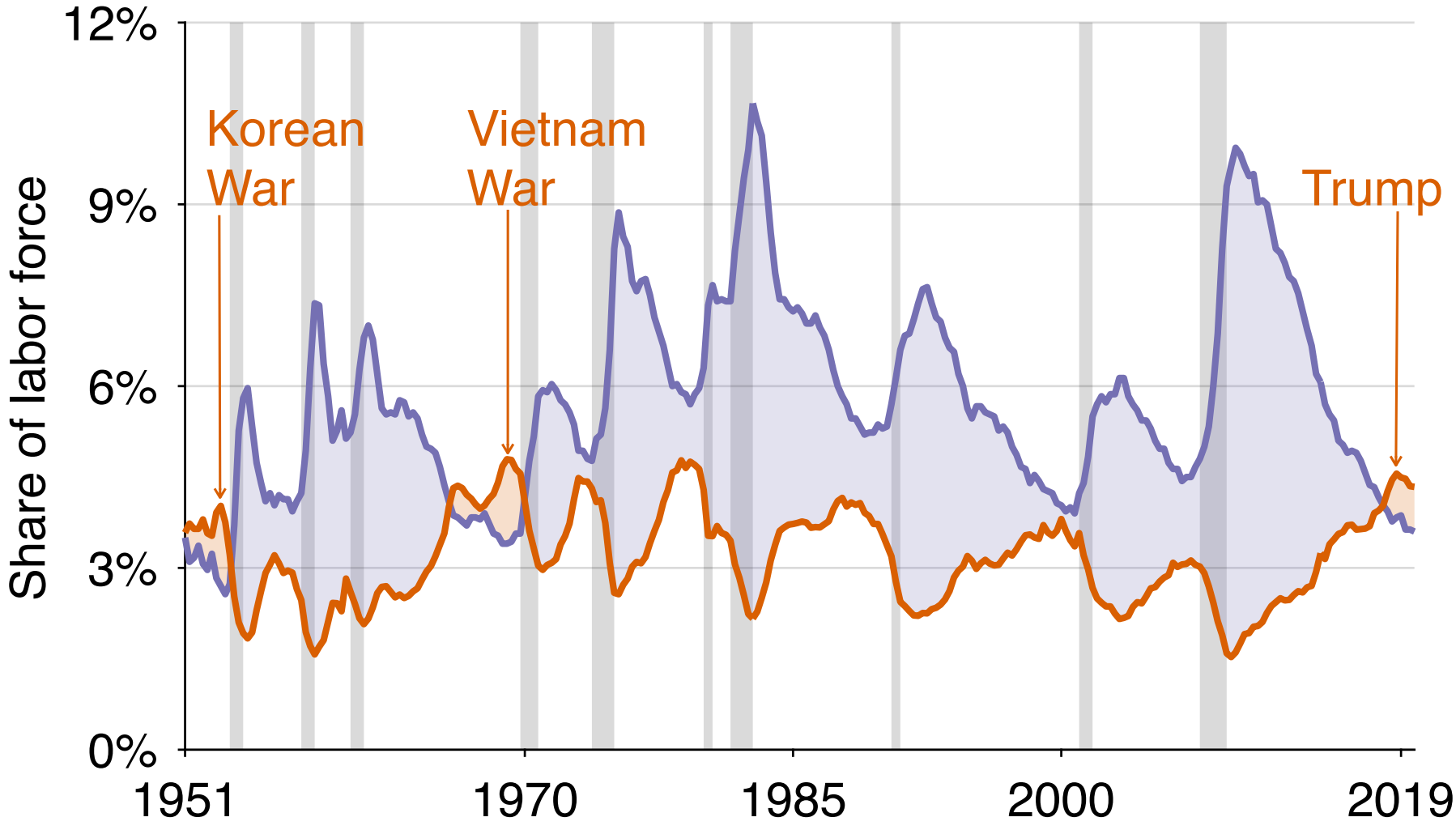
# LABOR MARKET IS GENERALLY TOO SLACK...



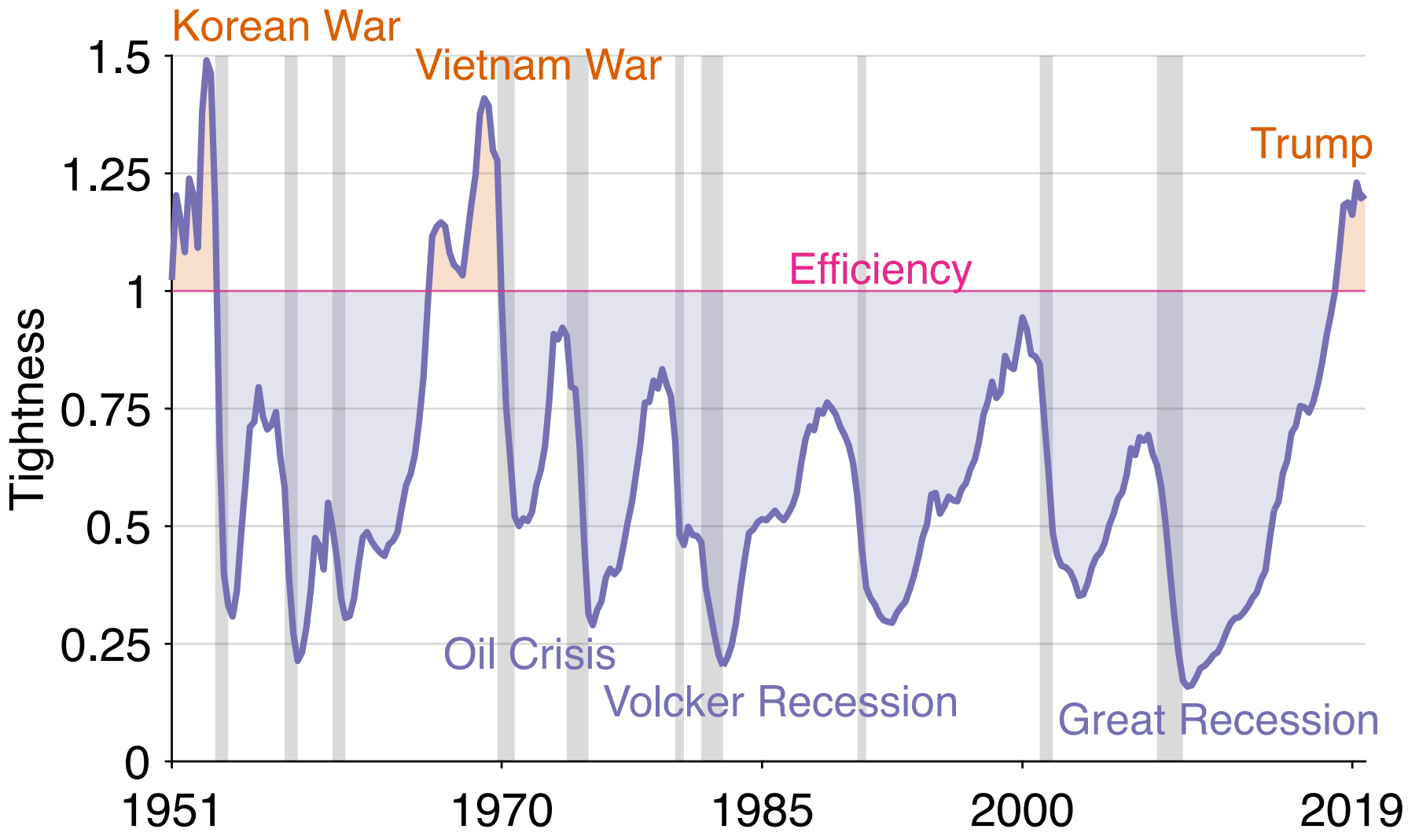
# . . . AND IS ESPECIALLY SLACK IN SLUMPS



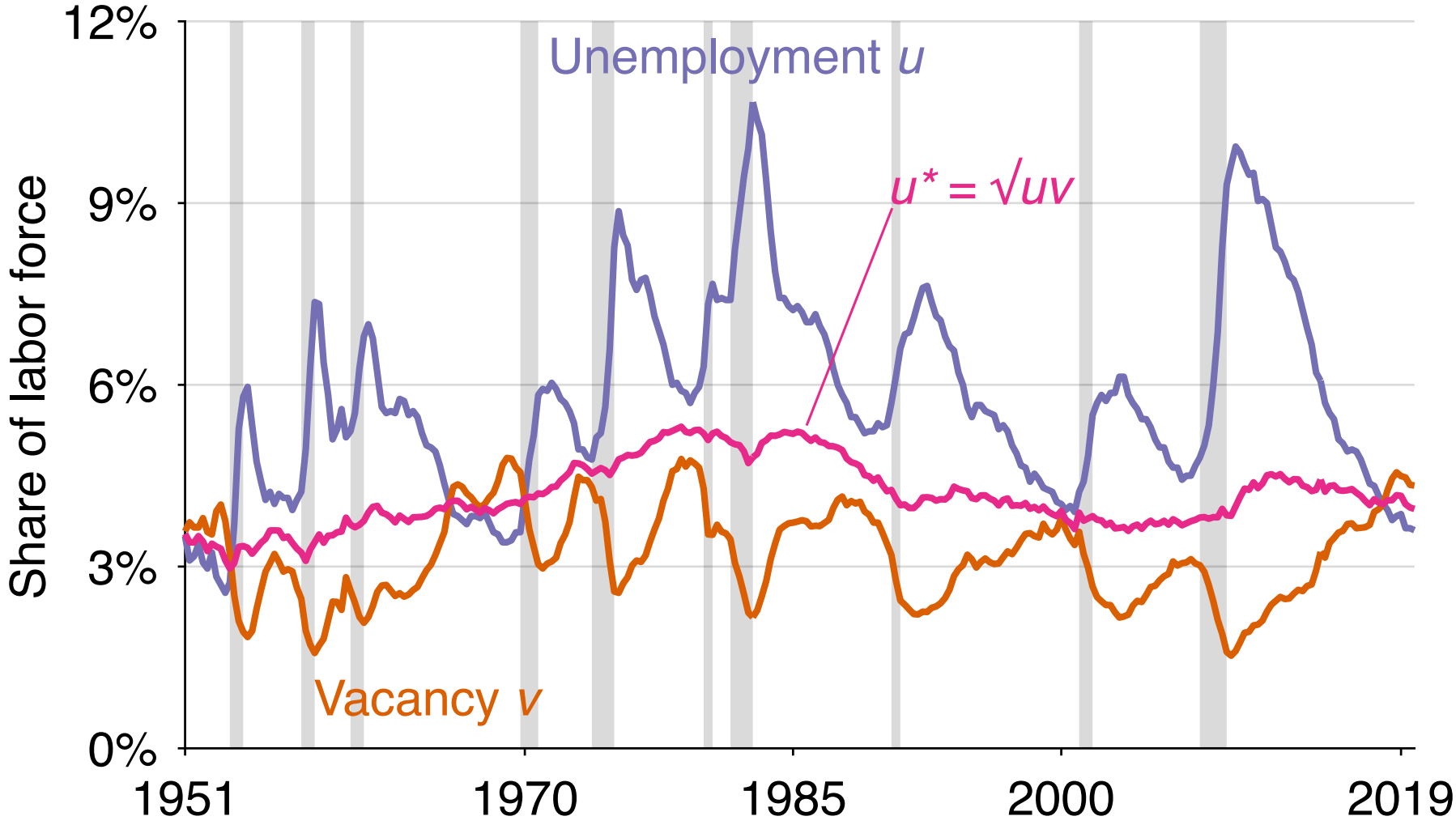
# LABOR MARKET IS TOO TIGHT DURING WARS



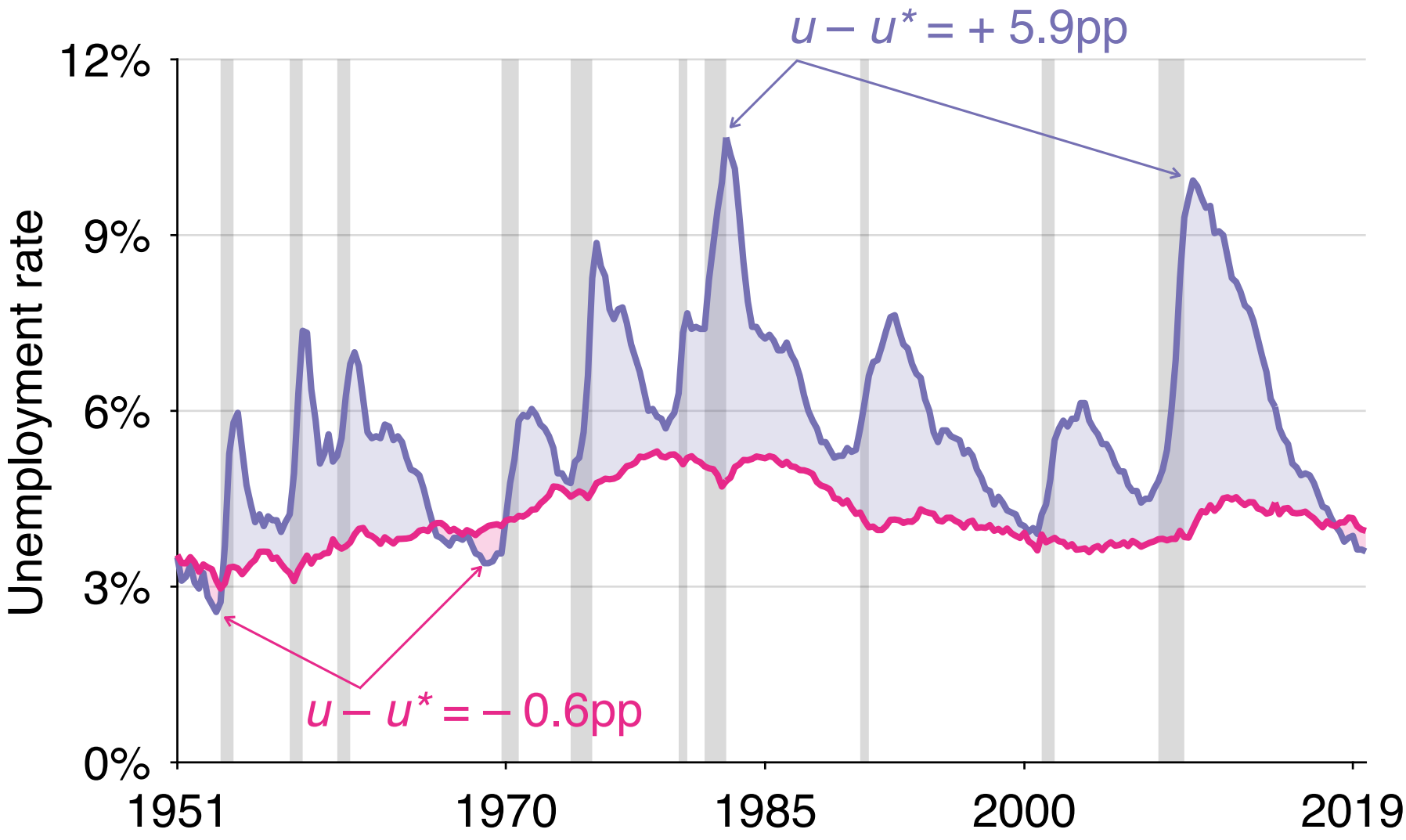
# TIGHTNESS $v/u$ SUMMARIZES STATE OF LABOR MARKET



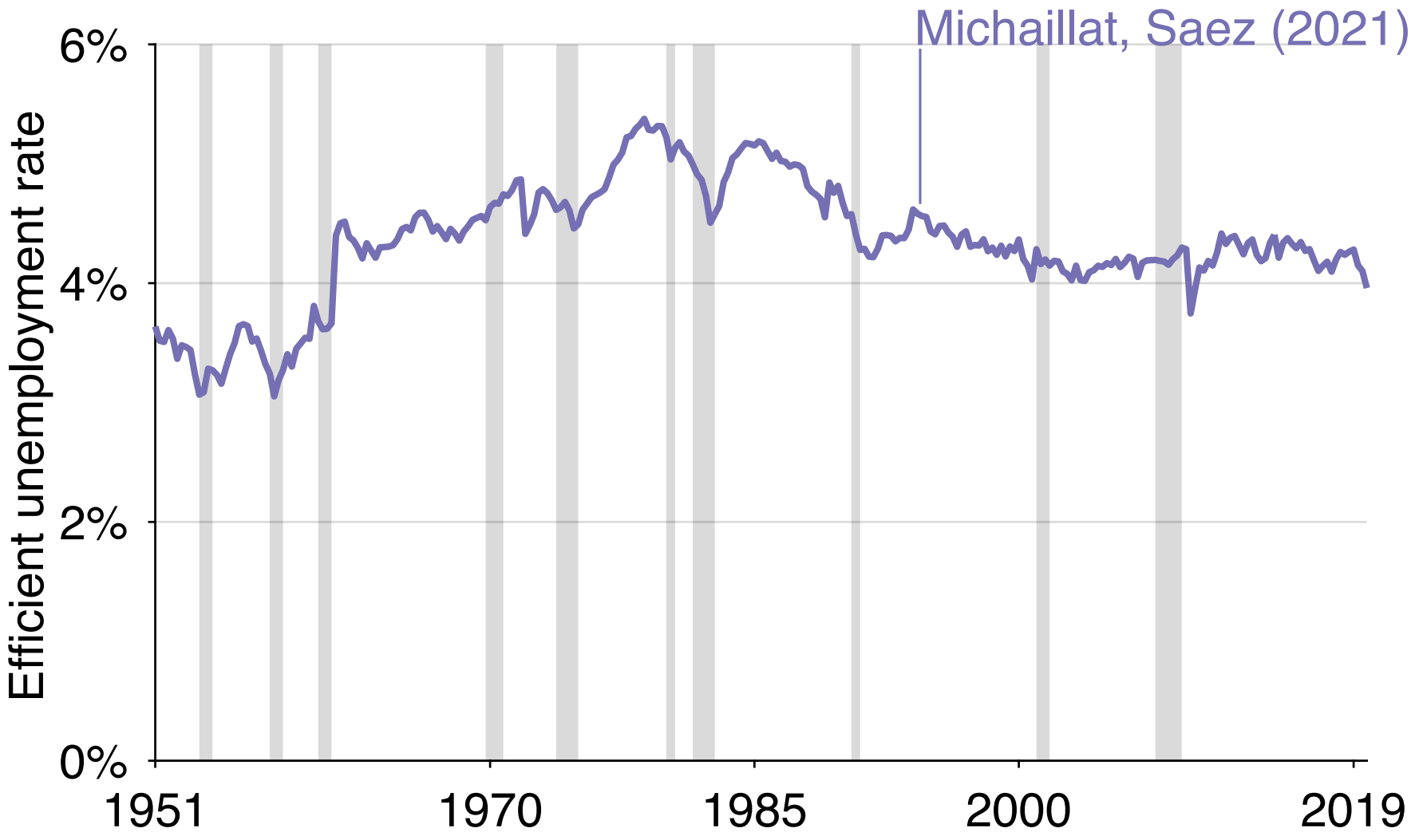
# $u^*$ REMAINS IN 3.0%–5.3%, AVERAGES 4.2%



# UNEMPLOYMENT GAP IS COUNTERCYCLICAL



# COMPARISON WITH MICHAILLAT, SAEZ (2021)



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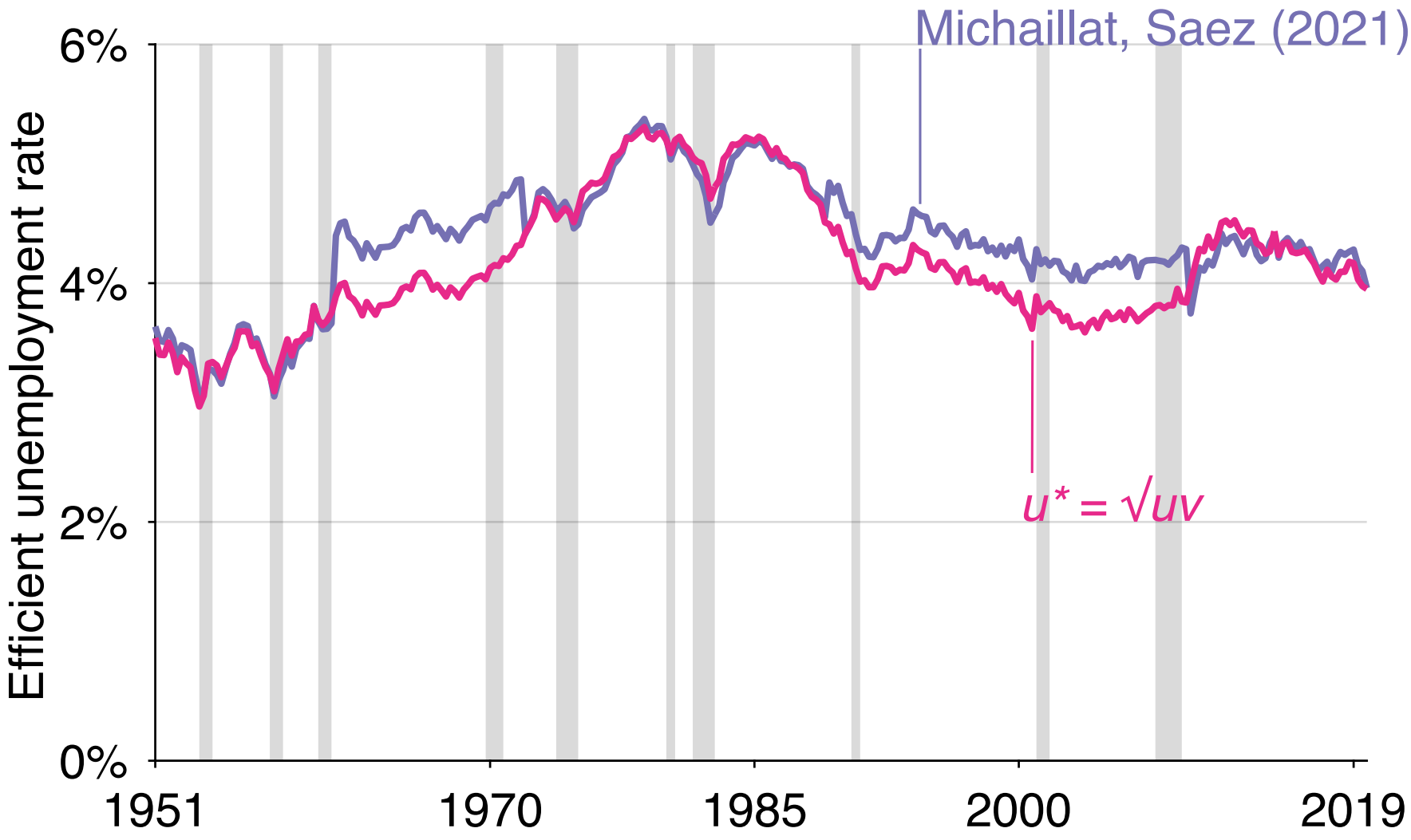
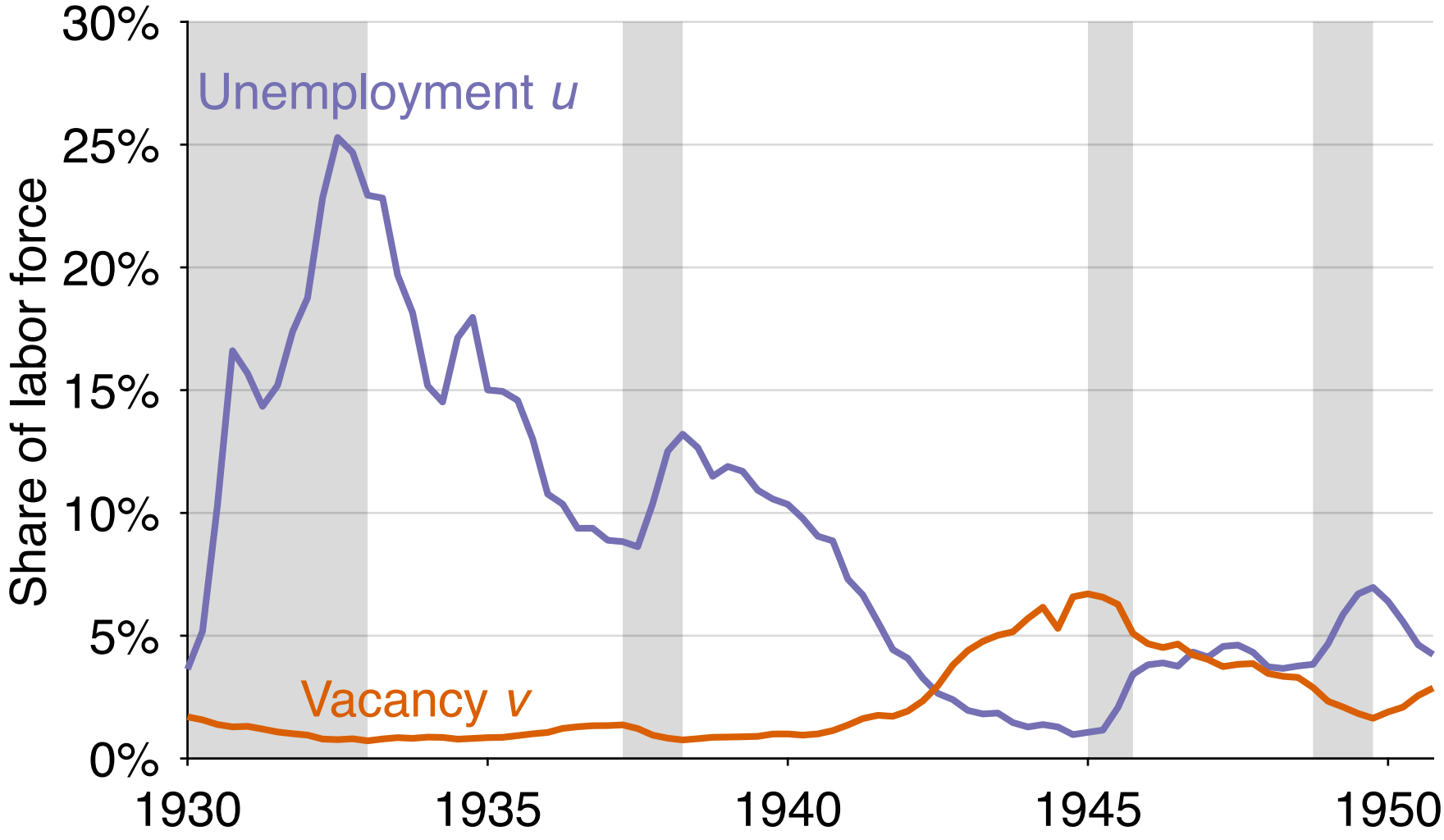


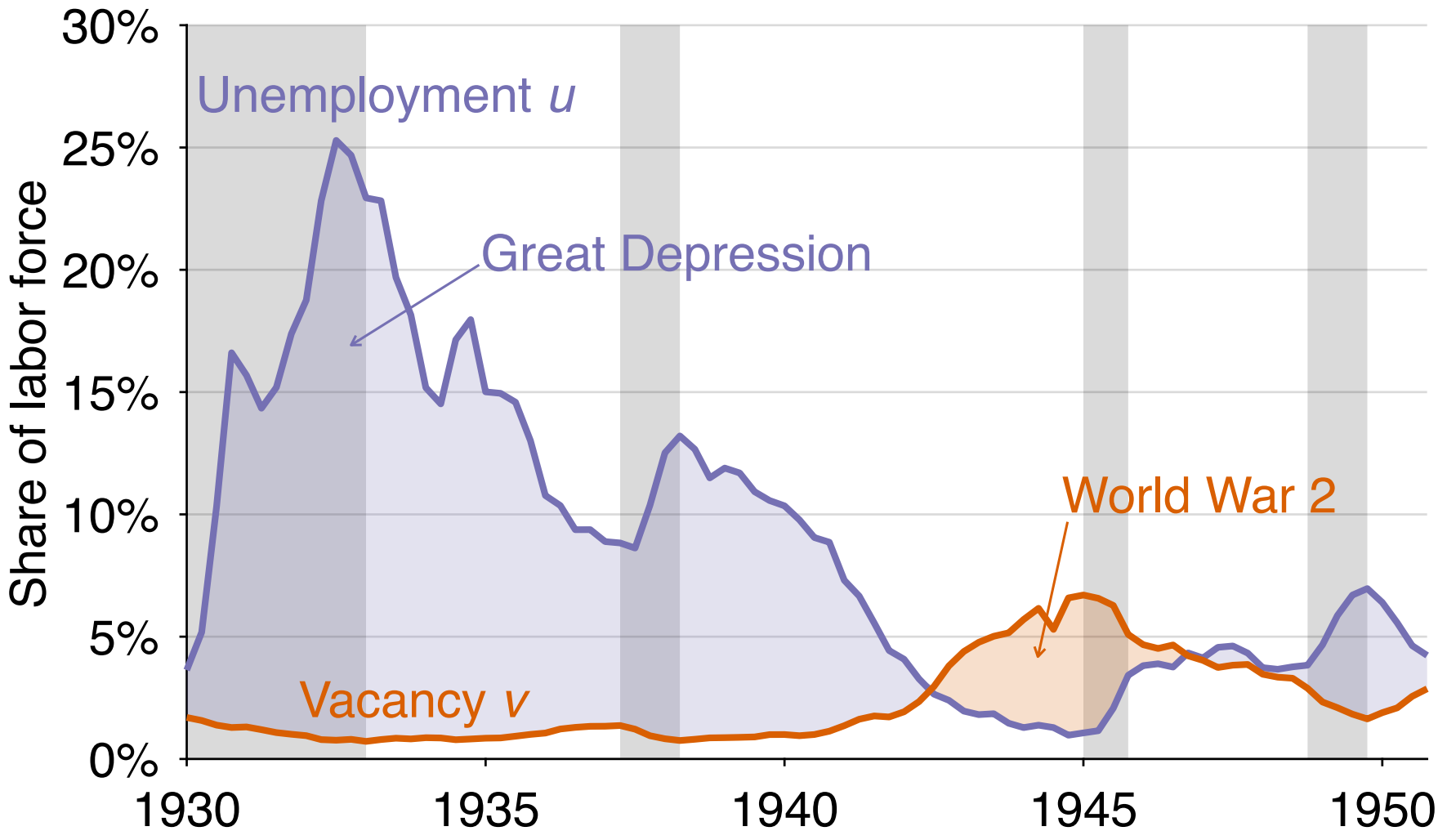
# GREAT DEPRESSION IN THE UNITED STATES

# NBER DATA (PETROSKY-NADEAU, ZHANG 2021)

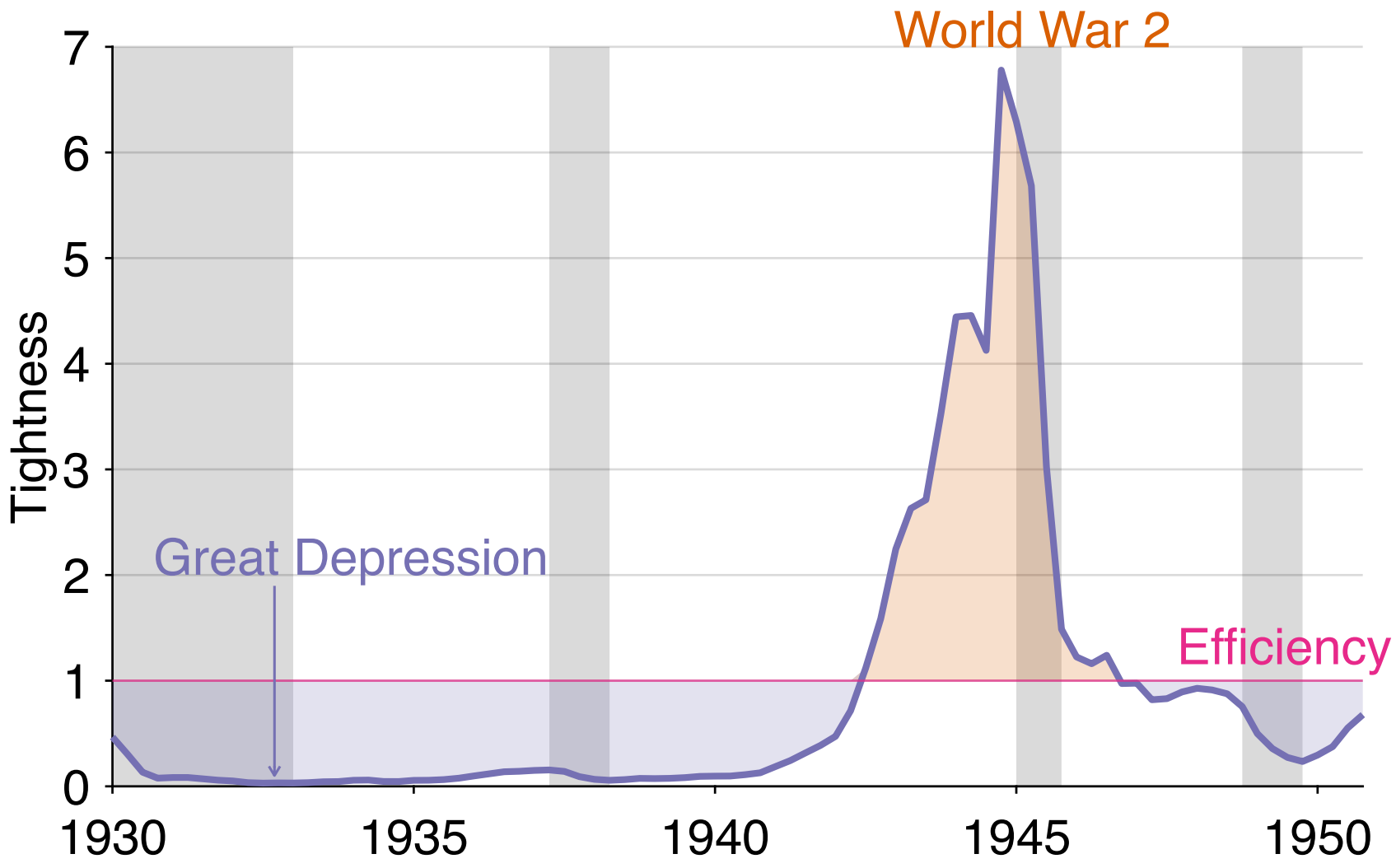


# BEVERIDGE CURVE ≈ HYPERBOLA

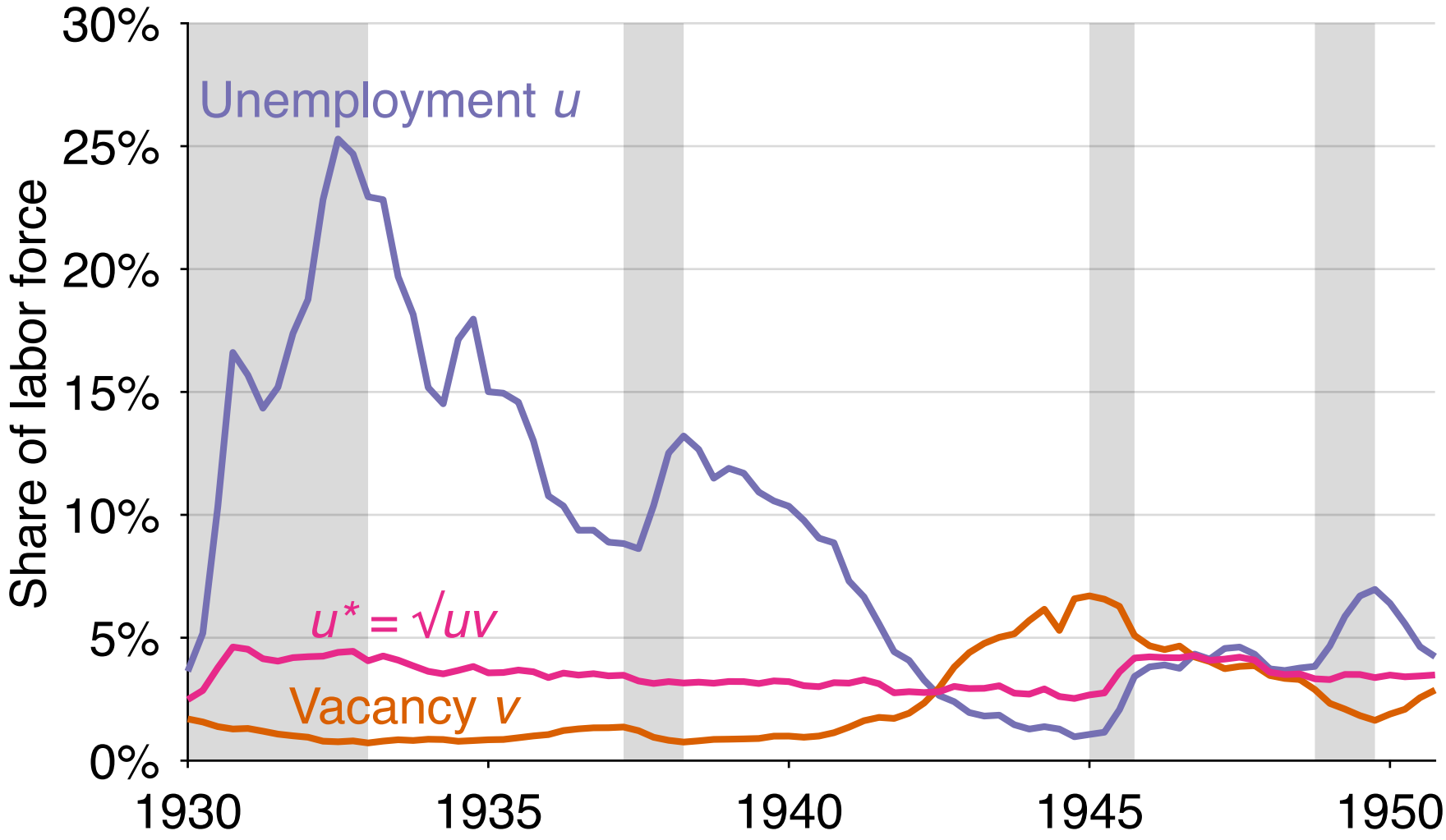
# LABOR MARKET WAS TOO SLACK UNTIL WW2



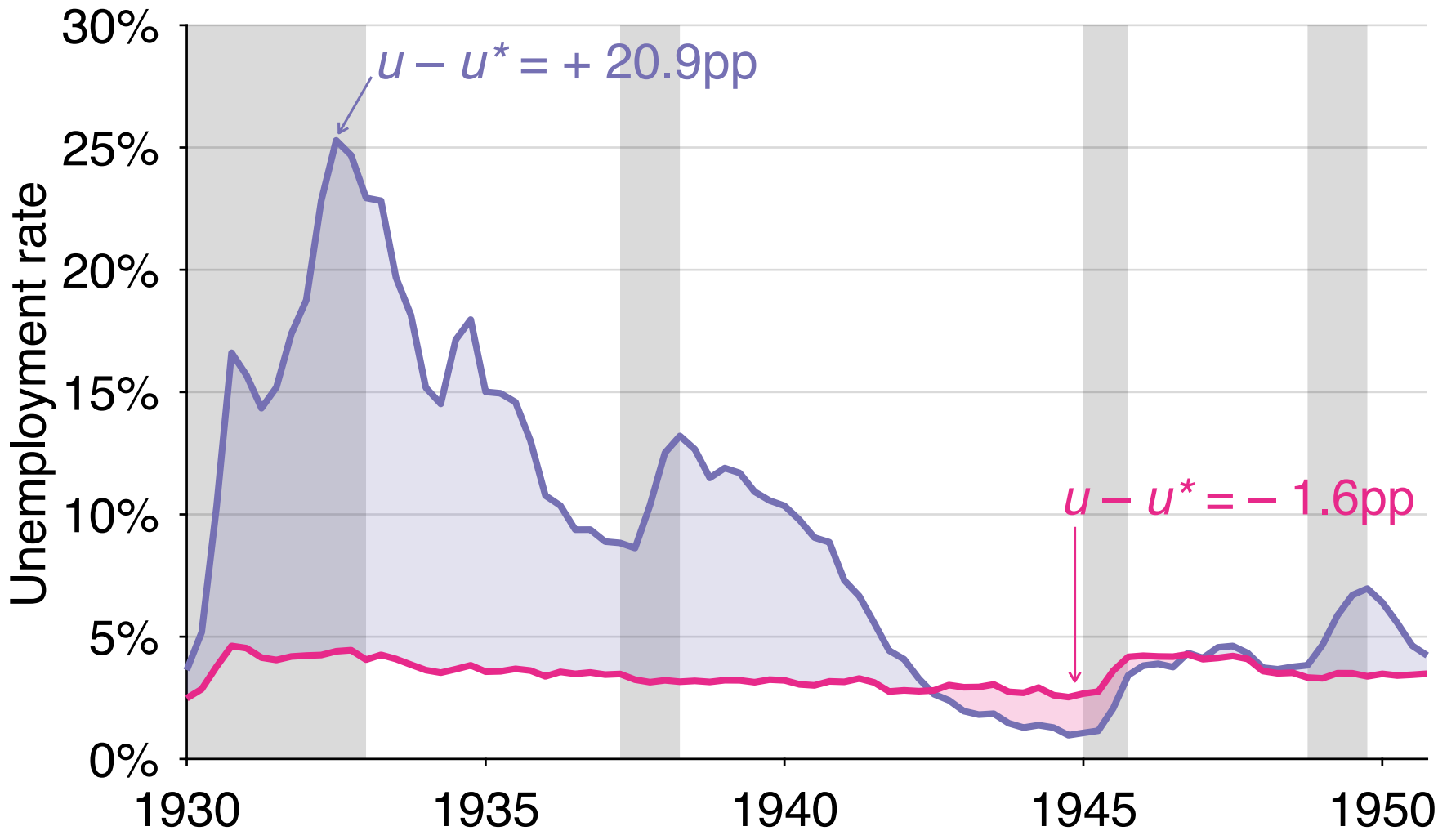
# LOWEST AND HIGHEST TIGHTNESS ON RECORD



# $u^*$ REMAINS IN 2.5%–4.6%, AVERAGES 3.5%

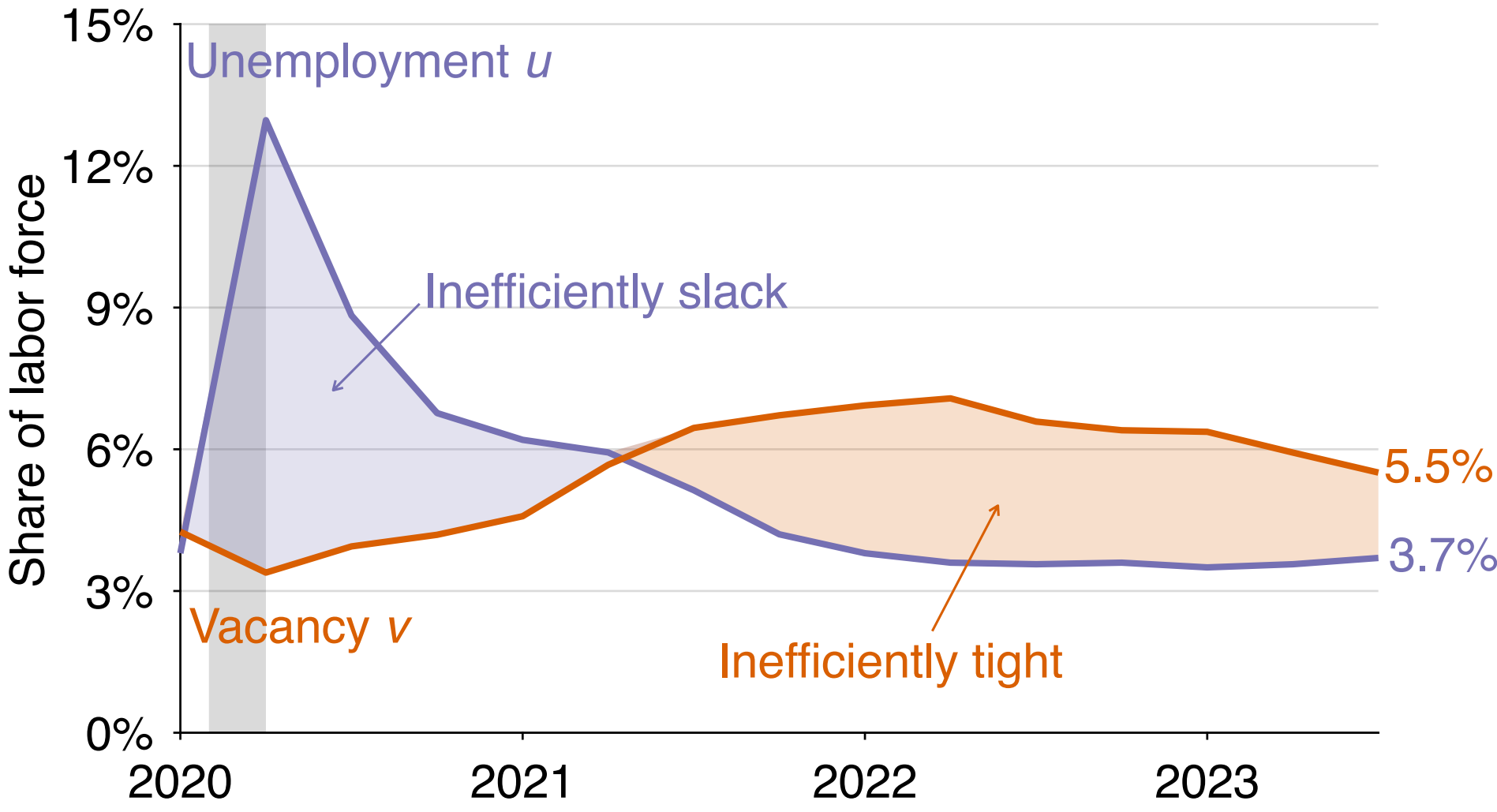


# MOST EXTREME UNEMPLOYMENT GAPS ON RECORD

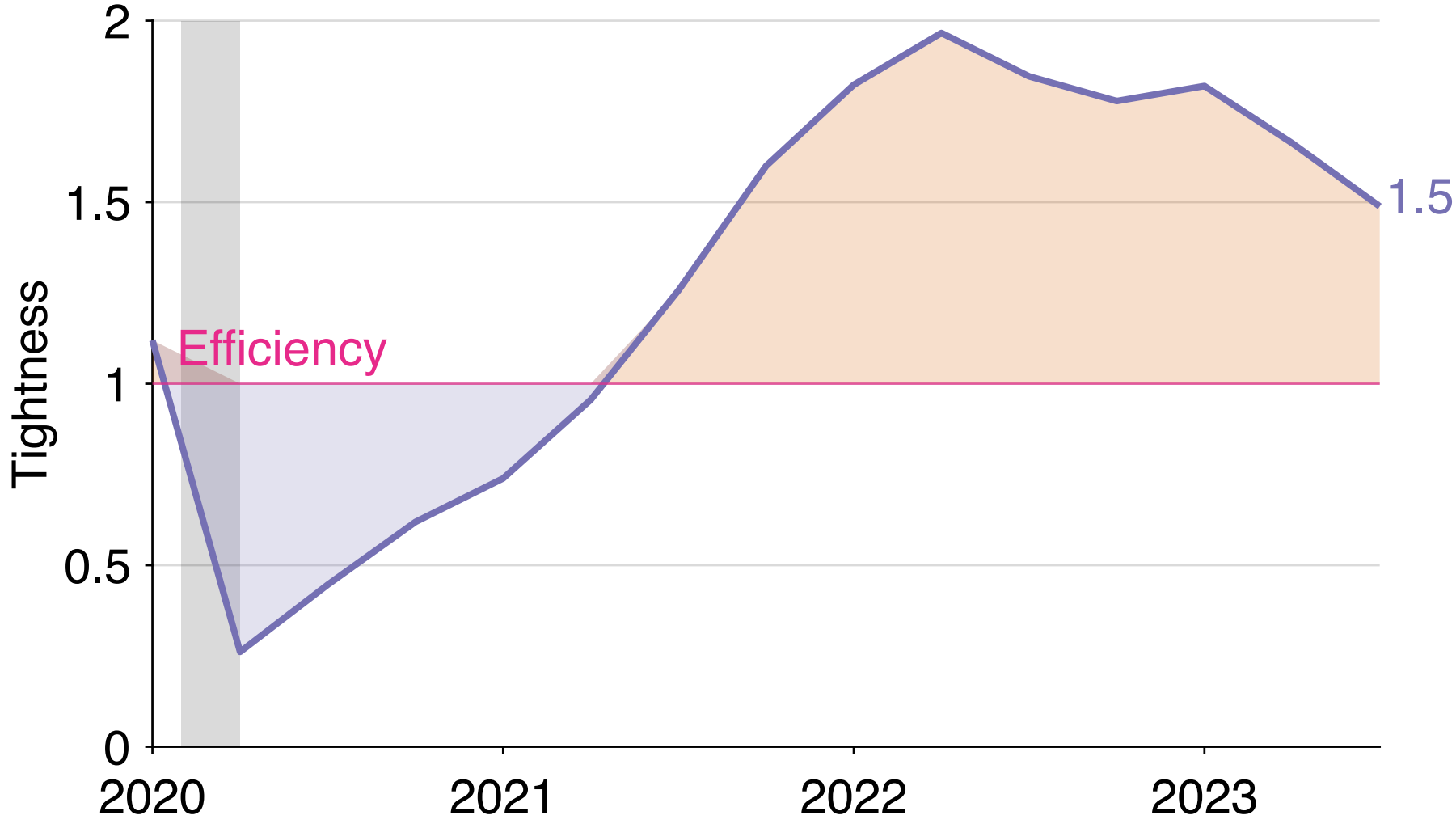


# PANDEMIC IN THE UNITED STATES

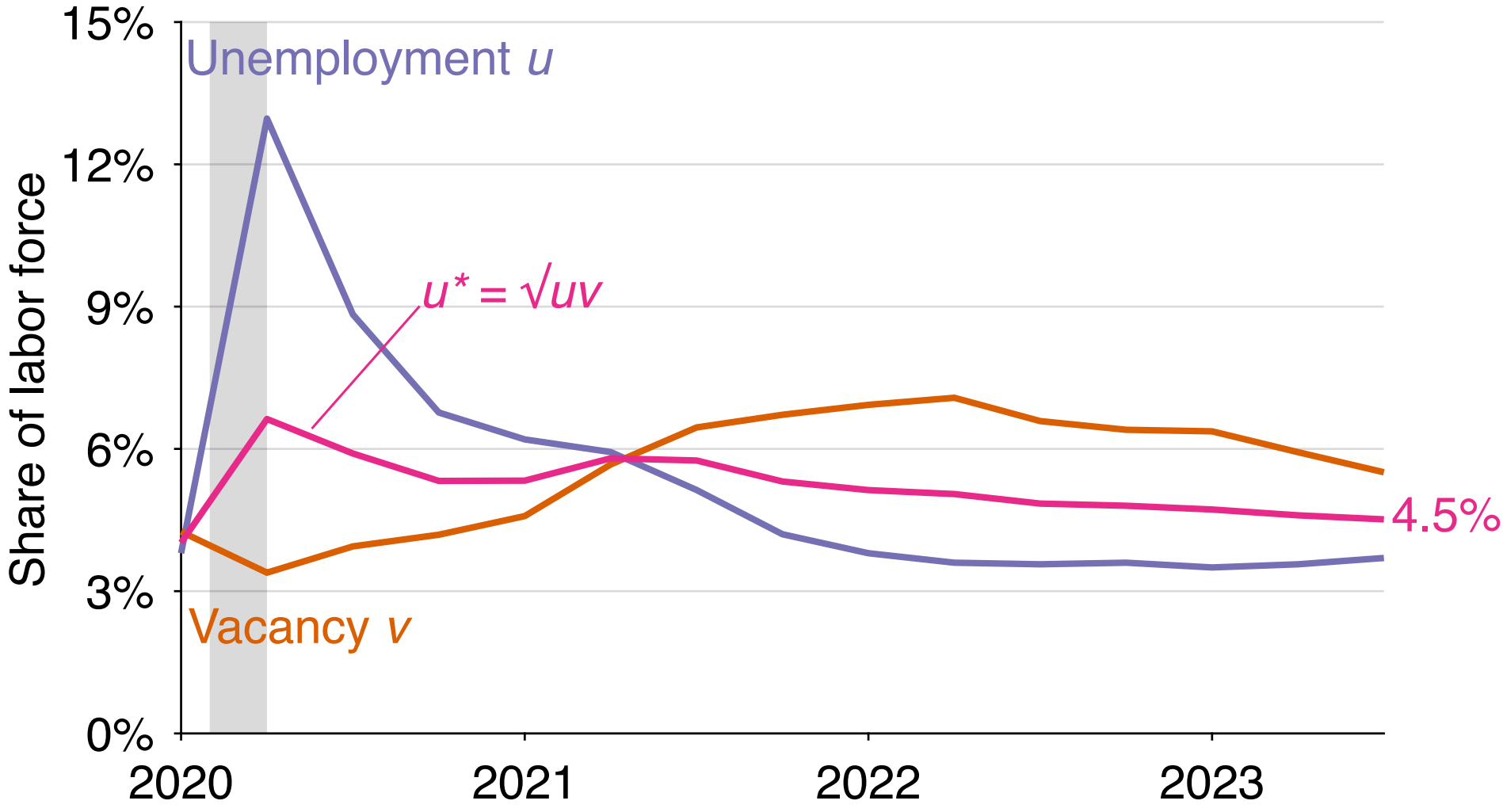
# LABOR MARKET HAS BEEN TOO TIGHT SINCE 2021Q3...



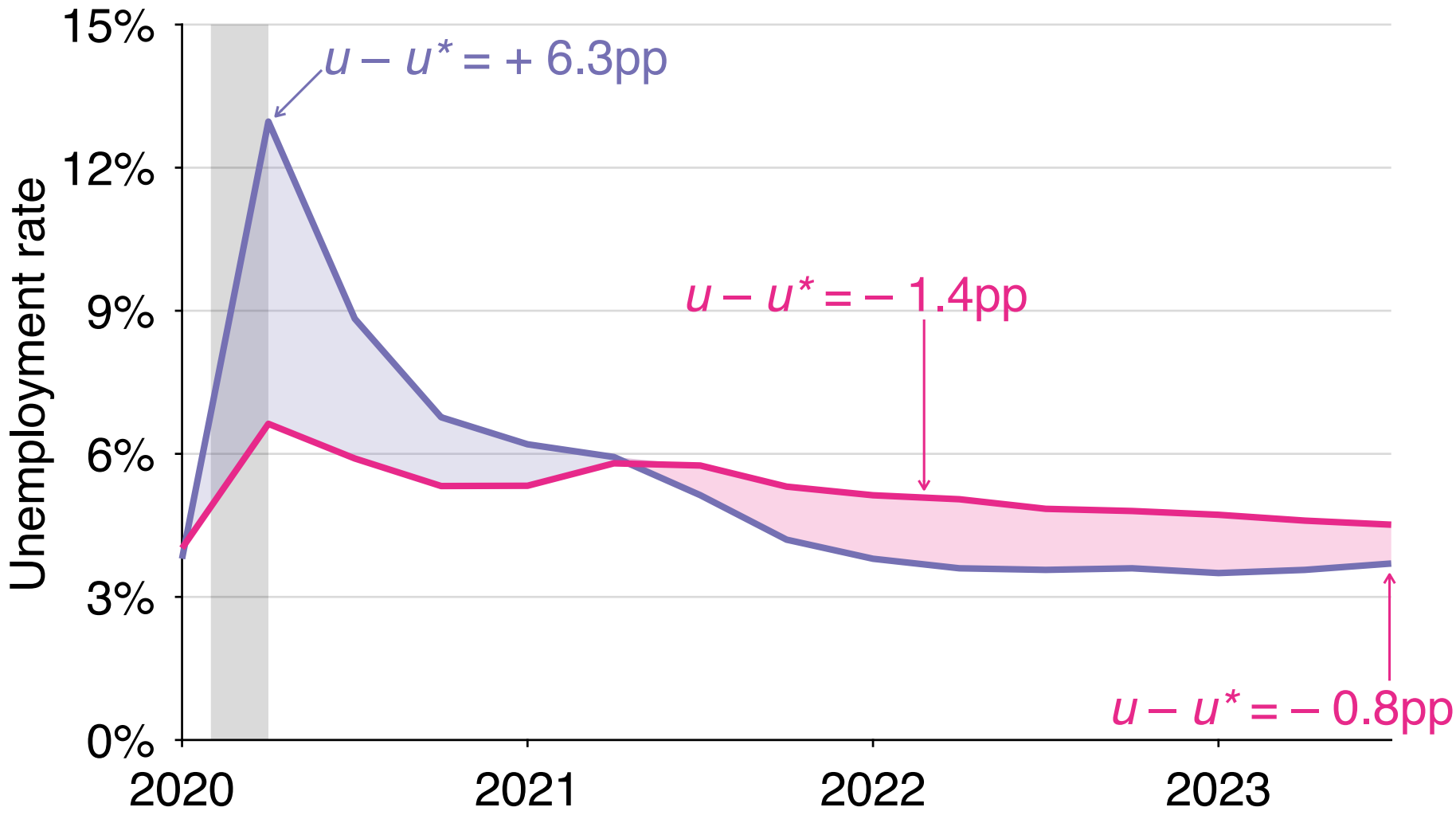
# . . . BUT IT HAS BEEN COOLING SINCE 2022Q2



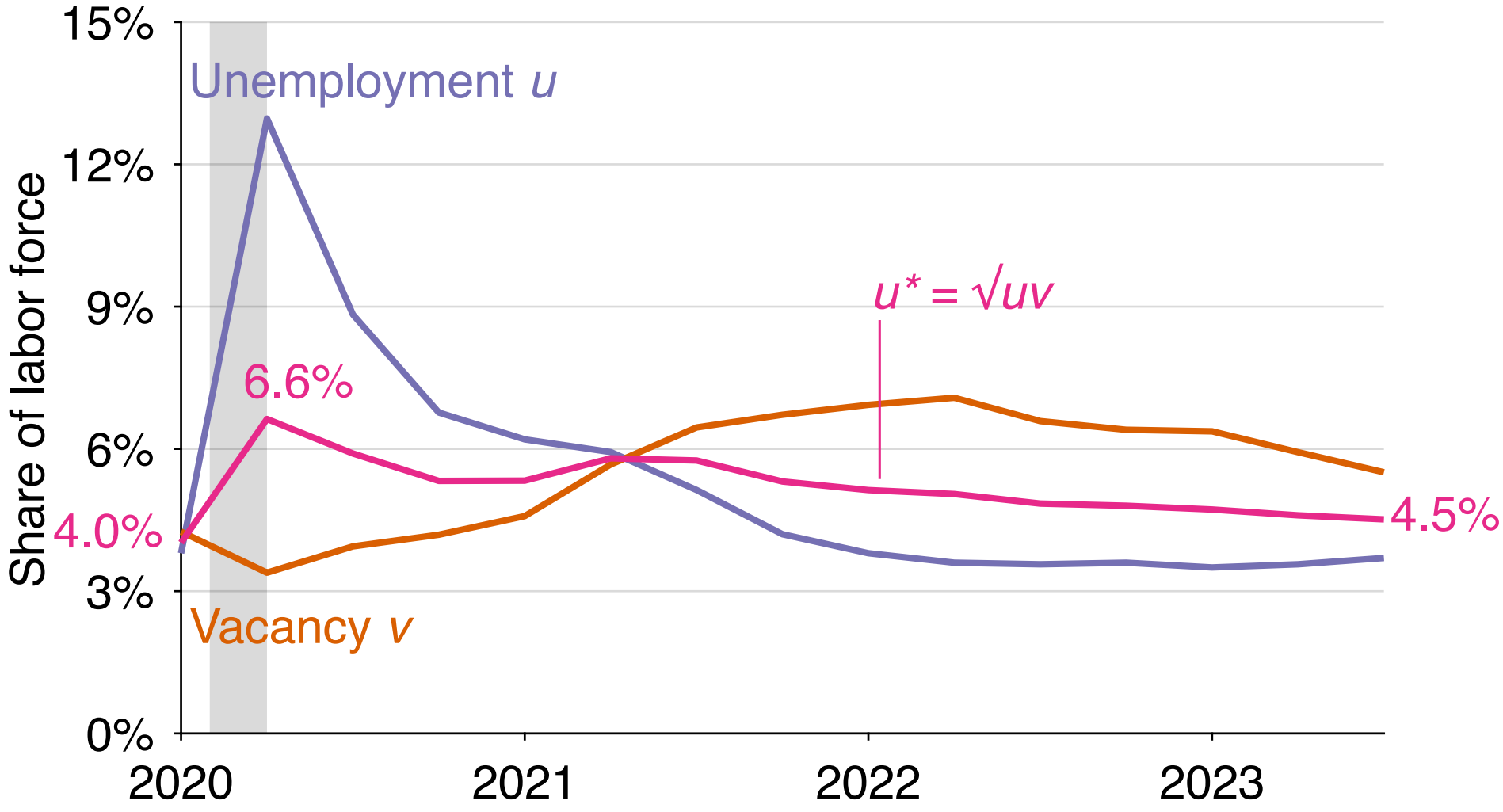
# CURRENT TARGET FOR MONETARY POLICY: $u^* = 4.5\%$



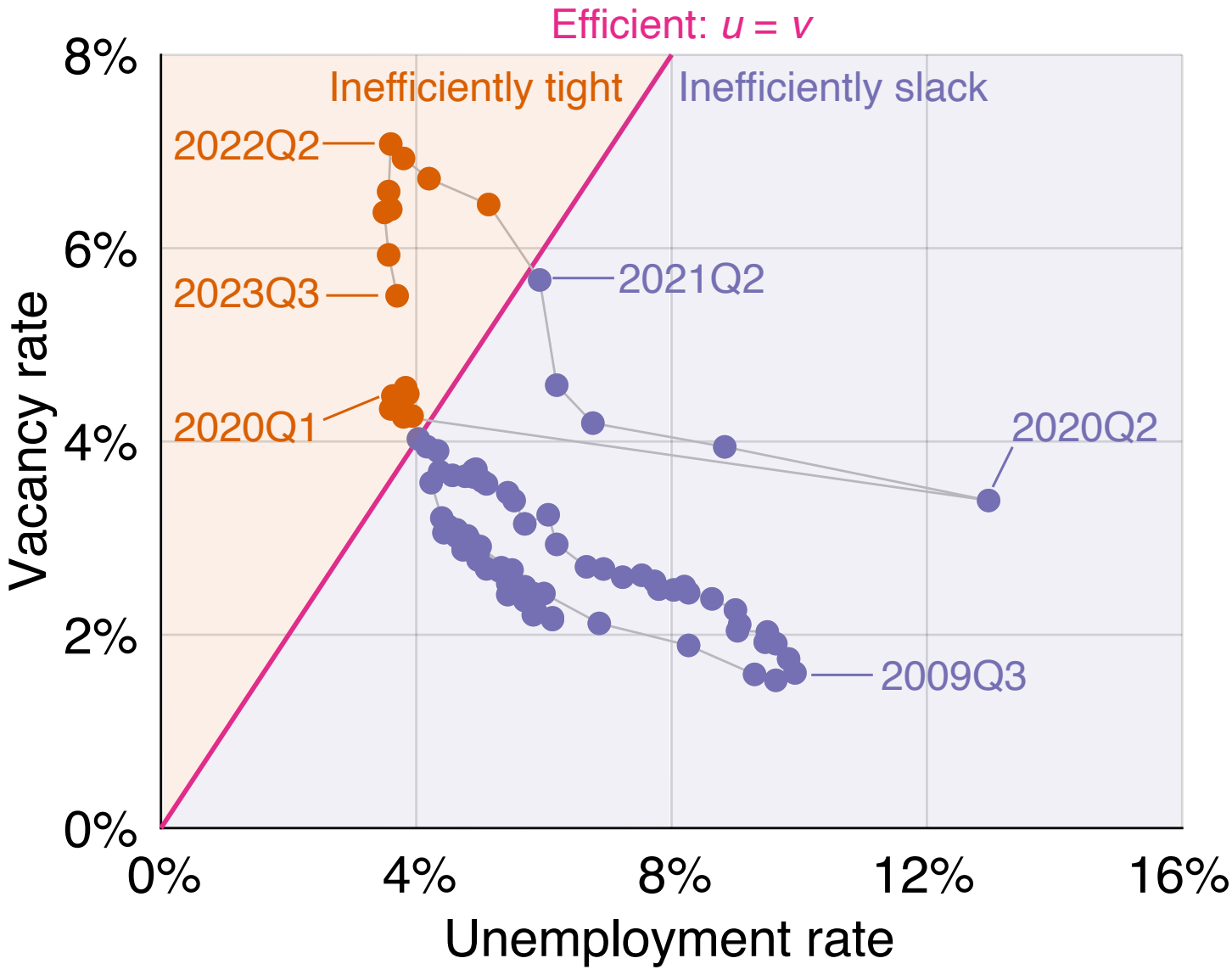
# MOST EXTREME UNEMPLOYMENT GAPS SINCE WW2



# WHY DID $u^*$ INCREASE SO MUCH IN 2020?

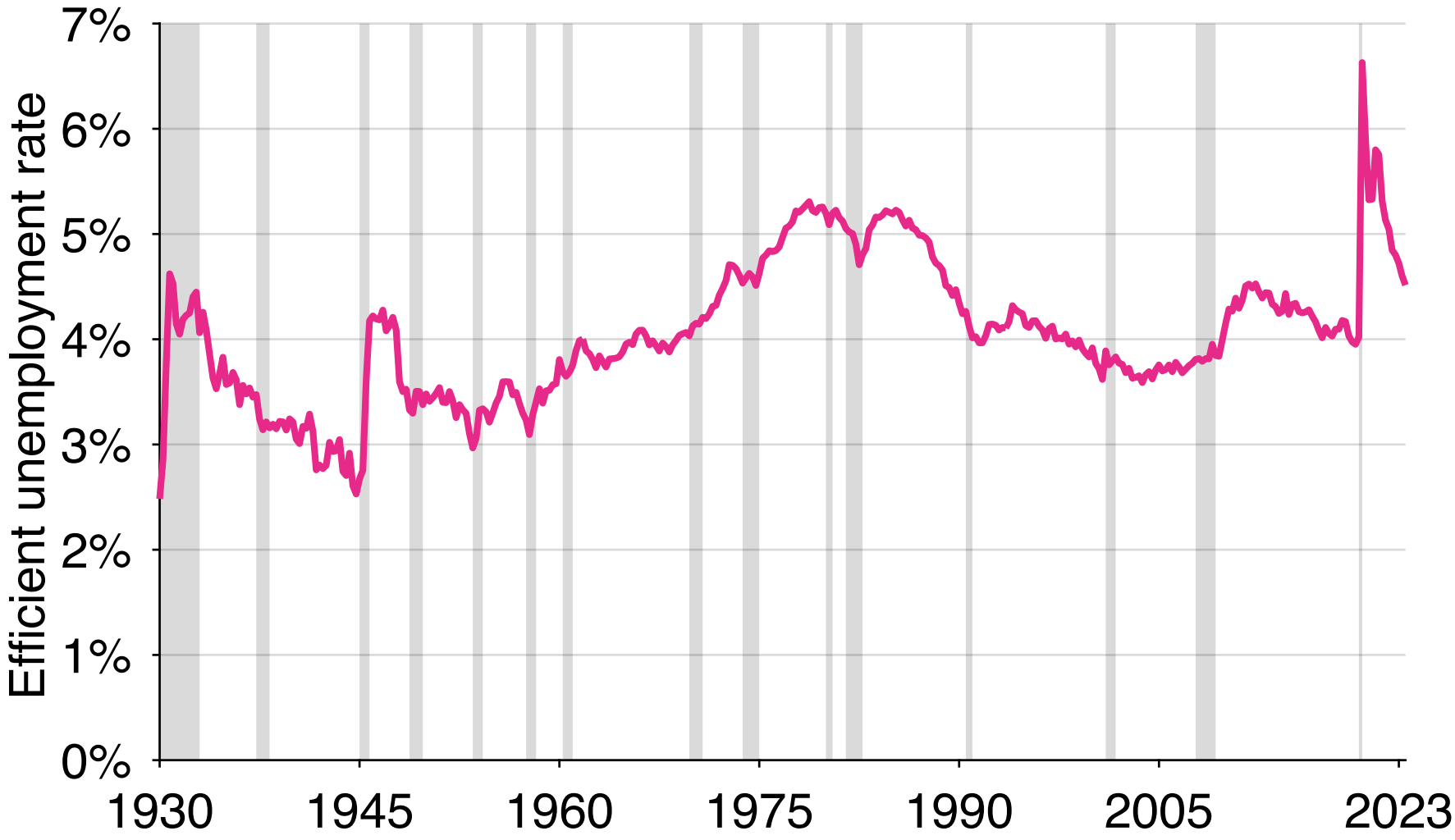


# BECAUSE OF LARGE SHIFT OF BEVERIDGE CURVE IN 2020Q2

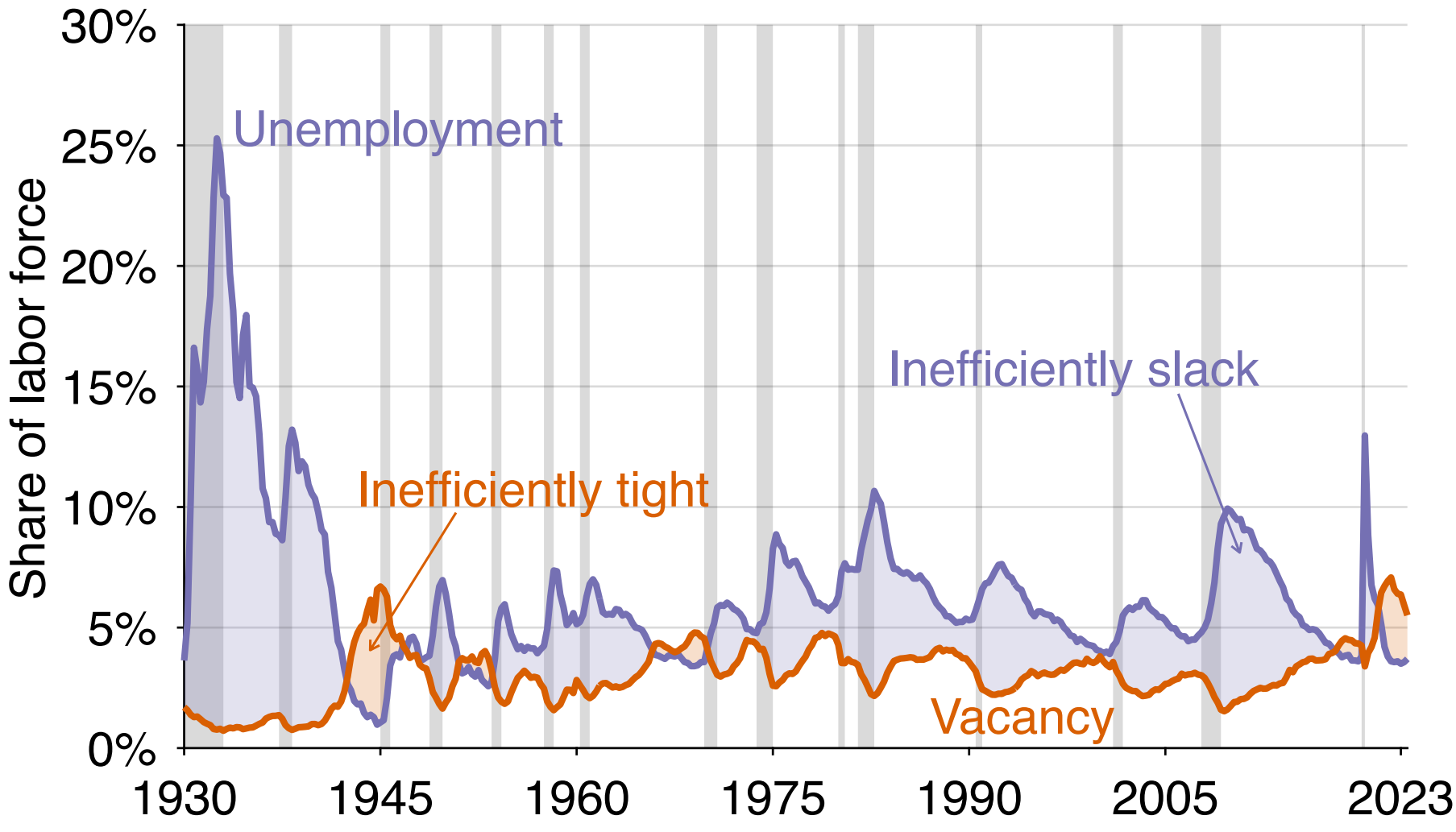


# SUMMARY

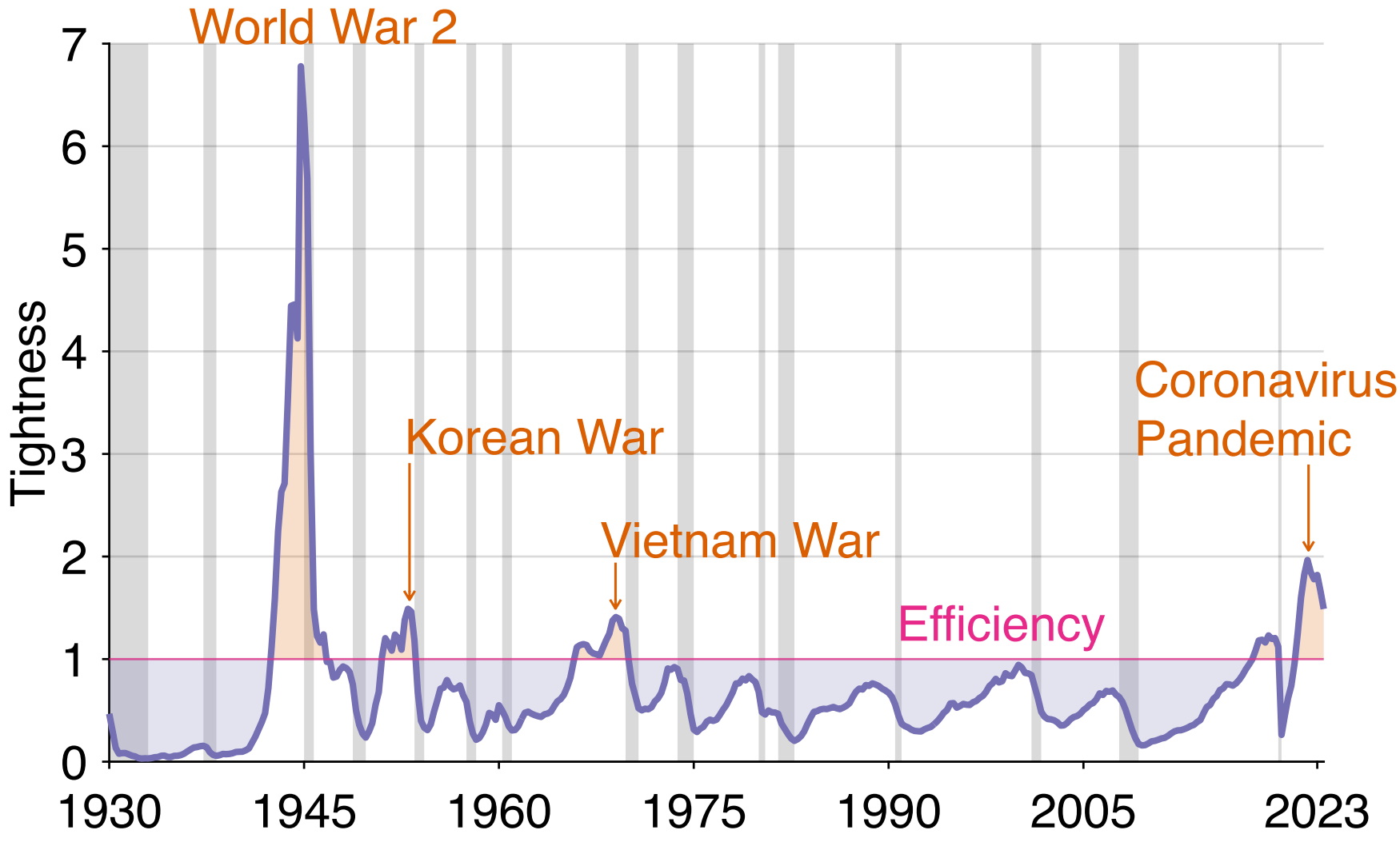
# $u^* = \sqrt{uv}$ AVERAGES 4.1% OVER 1930–2023



# EFFICIENCY CRITERION FOR US LABOR MARKET

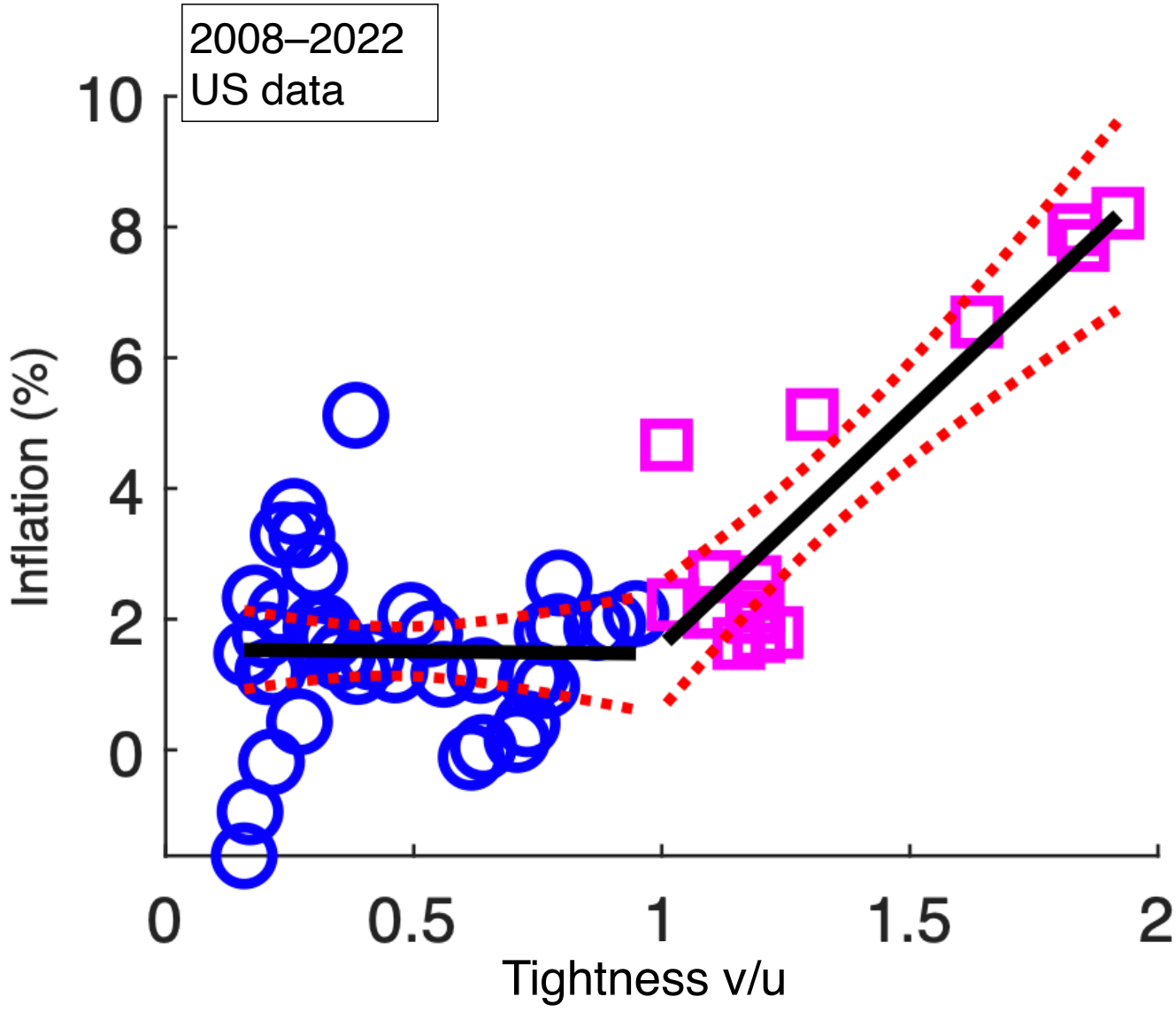


# AN EQUIVALENT EFFICIENCY CRITERION



# WHAT ABOUT THE PRICE MANDATE?

# BENIGNO, EGGERTSSON (2023): DIVINE COINCIDENCE?



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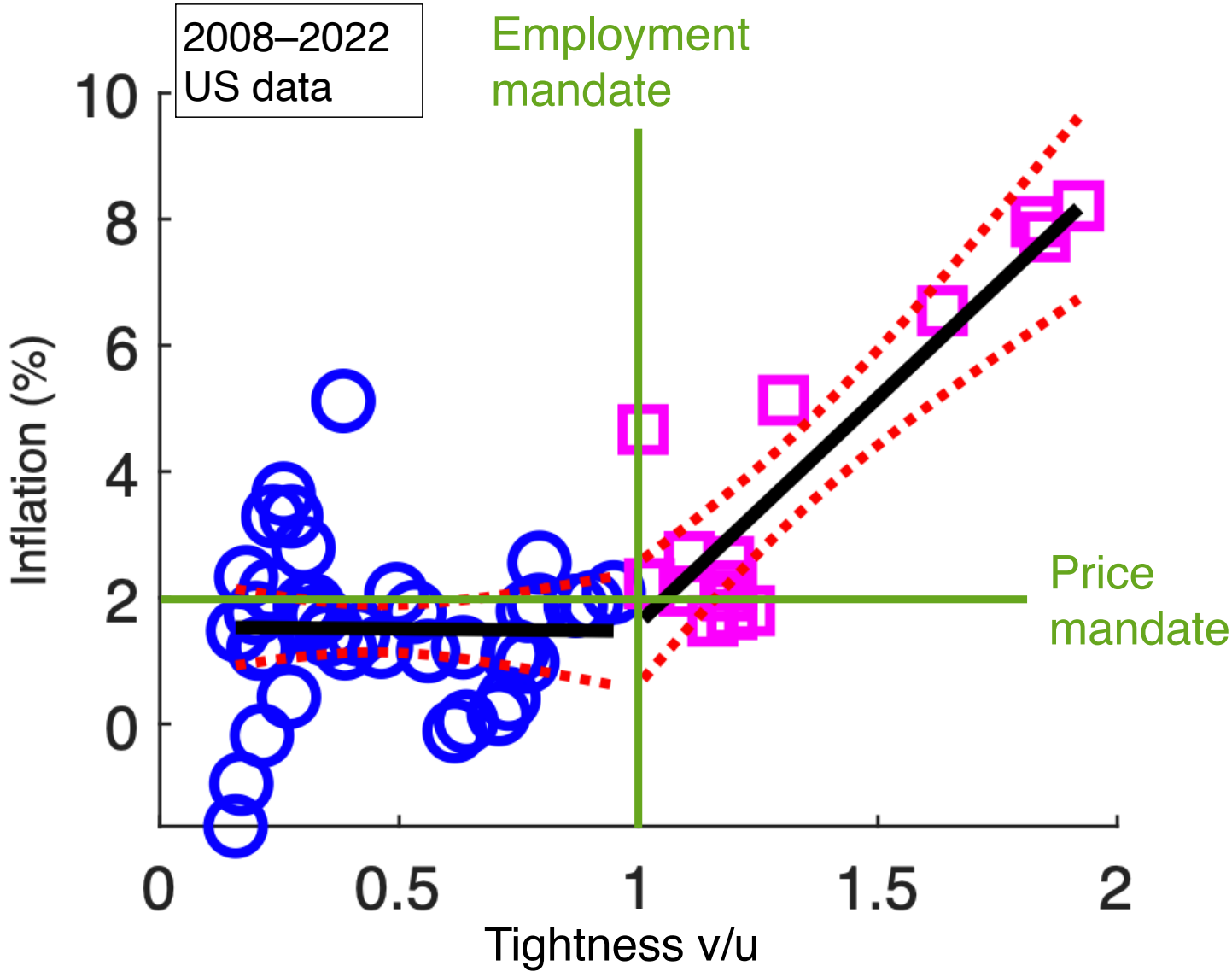
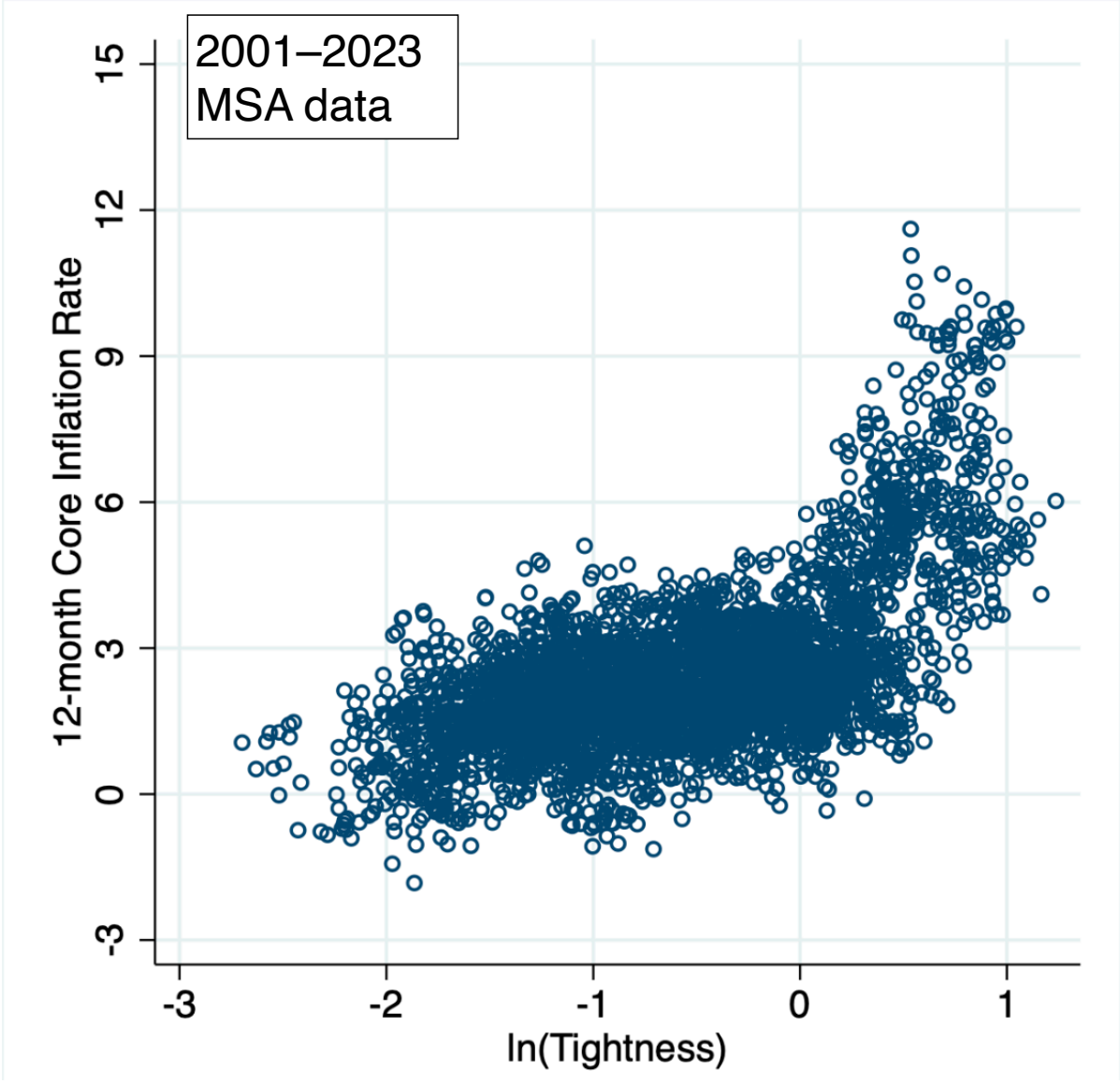
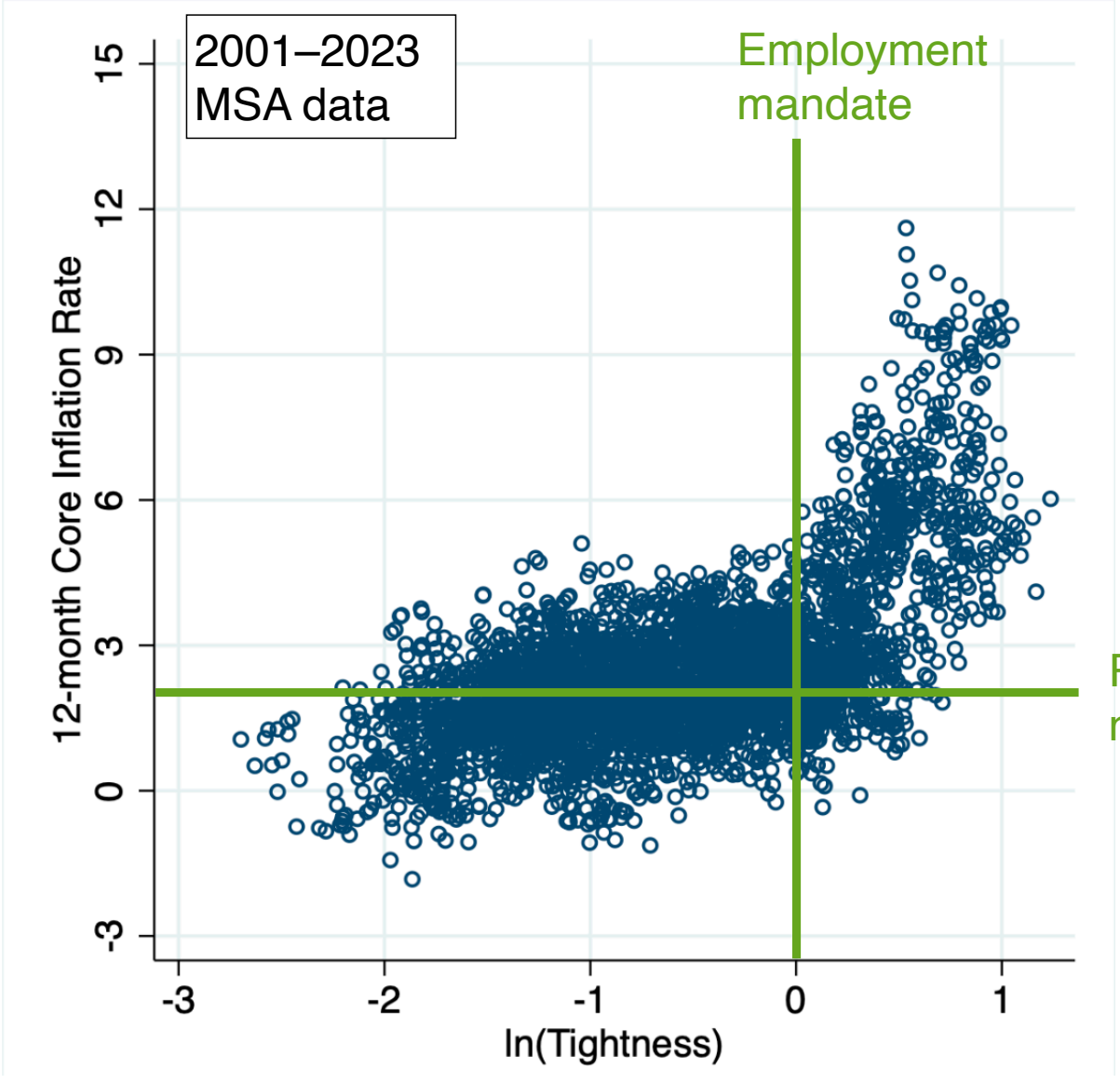


# GITTI (2023): DIVINE COINCIDENCE?



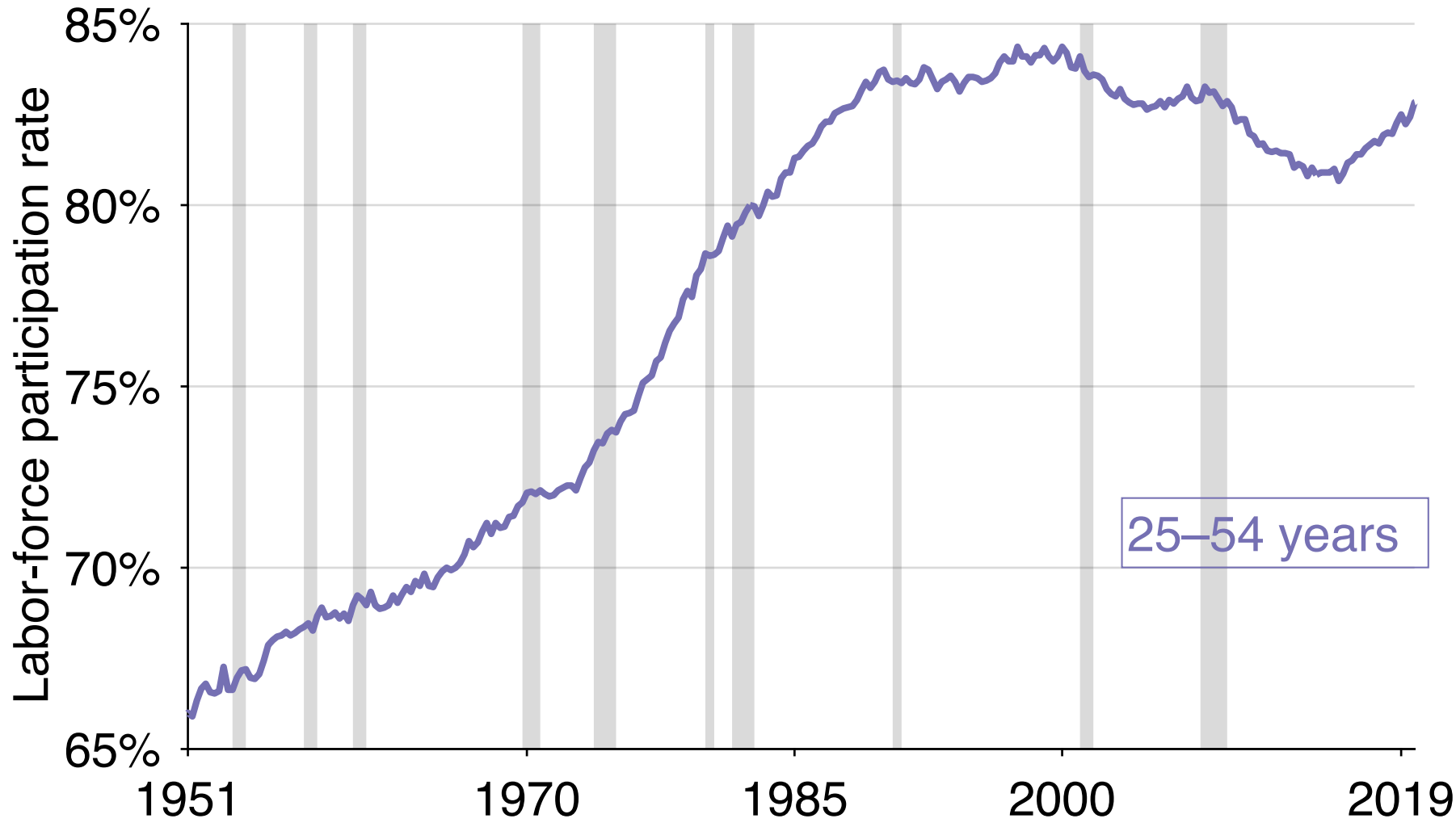
# GITTI (2023): DIVINE COINCIDENCE?



# A SIMPLE MODEL WITH DIVINE COINCIDENCE

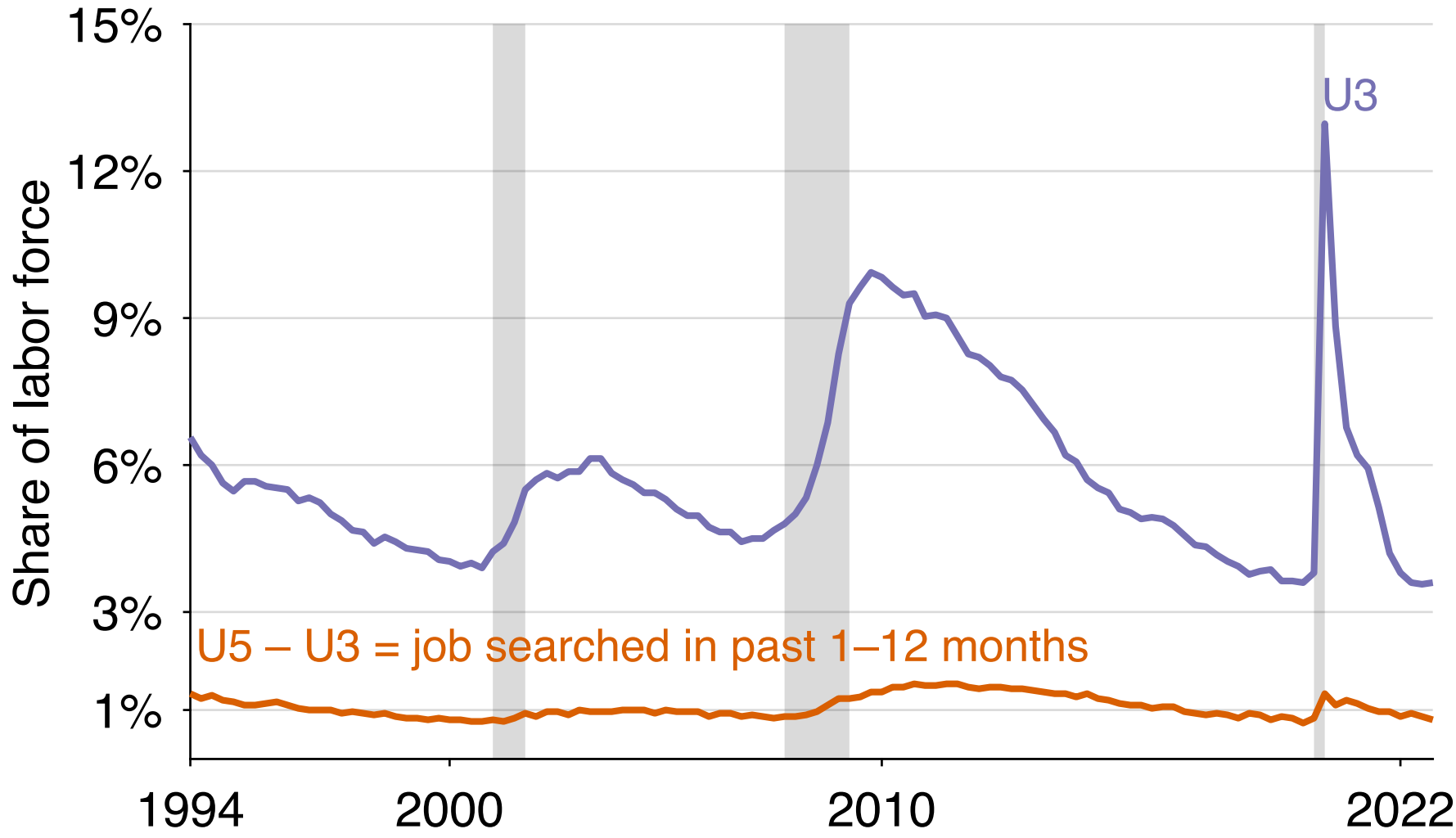
- economical business-cycle model structure (Michaillat, Saez 2022)
  - households sell and buy services
  - trades are mediated by a matching function $\Rightarrow$ unemployment
  - services and wealth provide utility $\Rightarrow$ nondegenerate AD curve
- price competition through directed search (Moen 1997)
  - services with higher prices take longer to sell
  - services with higher prices are also easier to buy
- price rigidity from quadratic price-adjustment costs (Rotemberg 1982)
- divine coincidence appears
  - $\pi = \bar{\pi} \Leftrightarrow u = u^*$
  - price mandate coincides with employment mandate

# US LABOR-FORCE PARTICIPATION ≈ ACYCLICAL



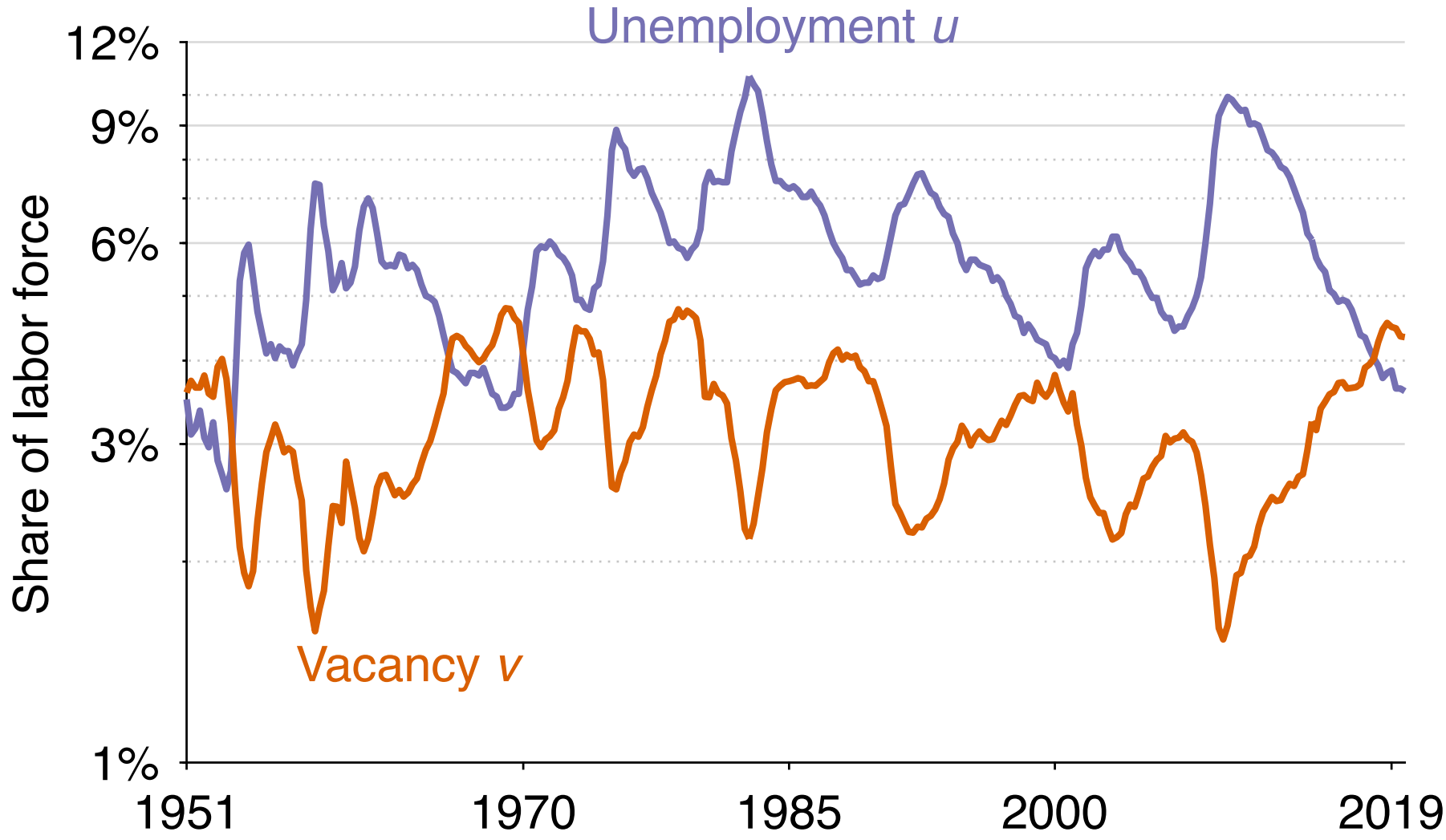

▸ Return to theory

# US MARGINAL ATTACHMENT RATE ≈ 1% LABOR FORCE




▸ Return to theory

# LOG UNEMPLOYMENT AND VACANCY RATES




▸ Return to Beveridge curve