$u^* = \sqrt{uv}$

Pascal Michaillat, Emmanuel Saez

December 2023

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

HOW TO INTERPRET LEGAL CONCEPT OF FULL EMPLOYMENT?

- Employment Act of 1946
  - "policy and responsibility of the federal government…to promote maximum employment, production"
- 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
  - "responsibility of the federal government…to foster and promote…full employment and production"

EXISTING INTERPRETATIONS OF FULL EMPLOYMENT

- Boston Fed's Rosengren (2014): u^* = CBO's NRU
  - but a slow-moving average is not socially desirable
- Joint Economic Committee (2019); Fed's Powell (2022): u^* = NAIRU
  - "full employment is…synonymous with the non-accelerating inflationary rate of unemployment (NAIRU)—the rate of unemployment that neither stokes nor slows inflation"
  - "maximum employment in the sense of the highest level of employment that is consistent with price stability"
  - but inconsistent with dual mandate: subsumes employment mandate into price mandate

THIS PAPER: FULL EMPLOYMENT = EFFICIENT UNEMPLOYMENT

- maximizes productive use of labor
  - consistent with standard economic theory (Hosios 1990)
  - consistent with spirit of law ("promote maximum production")
- given voluntary labor-force participation
  - consistent with standard economic interpretation (Rees 1957)
  - consistent with spirit of law ("promote employment opportunities for those able, willing, and seeking to work")
- formula for u^* is easily applicable
  - simplification of Michaillat-Saez (2021) formula for US economy
  - can be applied to historical data
  - can be applied in real time

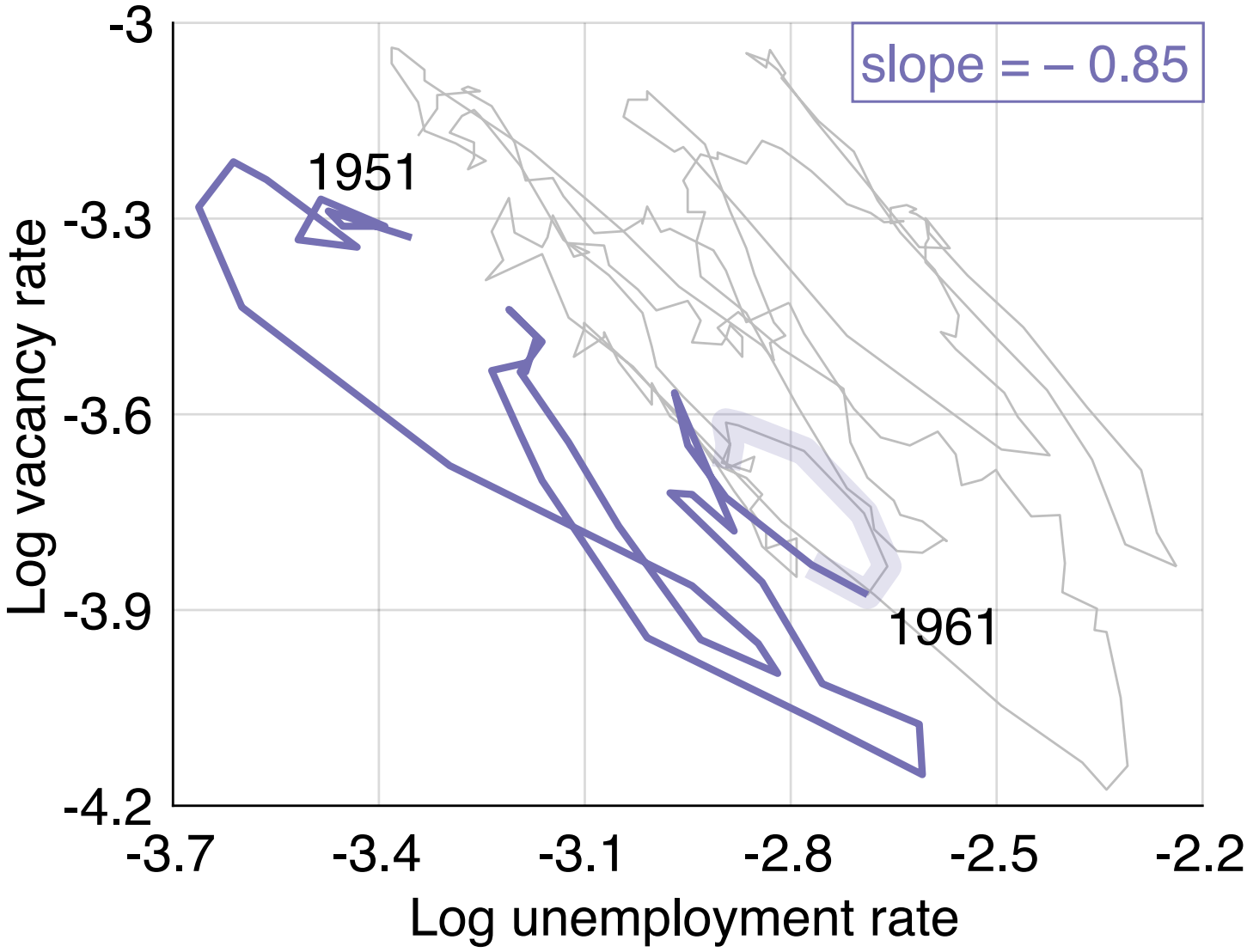
THEORY OF FULL EMPLOYMENT

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

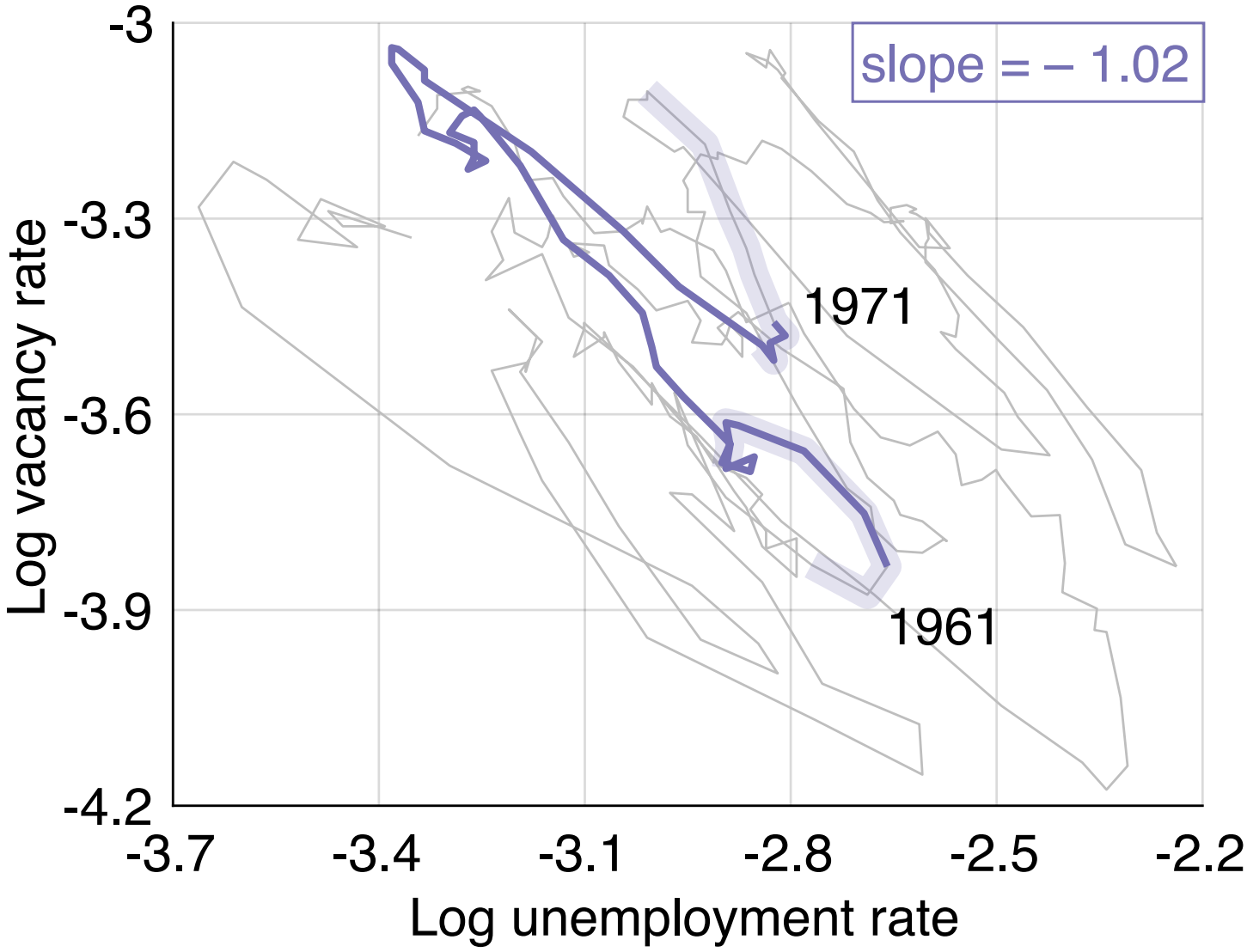
- labor force participation rate
- marginal attachment rate

US BEVERIDGE CURVE ≈ HYPERBOLA



▸ Time series on log scale

US BEVERIDGE CURVE ≈ HYPERBOLA



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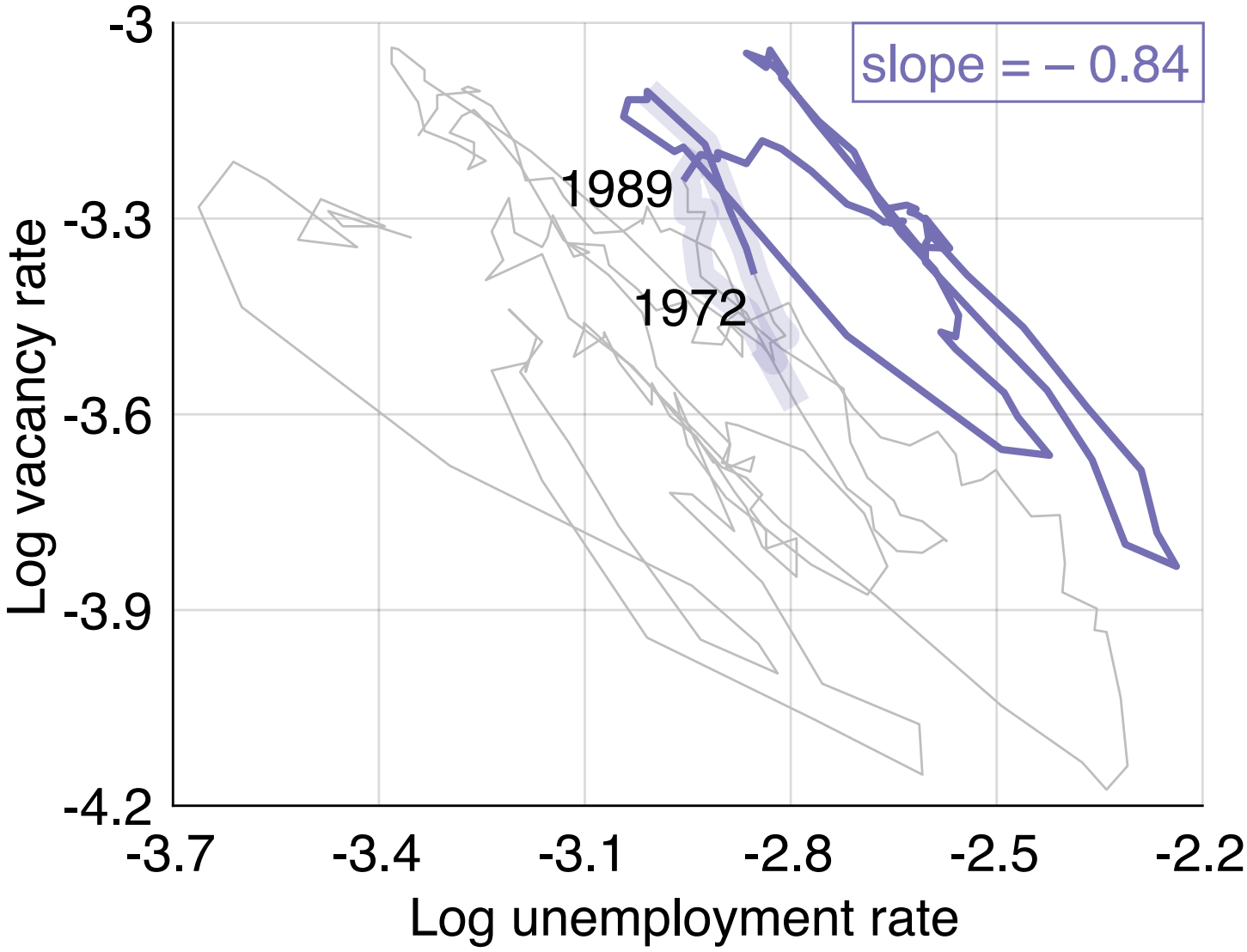

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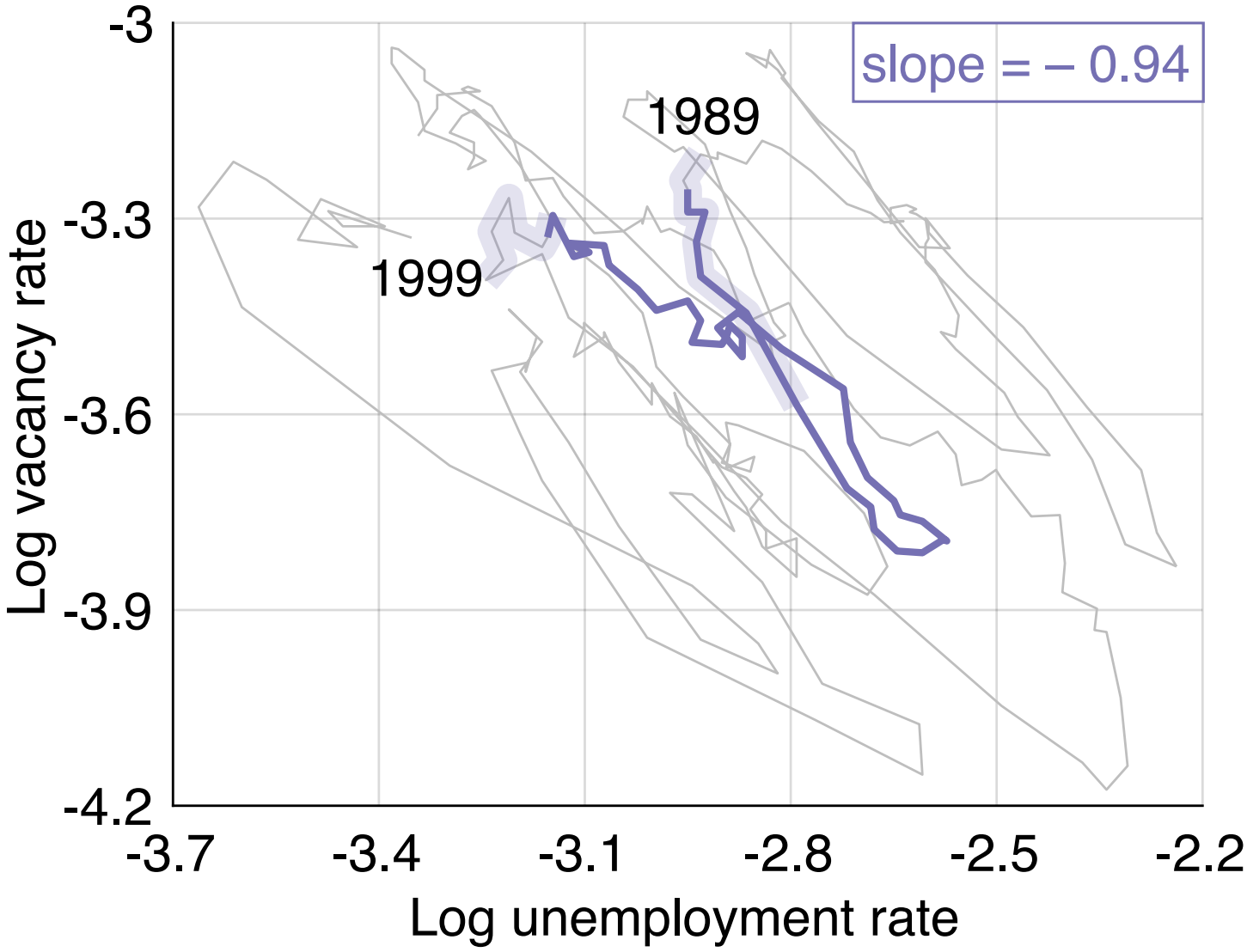

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US BEVERIDGE CURVE ≈ HYPERBOLA

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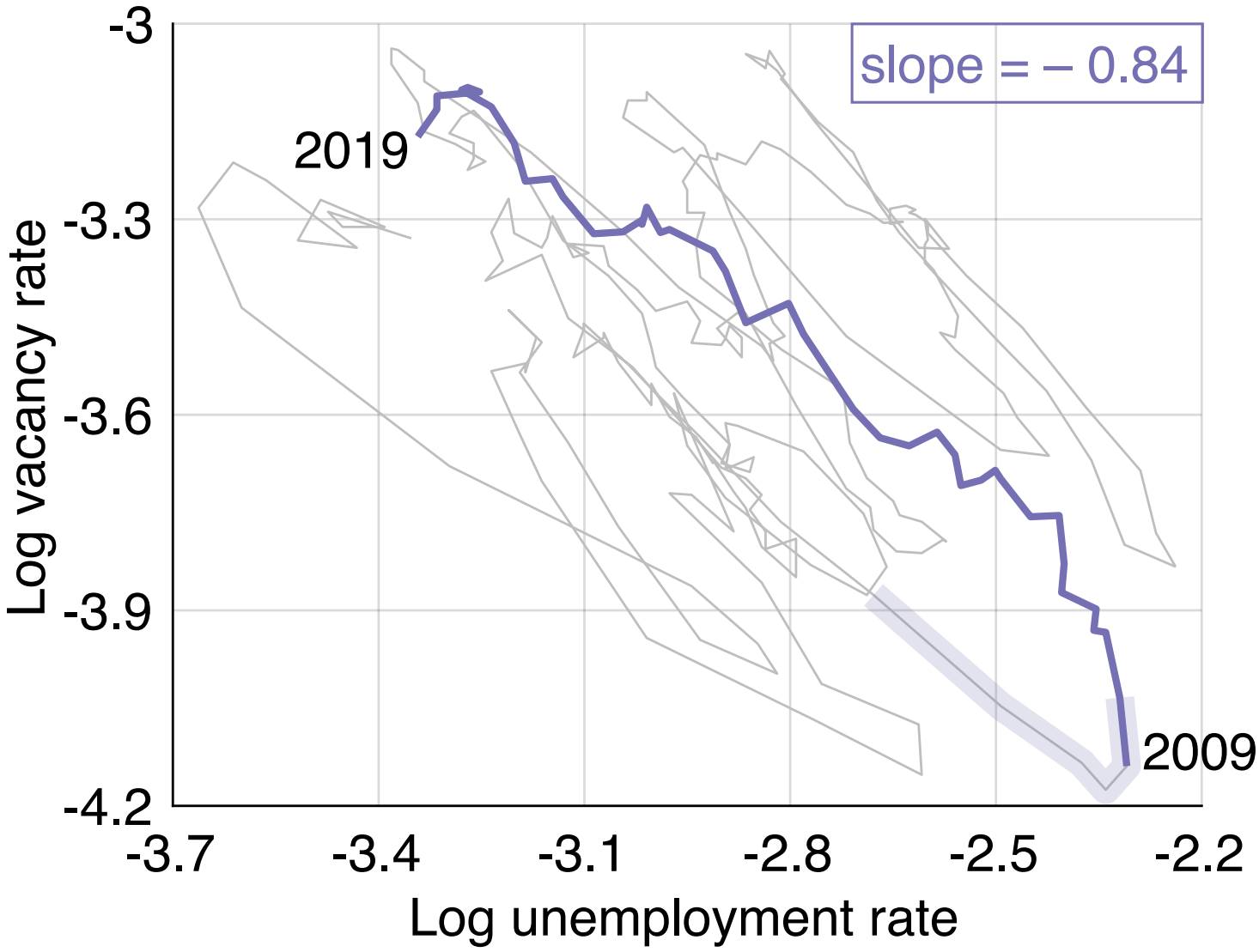


▸ Time series on log scale

COMPUTING FULL-EMPLOYMENT ALLOCATION

- 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 gives solution:

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

- solution is full-employment, efficient unemployment rate:

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

CRITERION FOR FULL EMPLOYMENT, EFFICIENCY

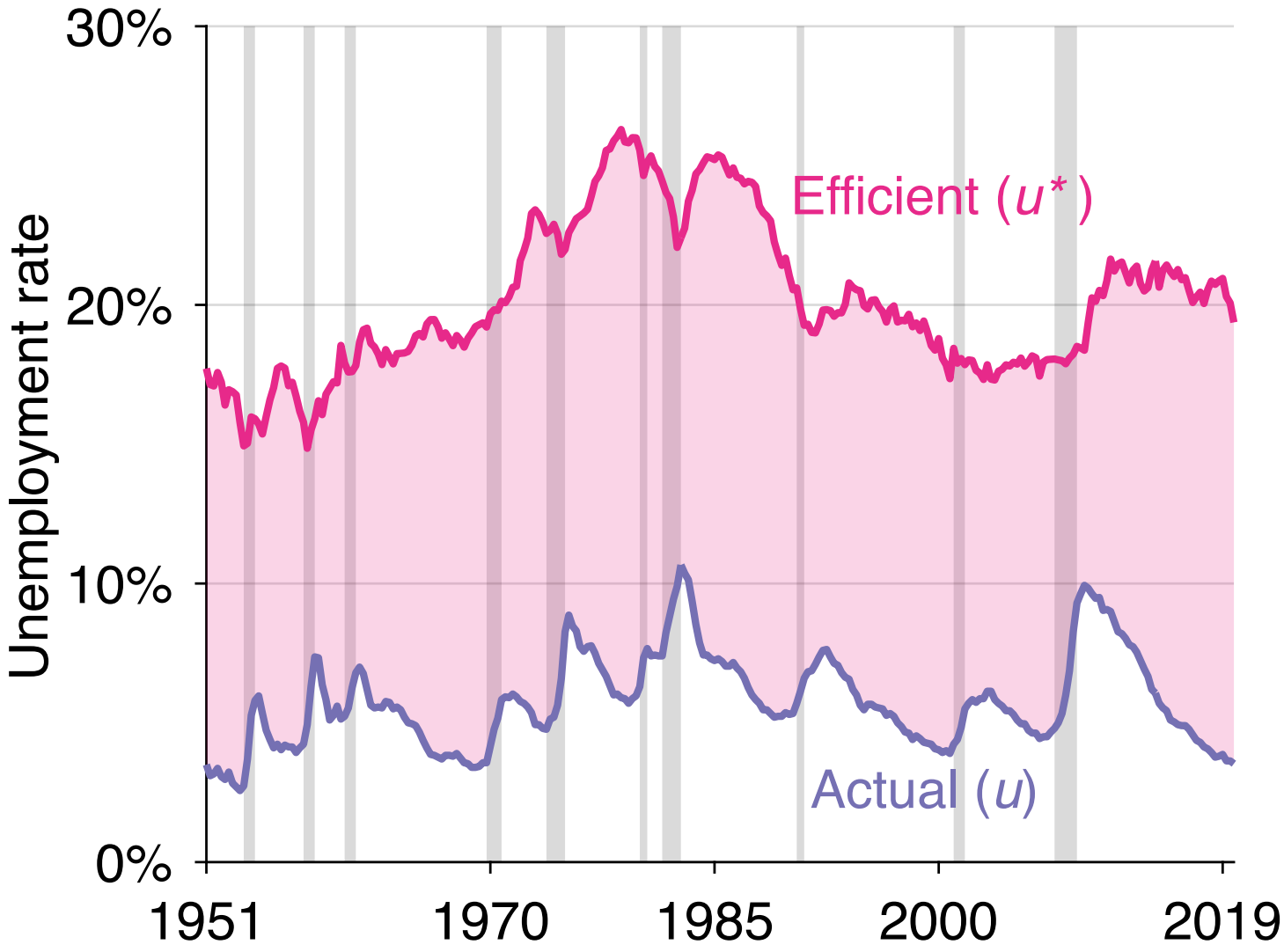
- recall: $u^* = \sqrt{uv}$ is geometric average of u and v
- economy is at full employment, efficient when $u = u^*$
  - ⇝ efficient when $u = v$
- economy is above full employment, inefficiently tight when $u < u^*$
  - ⇝ inefficiently tight when $u < v$
- economy is below full employment, inefficiently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

MORE GENERAL FORMULA (MICHAILLAT, SAEZ 2021)

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

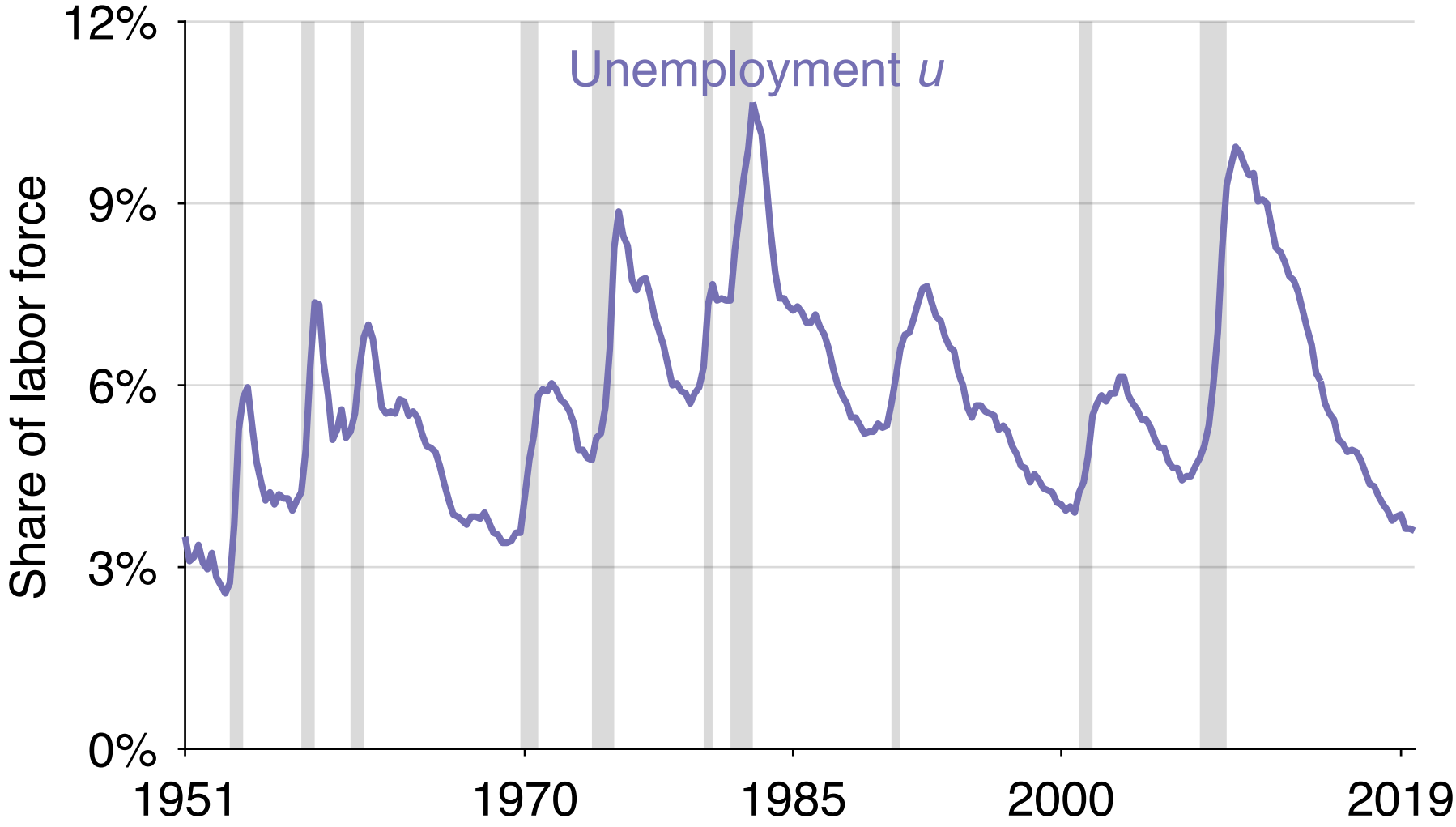
$$u^* = \sqrt{uv} \quad \to \quad u^* = \left(\frac{\kappa \cdot \epsilon}{1 - \zeta} \cdot v \cdot u^{\epsilon} \right)^{1/(1+\epsilon)}$$

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

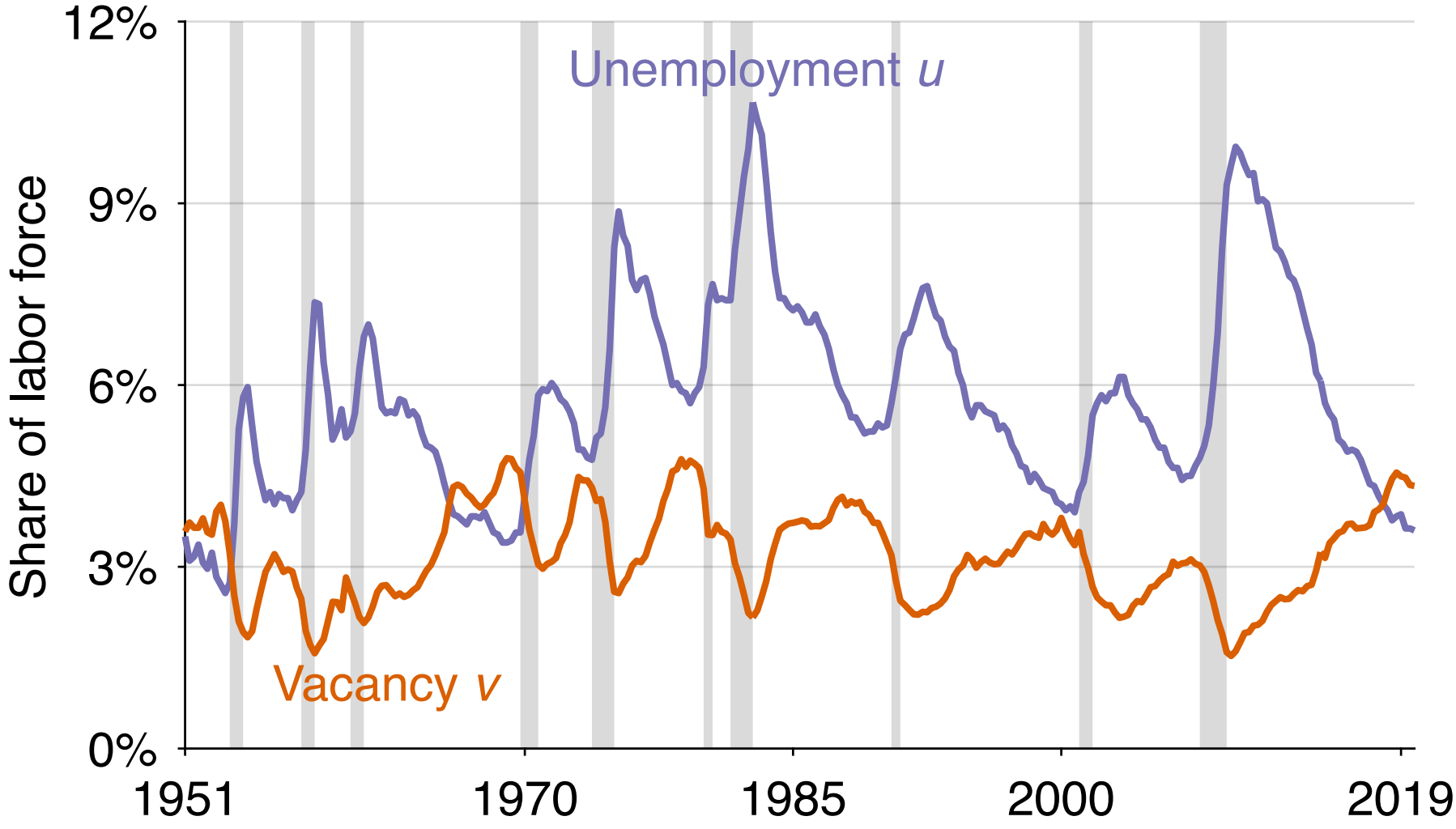


POSTWAR IN THE UNITED STATES

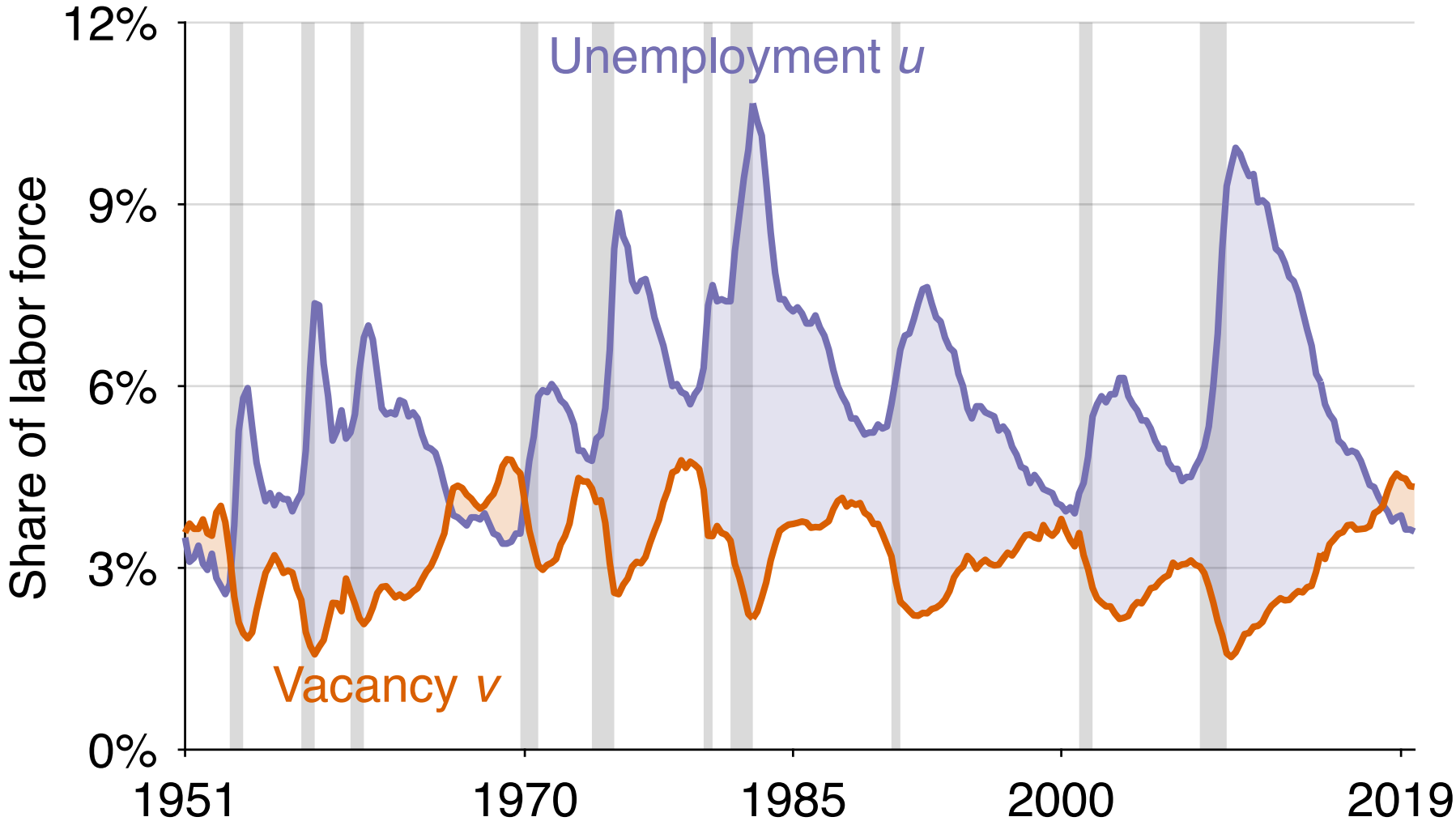
UNEMPLOYMENT RATE (CPS)



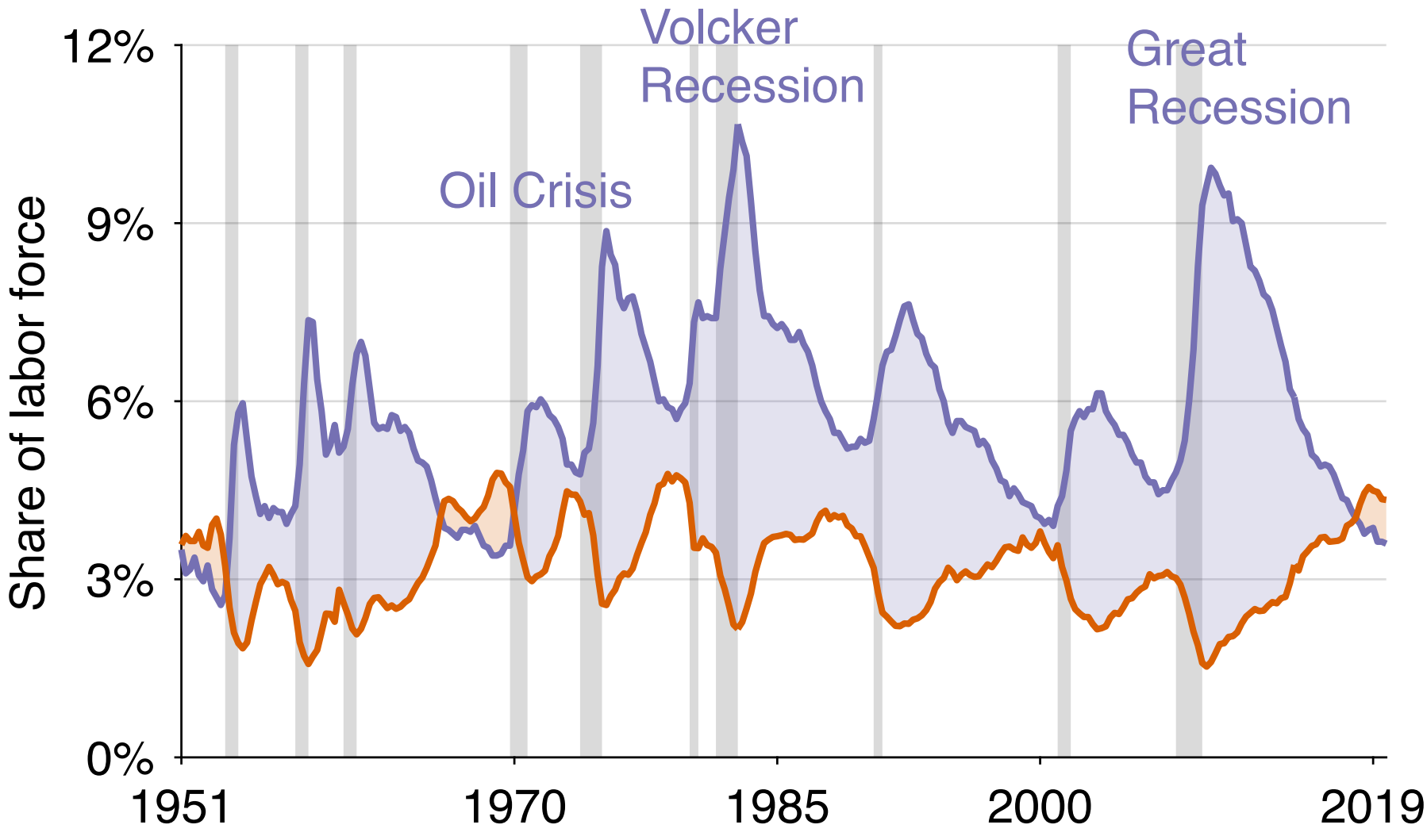
VACANCY RATE (BARNICHON 2010, JOLTS)



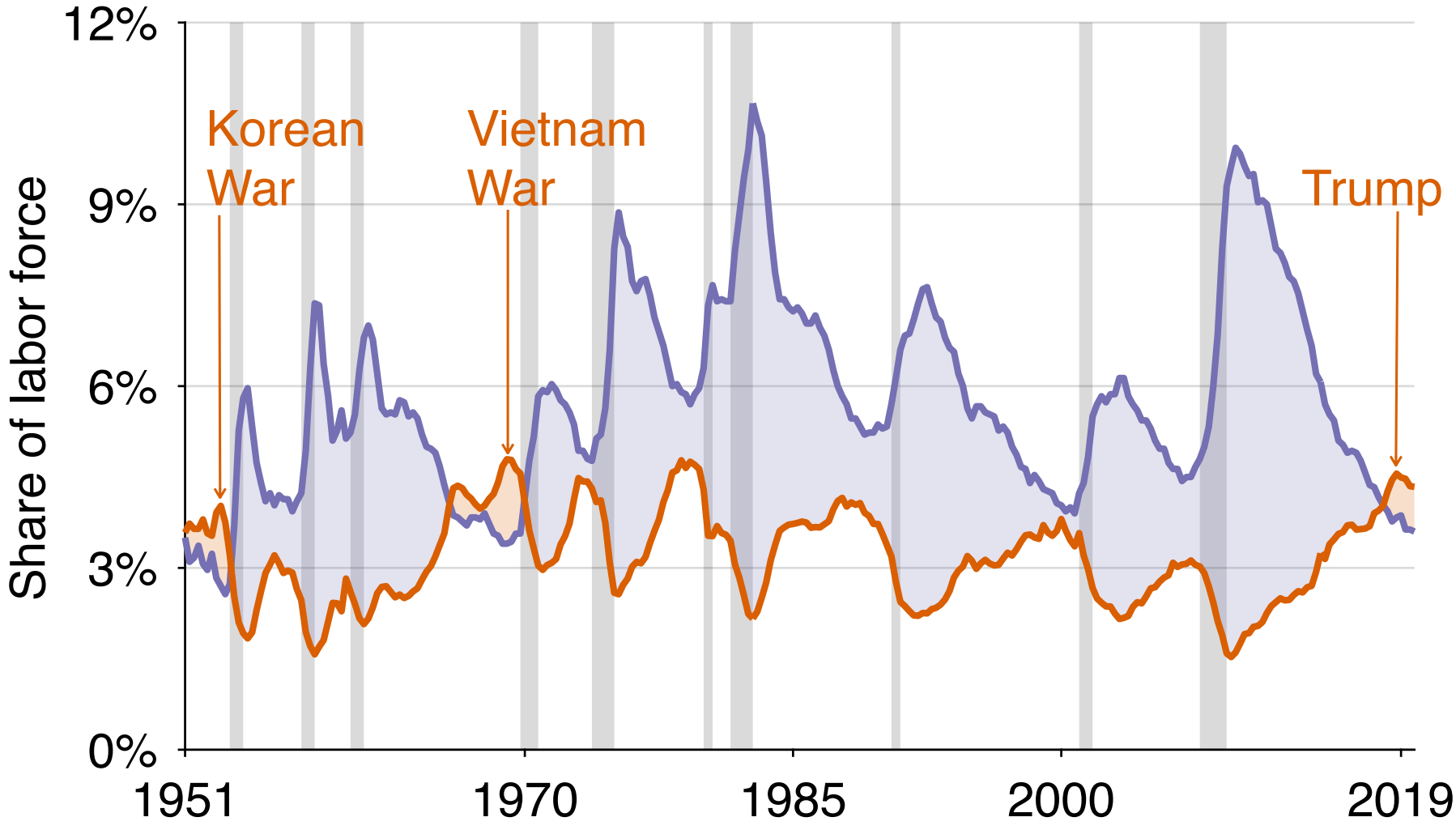
LABOR MARKET IS GENERALLY TOO SLACK...



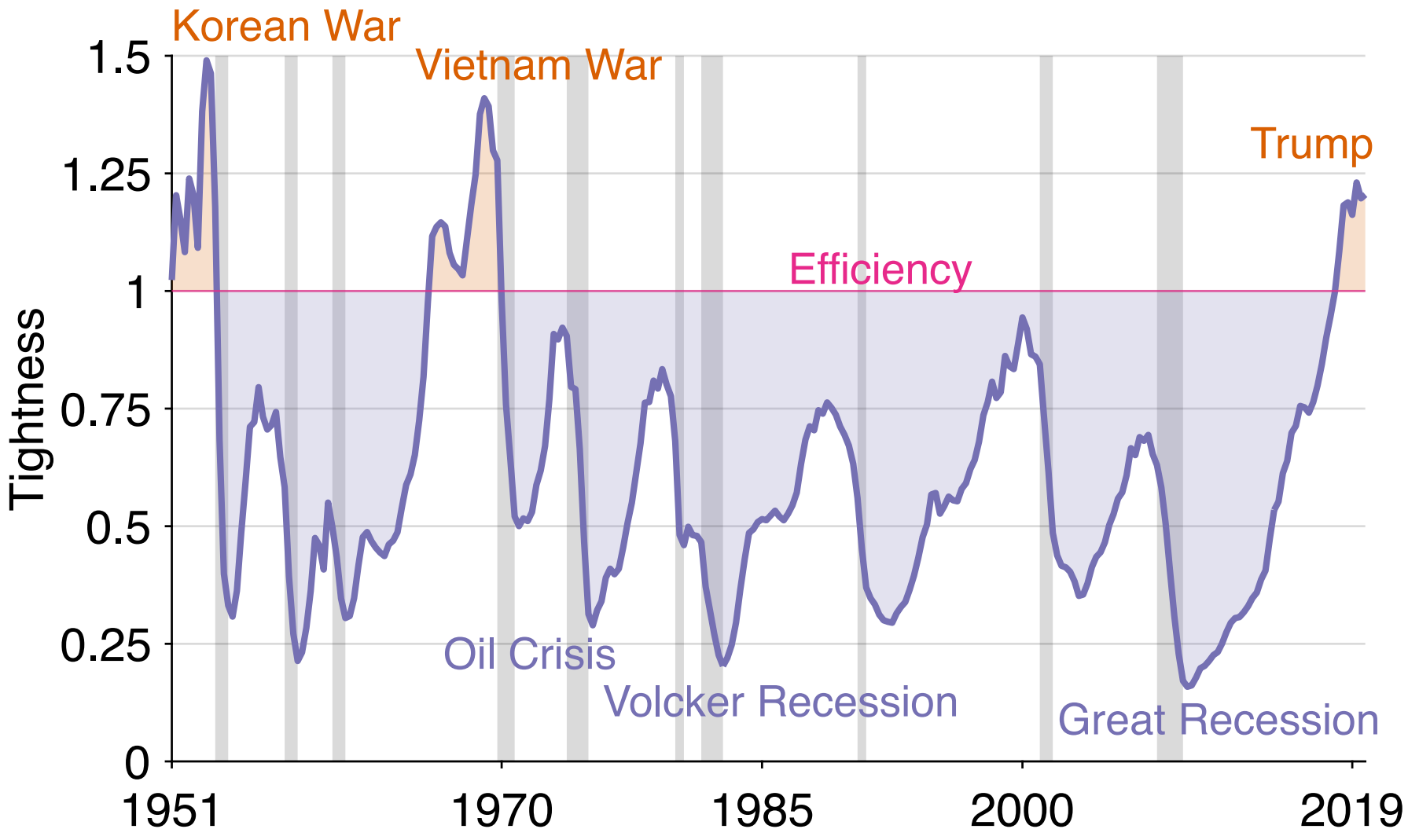
. . . AND IS ESPECIALLY SLACK IN SLUMPS



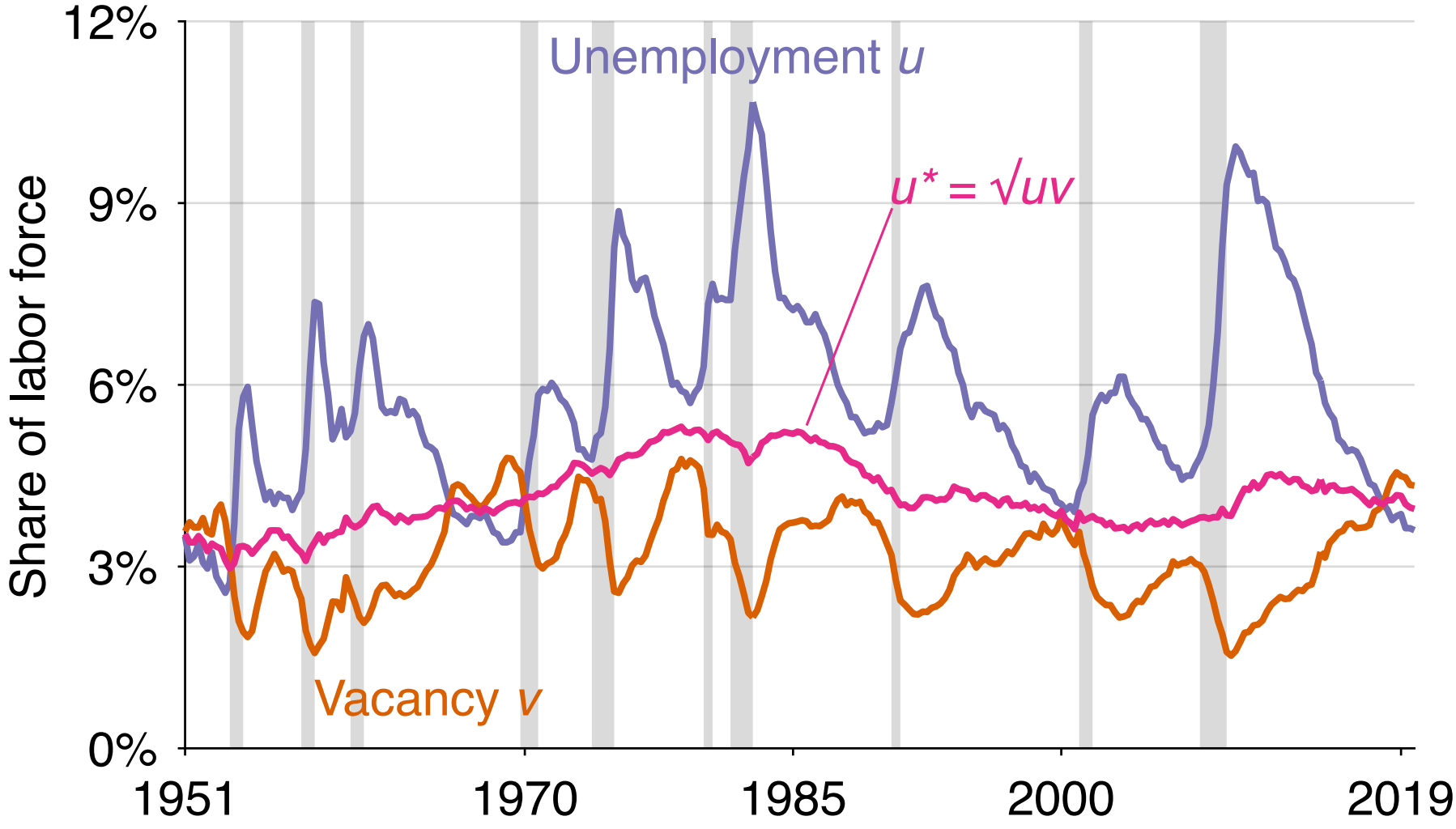
LABOR MARKET IS TOO TIGHT DURING WARS



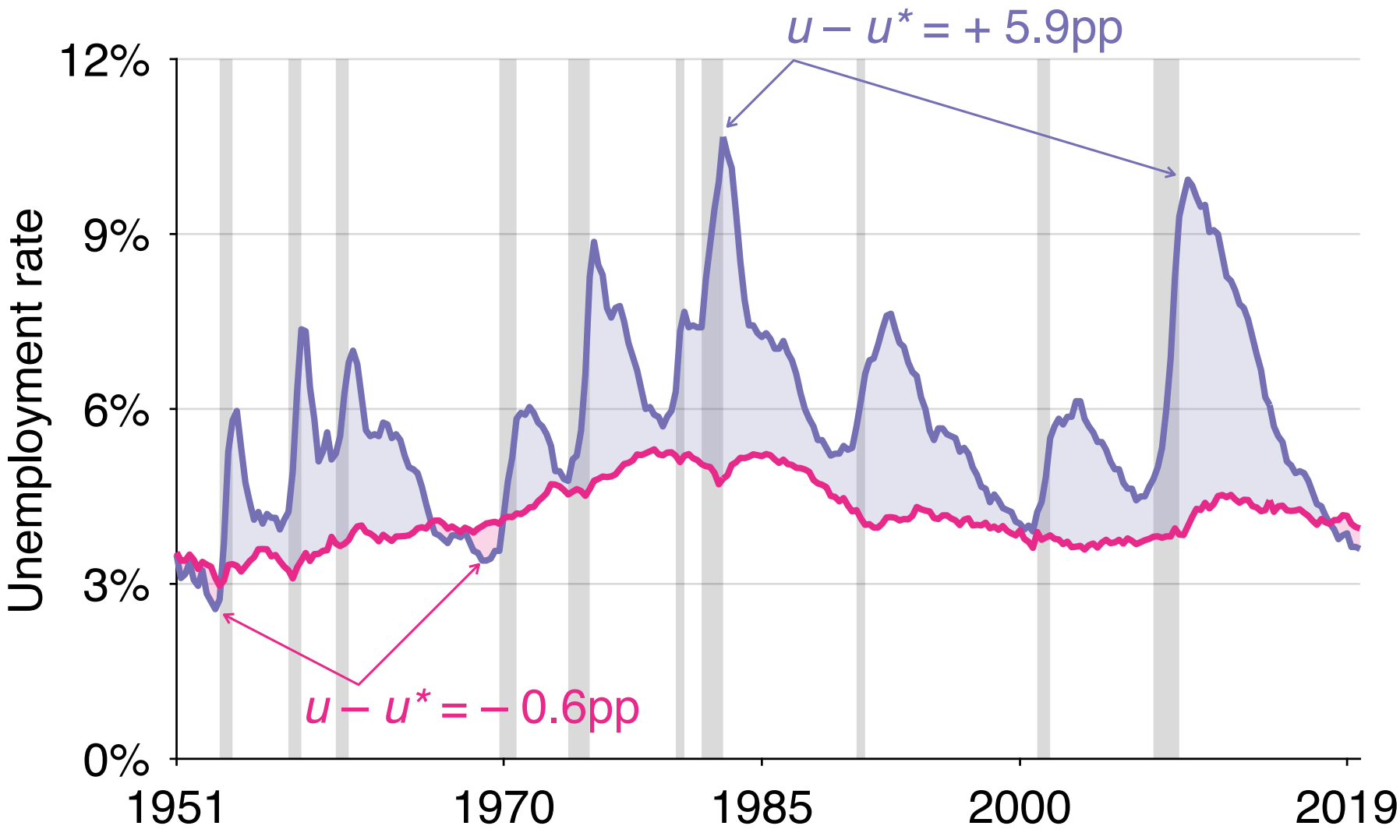
TIGHTNESS v/u SUMMARIZES STATE OF LABOR MARKET



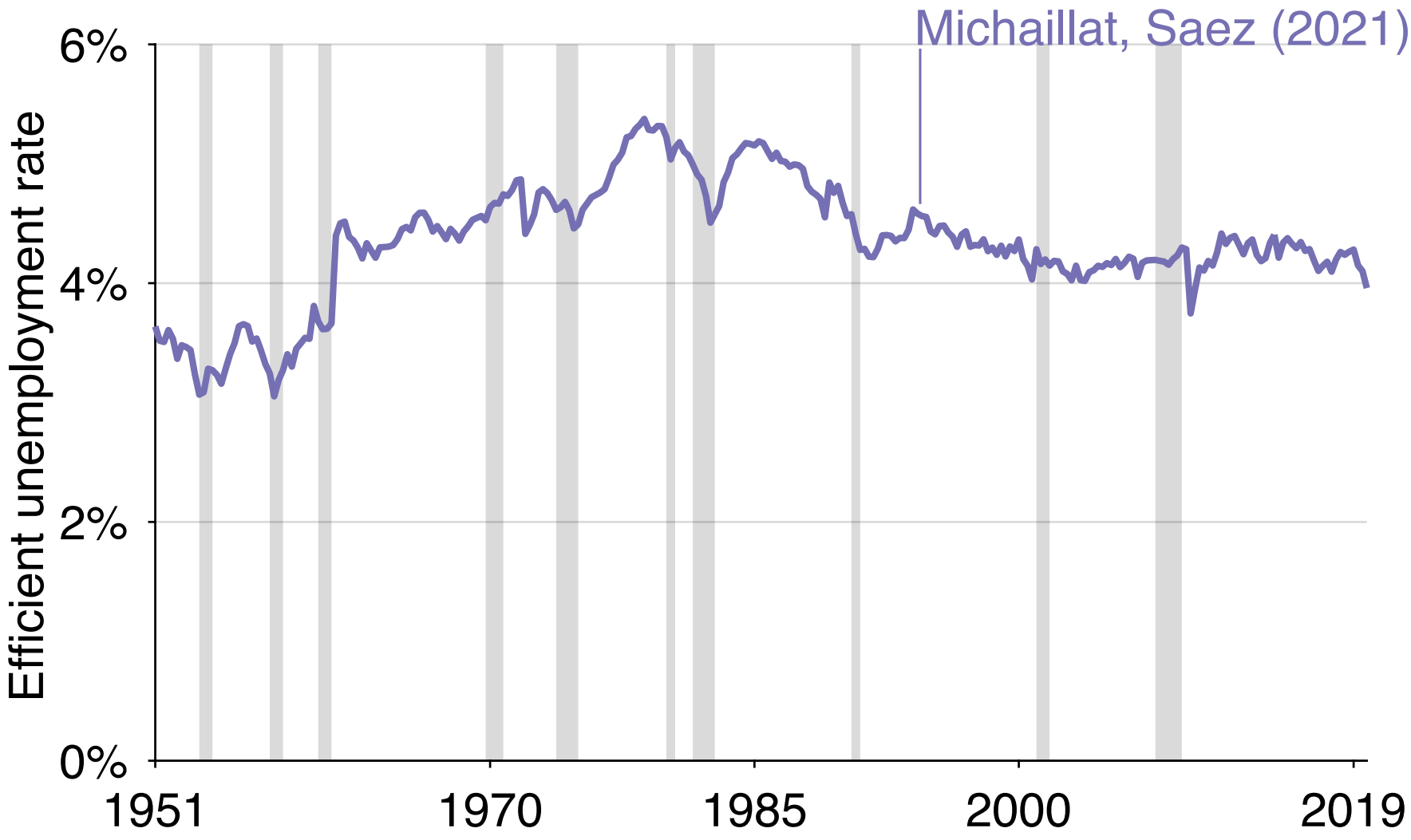
u^* REMAINS IN 3.0%–5.3%, AVERAGES 4.2%



UNEMPLOYMENT GAP IS COUNTERCYCLICAL



COMPARISON WITH MICHAILLAT, SAEZ (2021)



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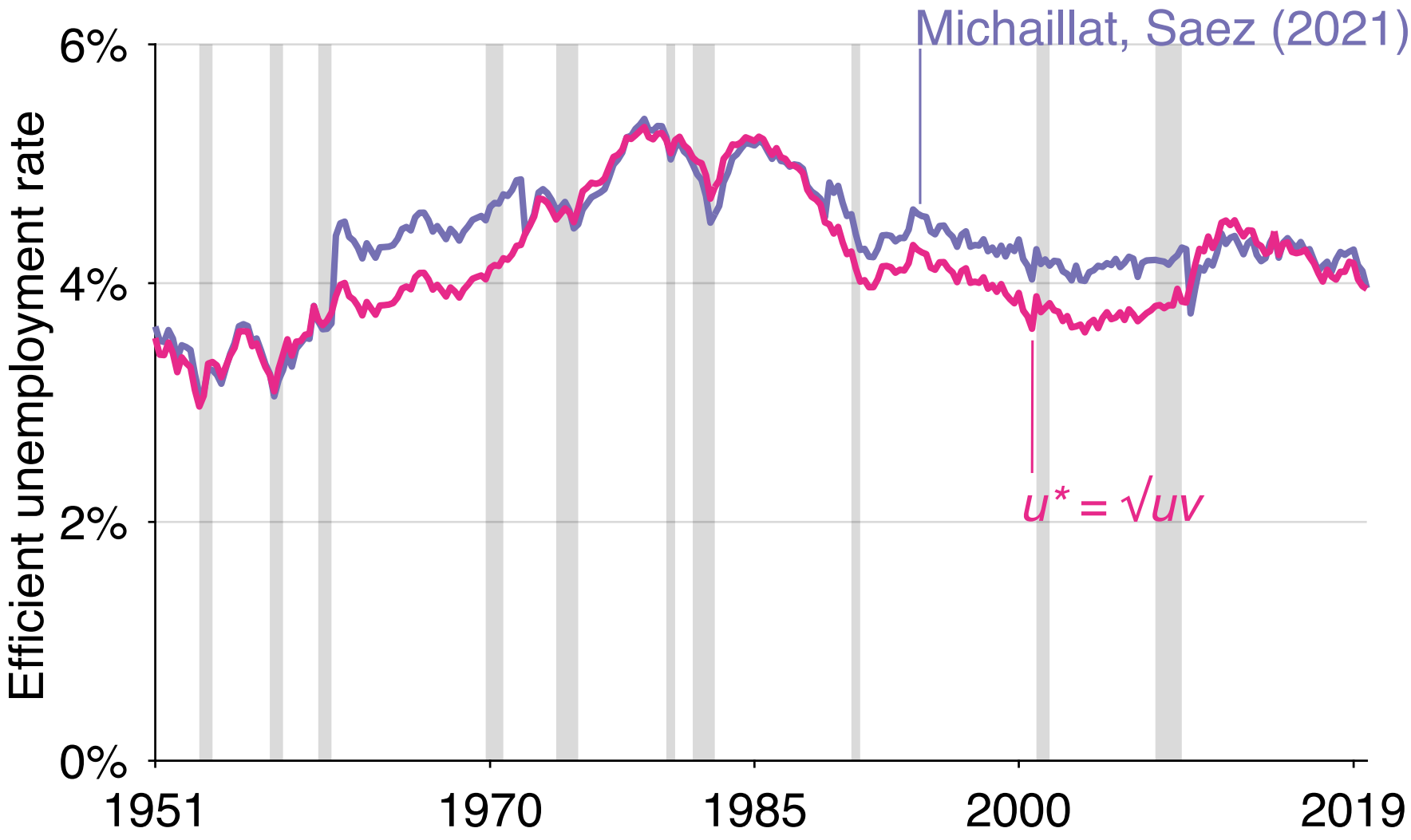
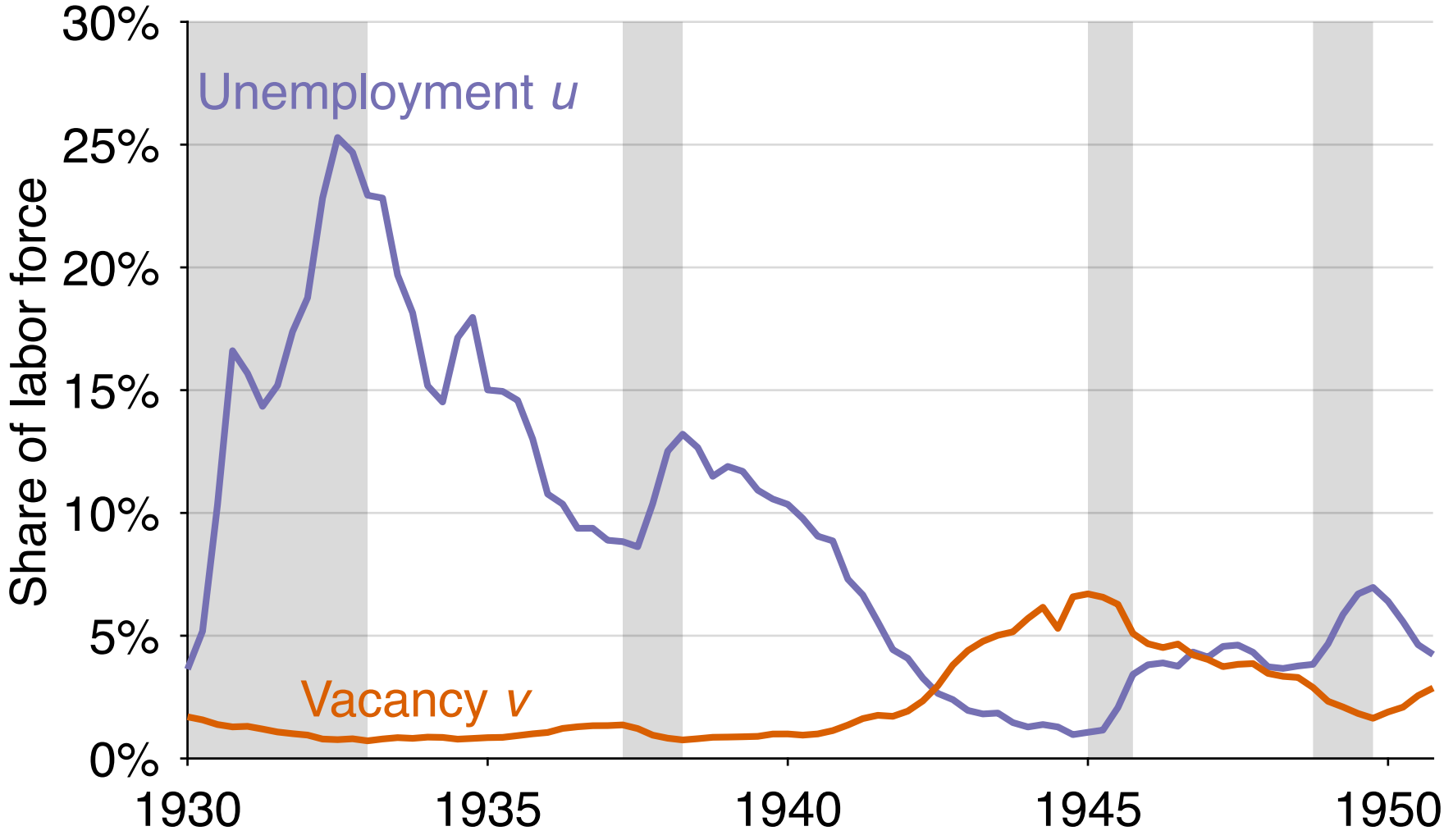


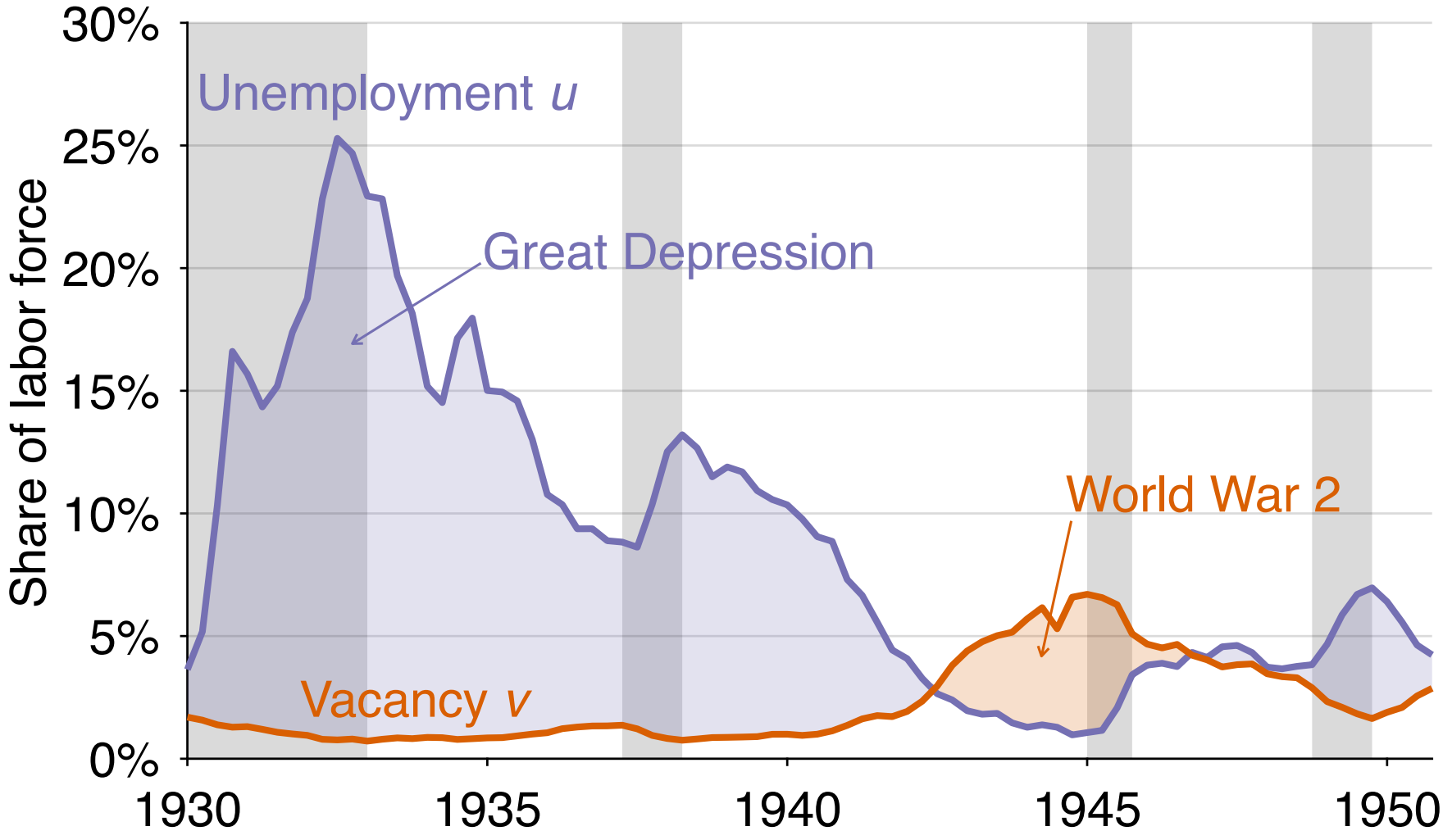
GREAT DEPRESSION IN THE UNITED STATES

NBER DATA (PETROSKY-NADEAU, ZHANG 2021)

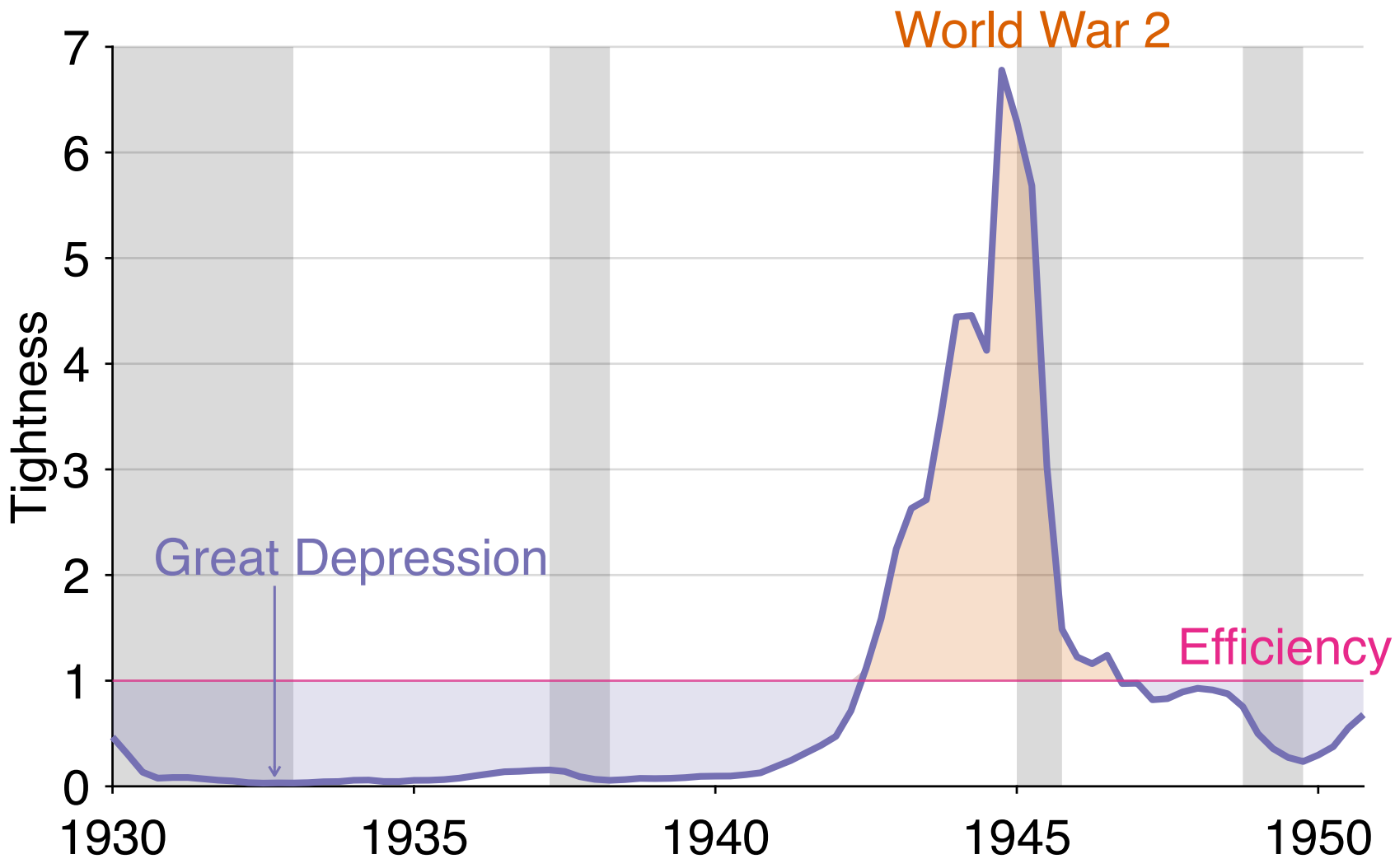


BEVERIDGE CURVE ≈ HYPERBOLA

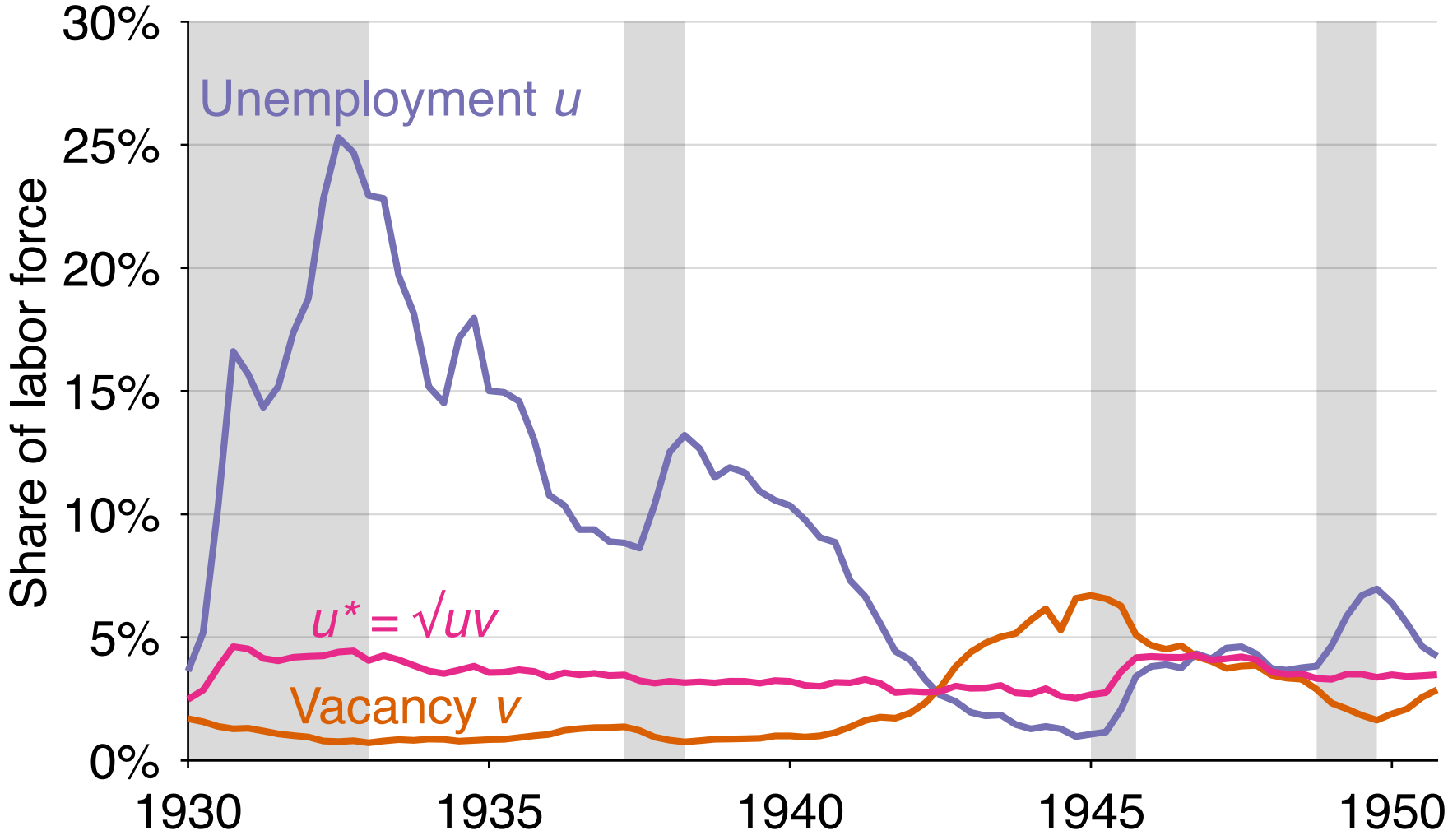
LABOR MARKET WAS TOO SLACK UNTIL WW2



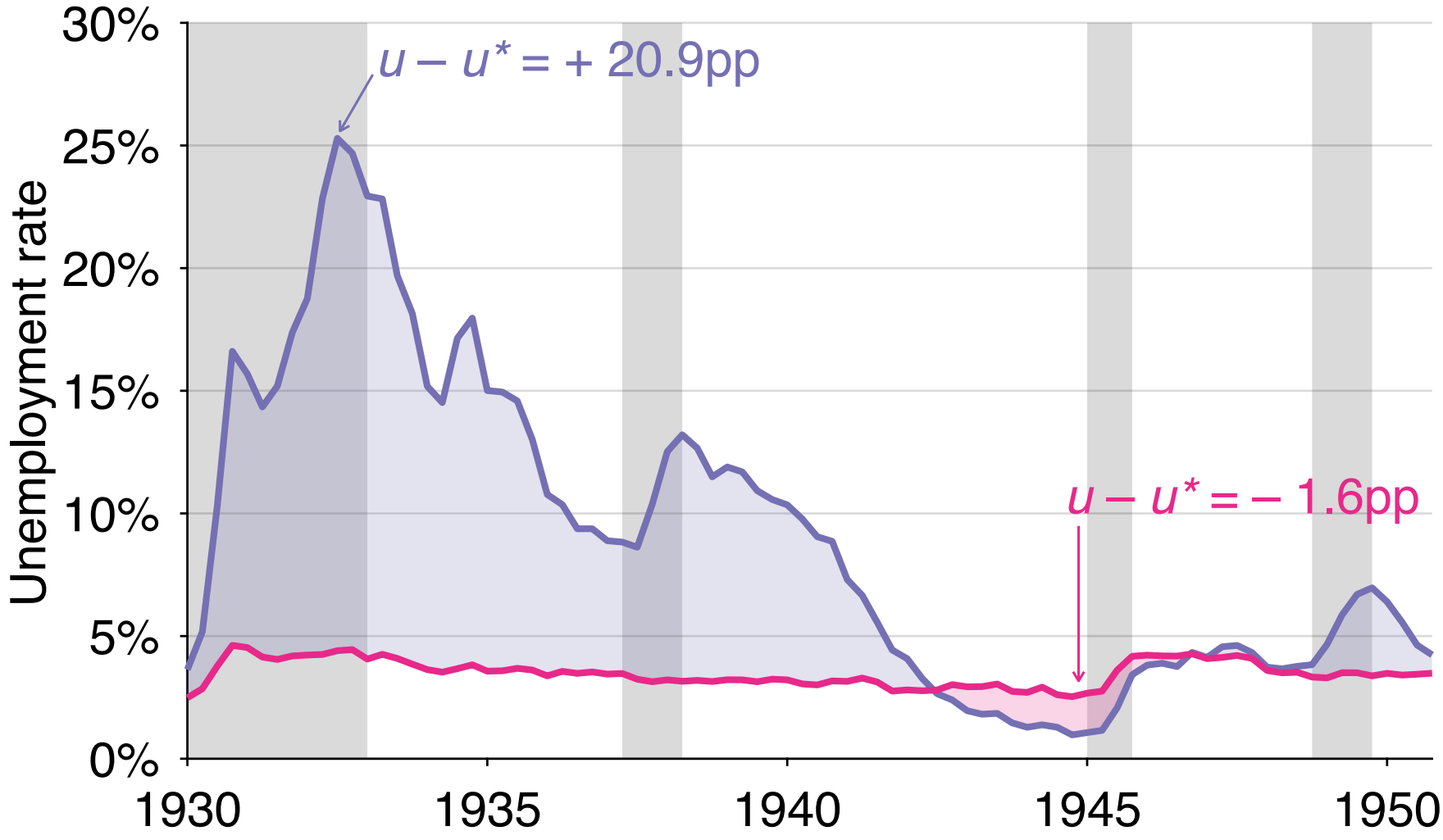
LOWEST AND HIGHEST TIGHTNESS ON RECORD



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

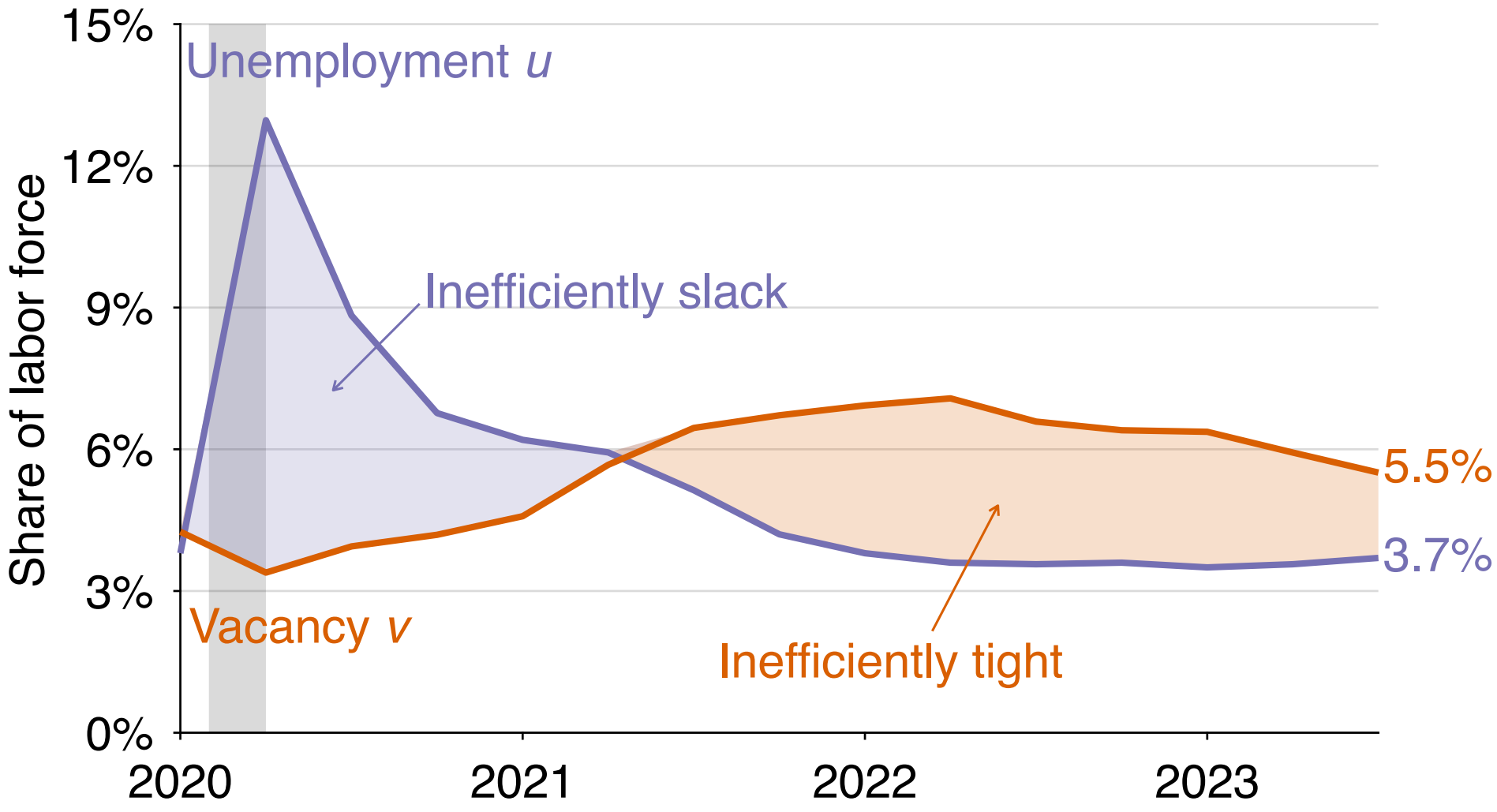


MOST EXTREME UNEMPLOYMENT GAPS ON RECORD

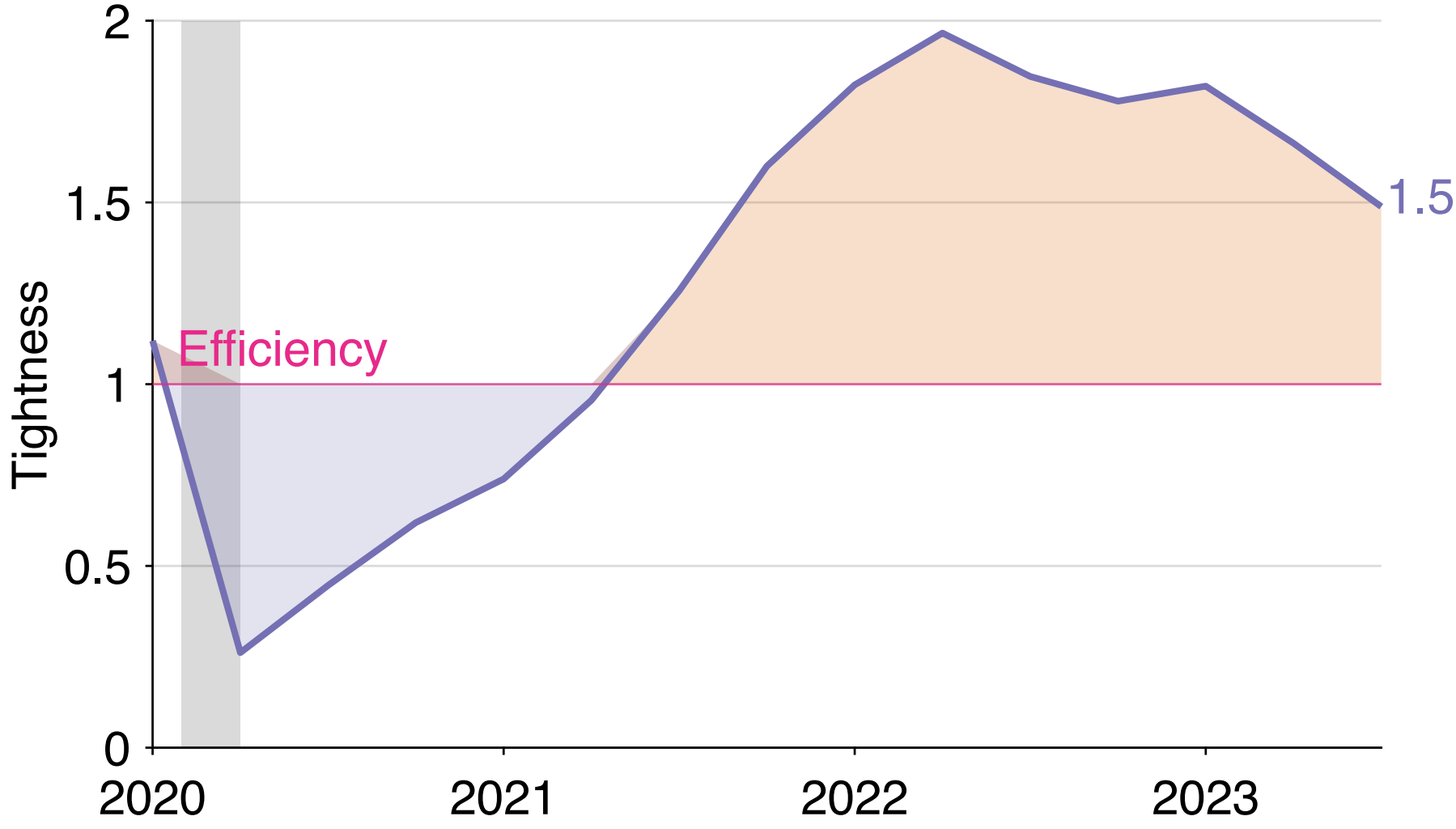


PANDEMIC IN THE UNITED STATES

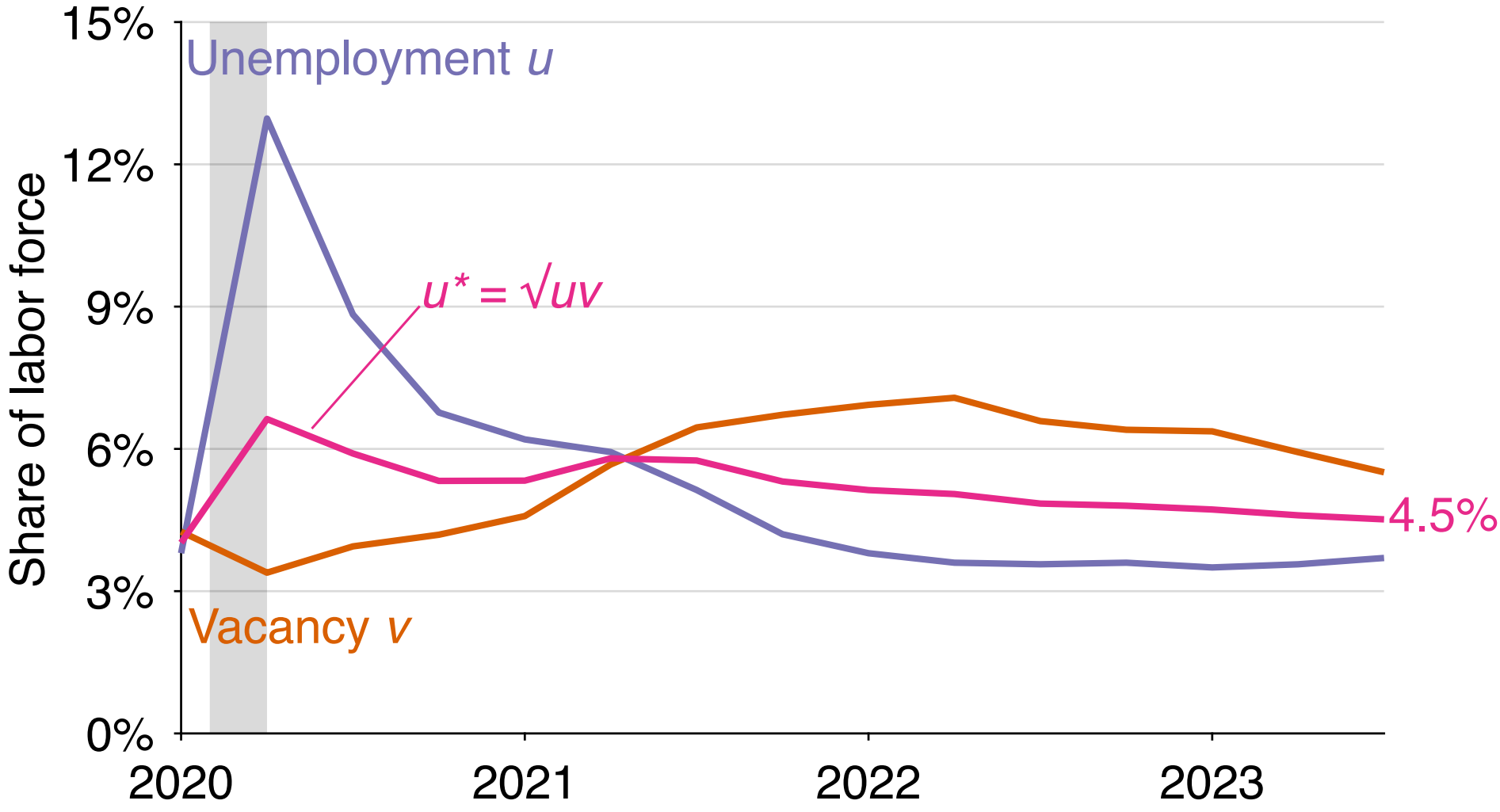
LABOR MARKET HAS BEEN TOO TIGHT SINCE 2021Q3...



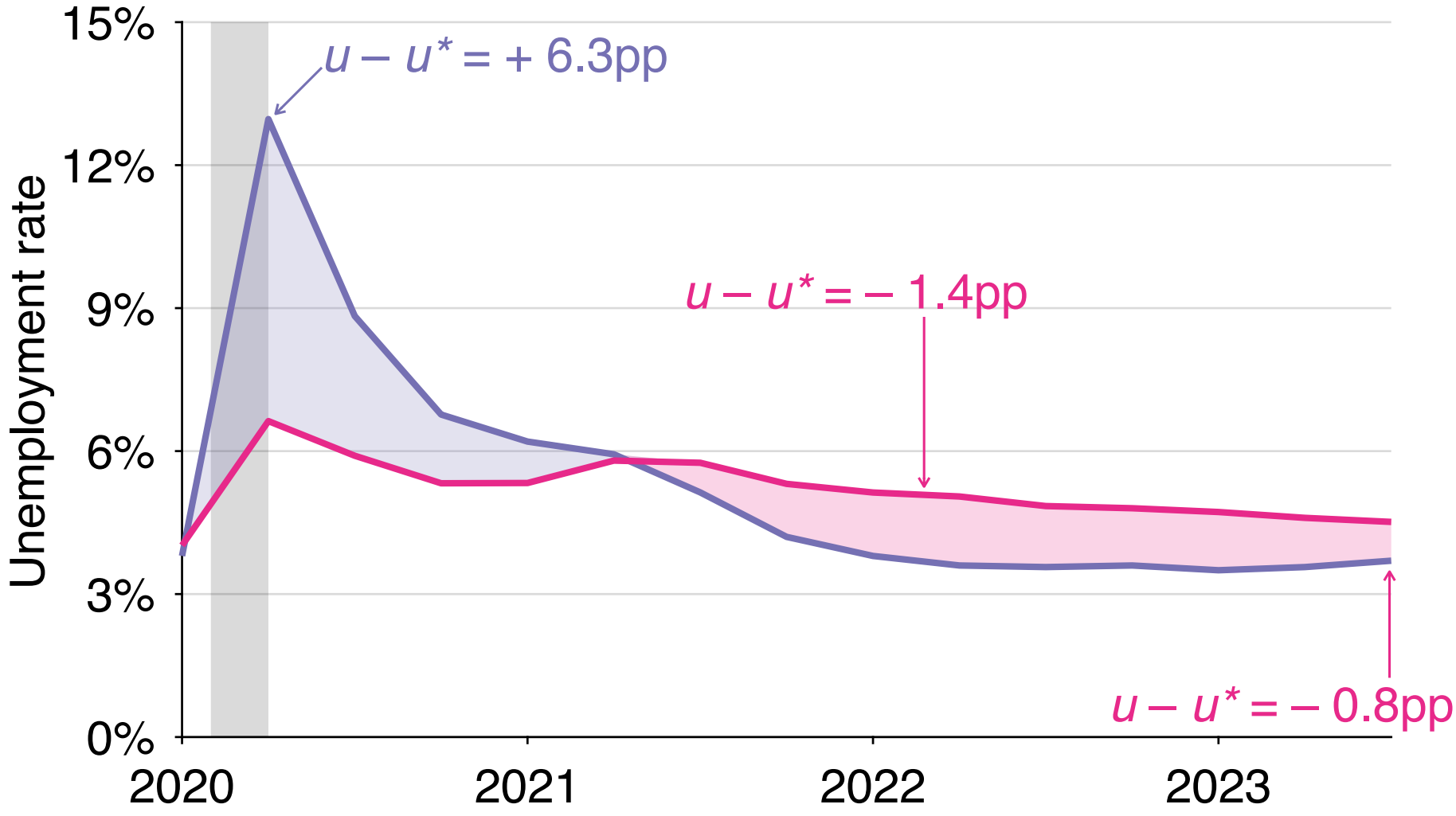
. . . BUT IT HAS BEEN COOLING SINCE 2022Q2



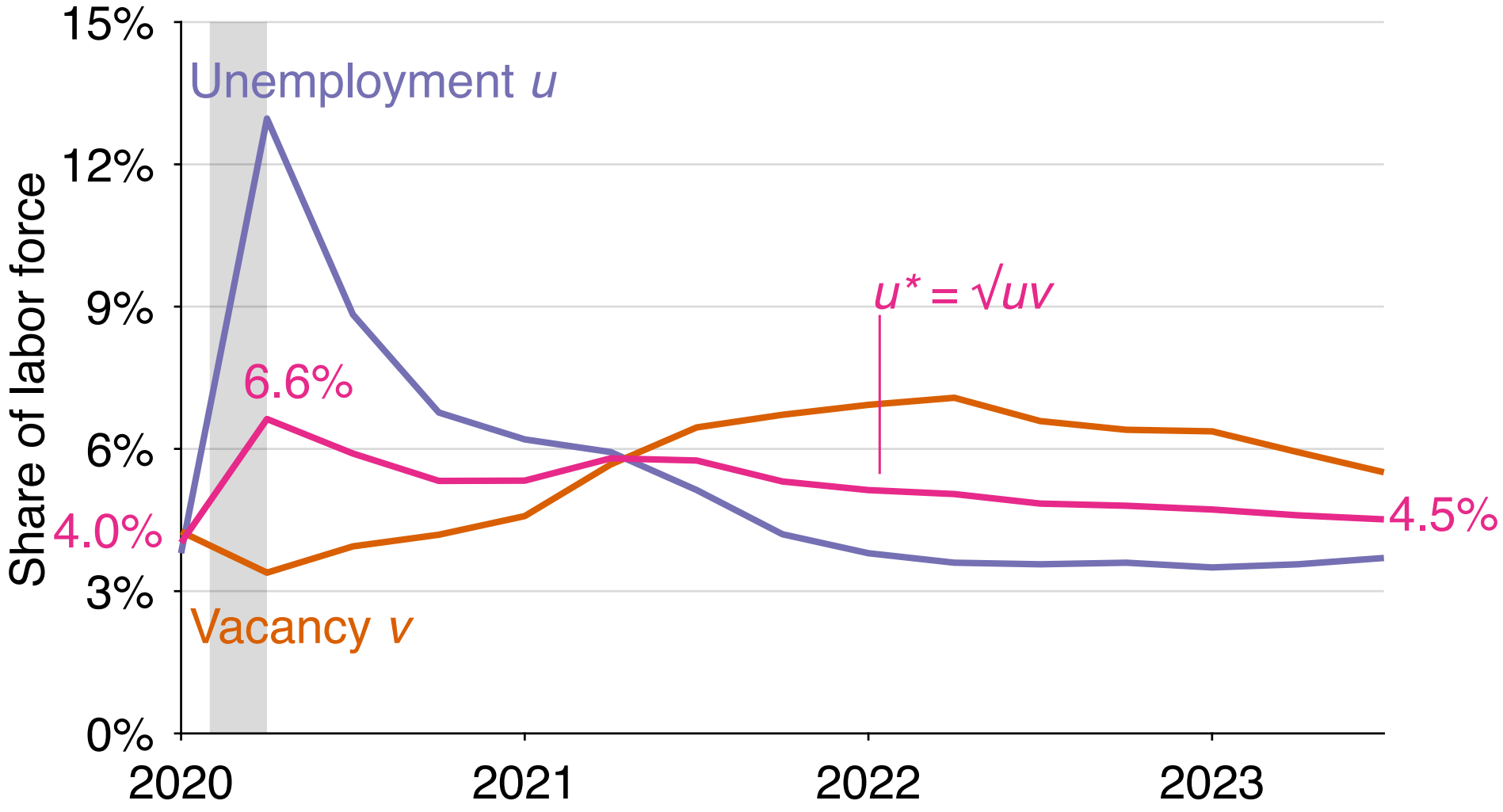
CURRENT TARGET FOR MONETARY POLICY: $u^* = 4.5\%$



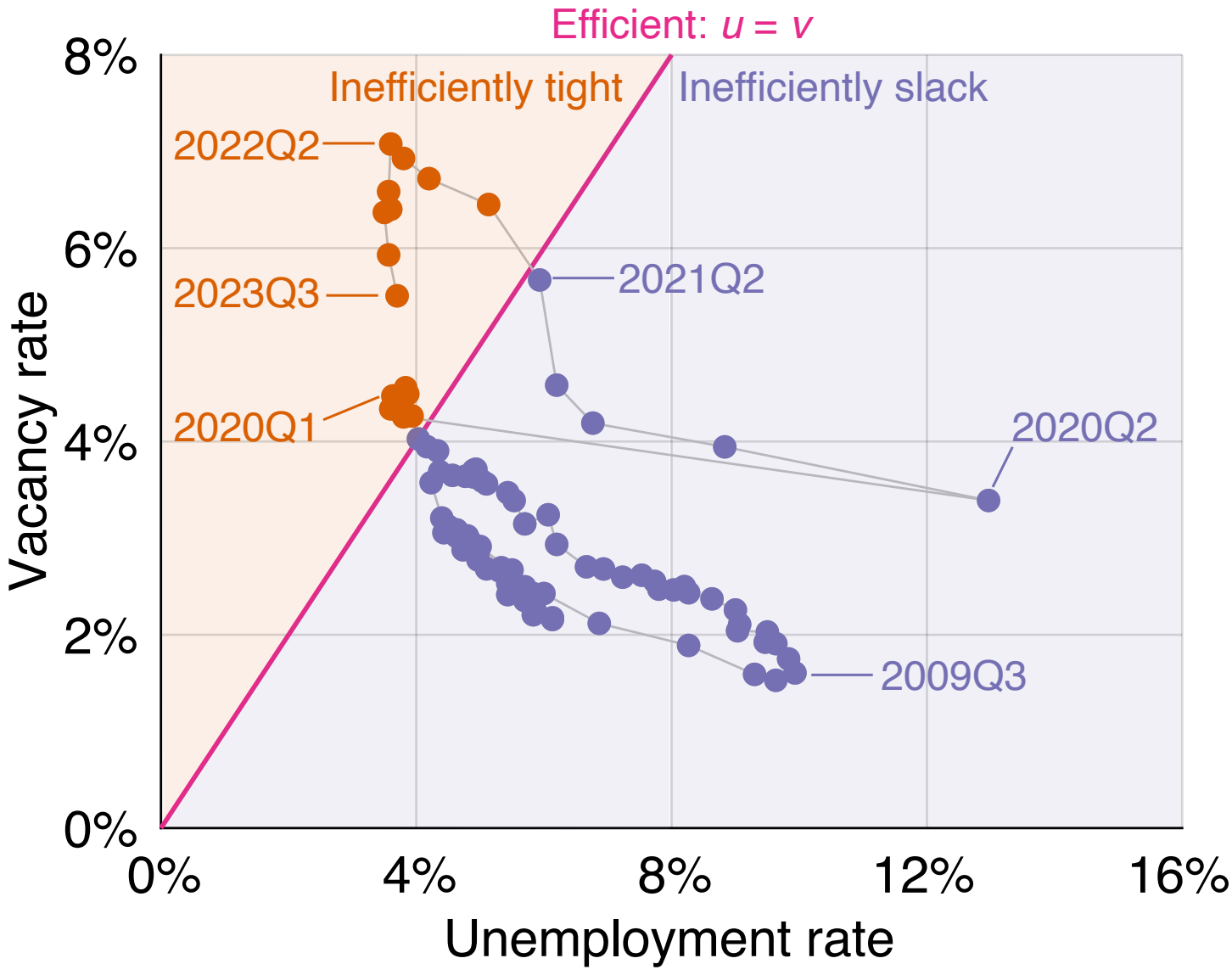
MOST EXTREME UNEMPLOYMENT GAPS SINCE WW2



WHY DID u^* INCREASE SO MUCH IN 2020?

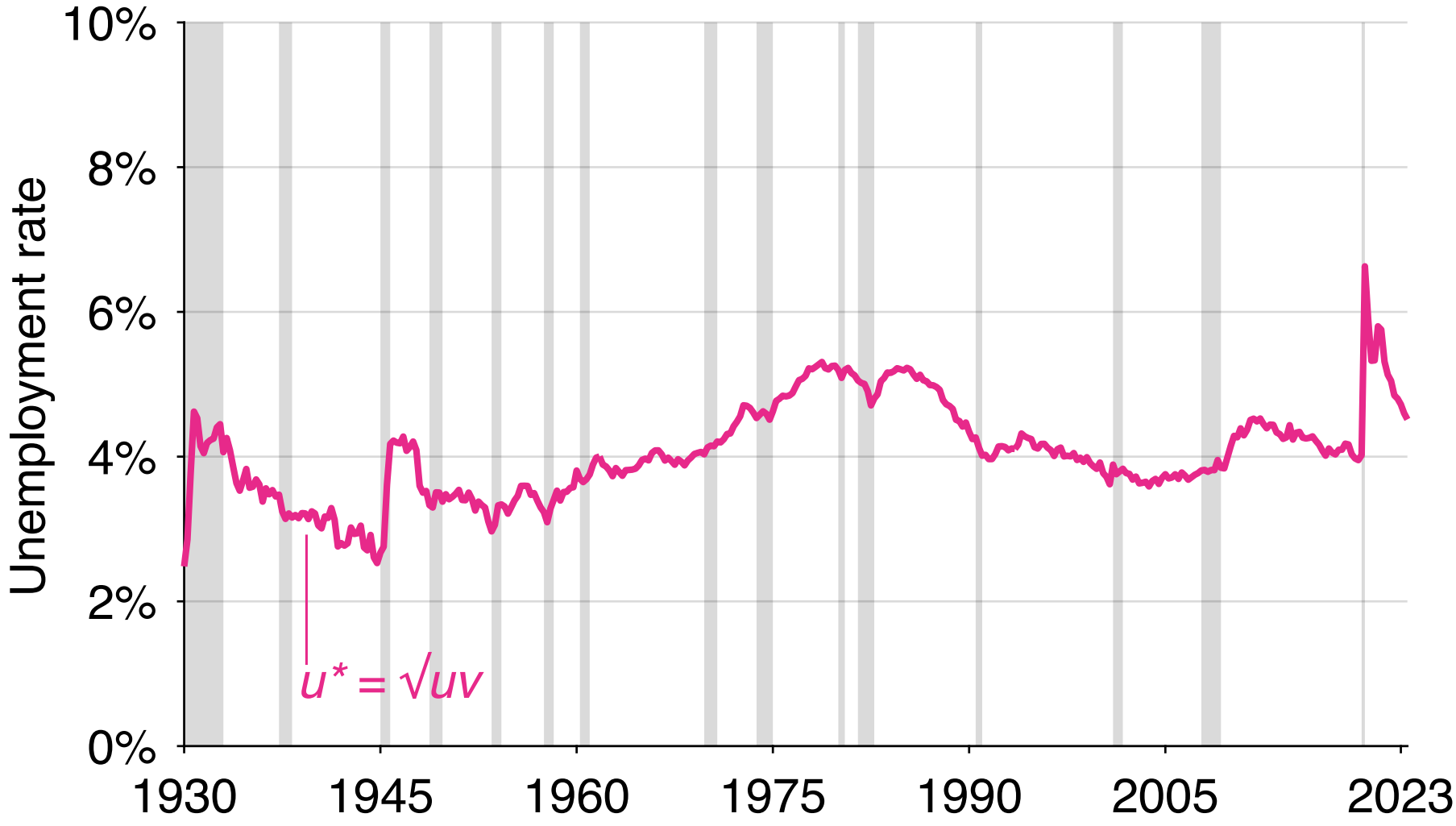


BECAUSE OF LARGE SHIFT OF BEVERIDGE CURVE IN 2020Q2

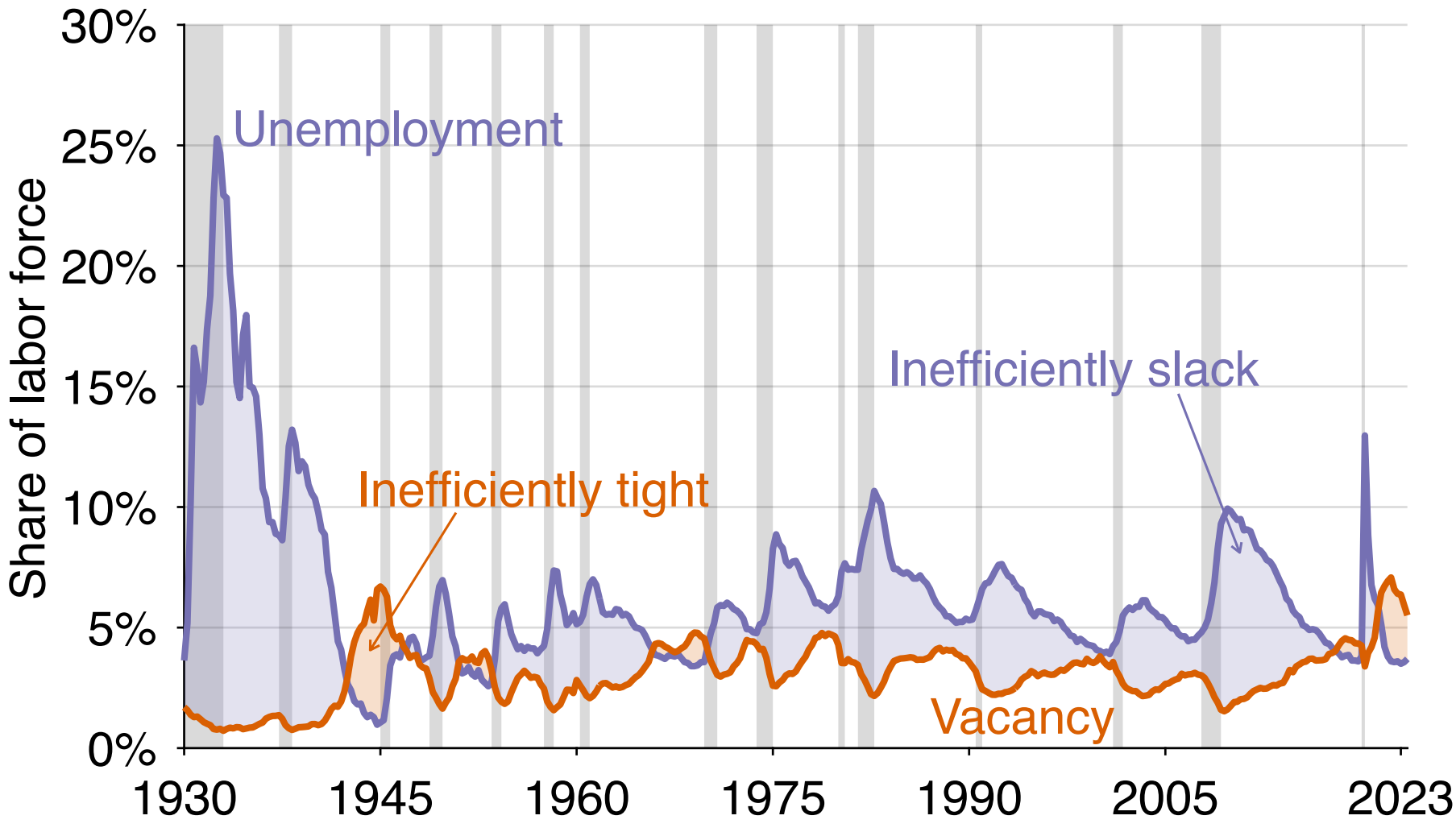


SUMMARY

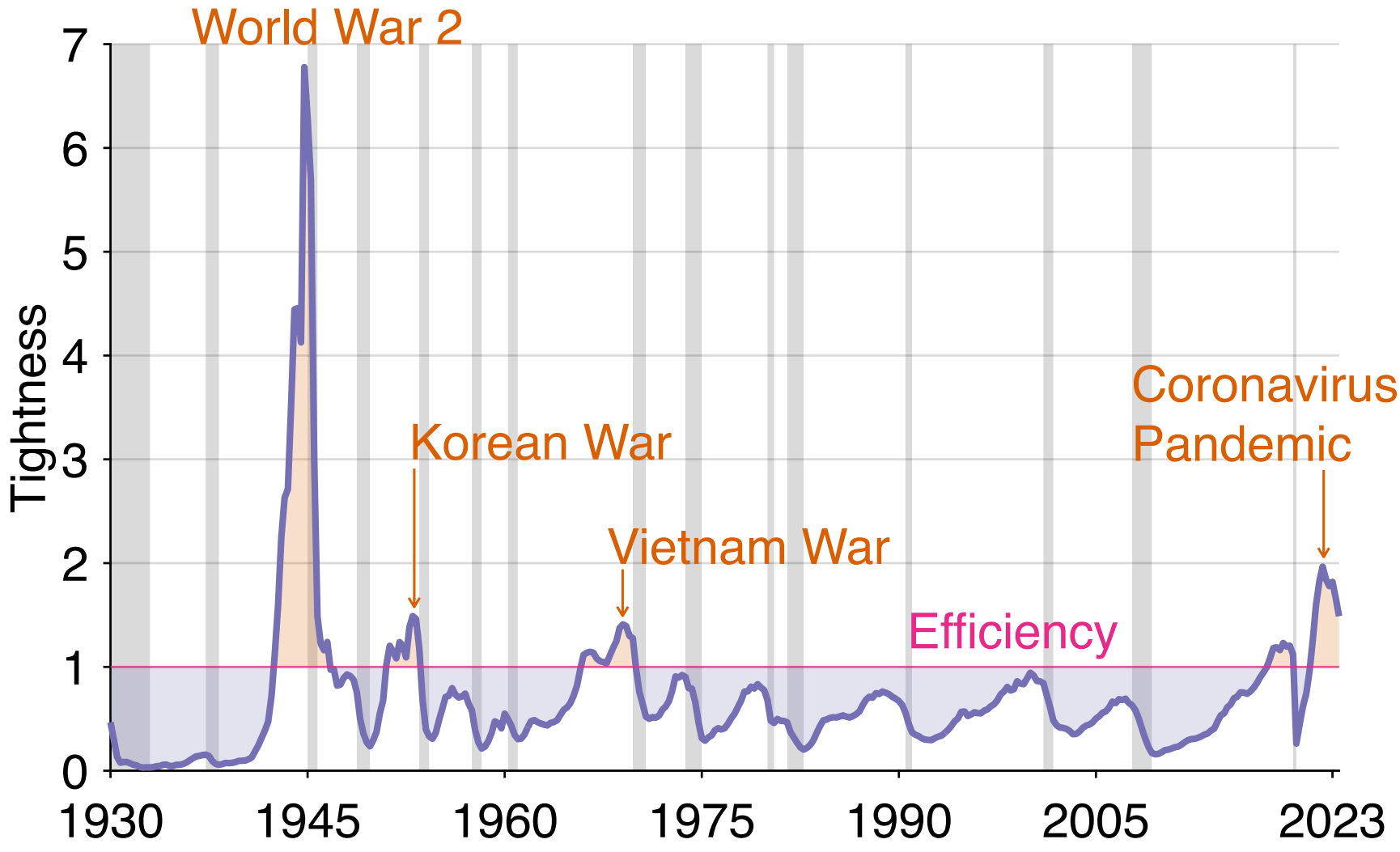
u^* AVERAGES 4.1% OVER 1930–2023



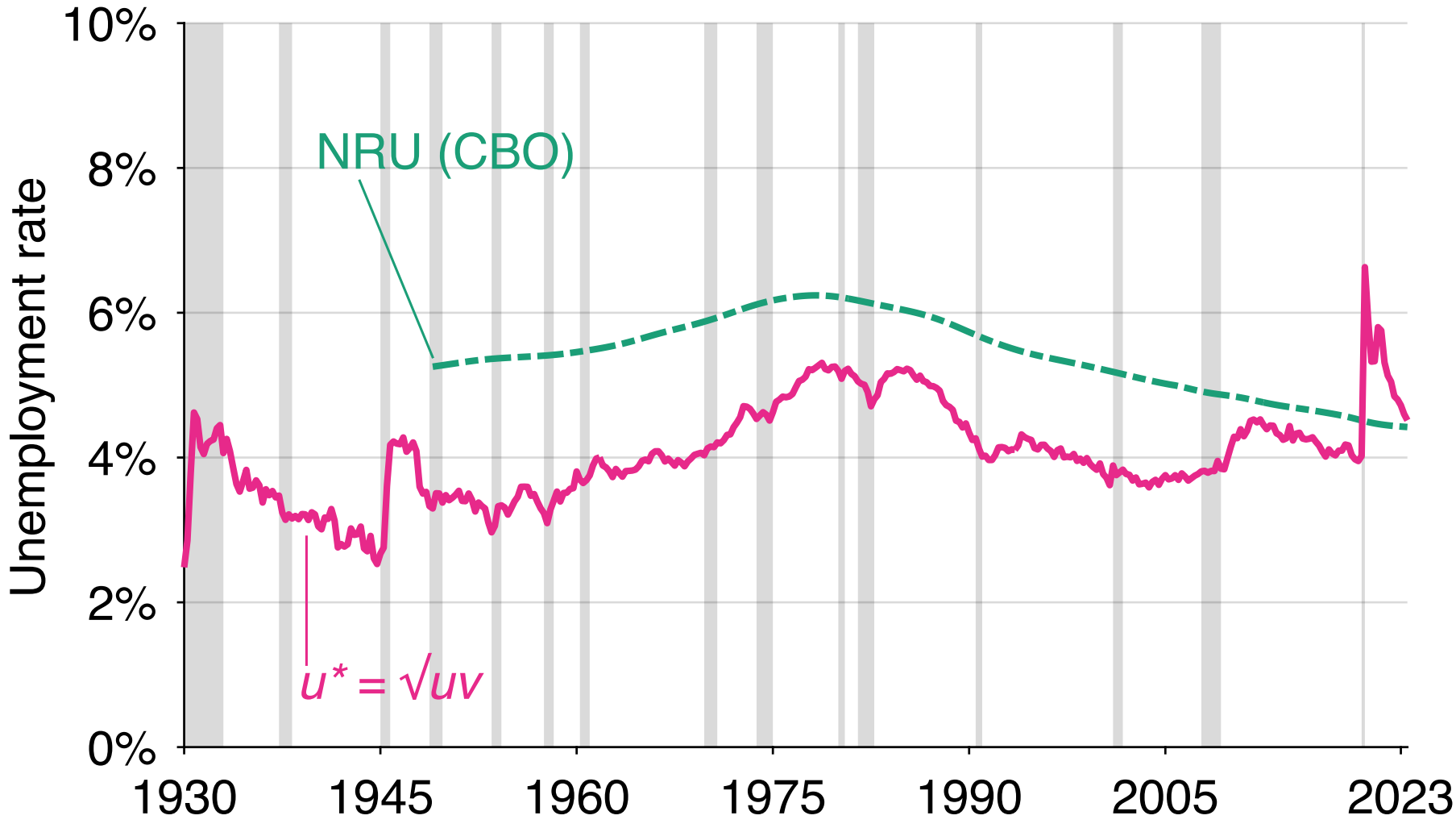
EFFICIENCY CRITERION FOR US LABOR MARKET



AN EQUIVALENT EFFICIENCY CRITERION



$u^* = \sqrt{uv}$ IS LOWER THAN EXISTING TARGETS



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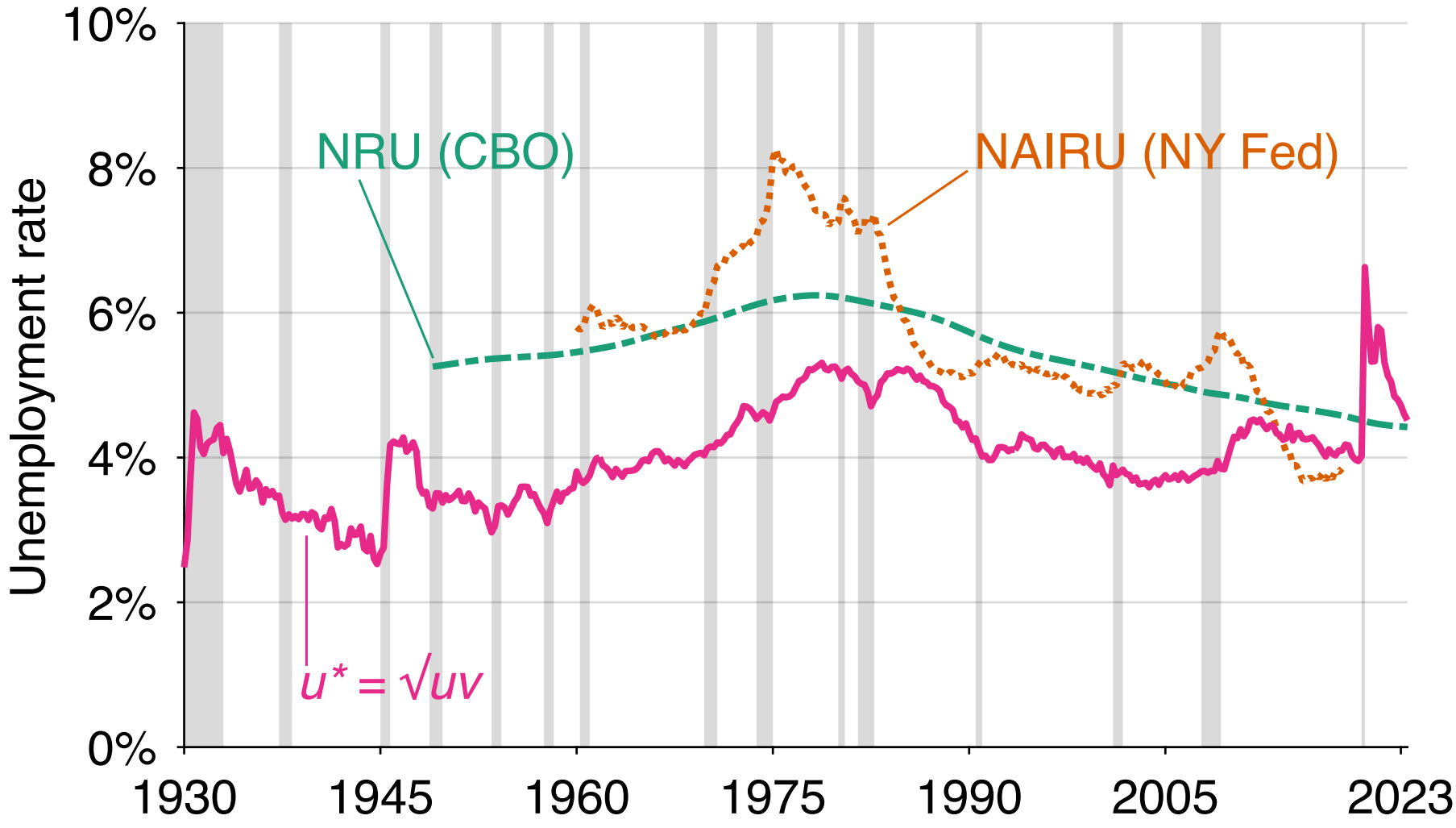
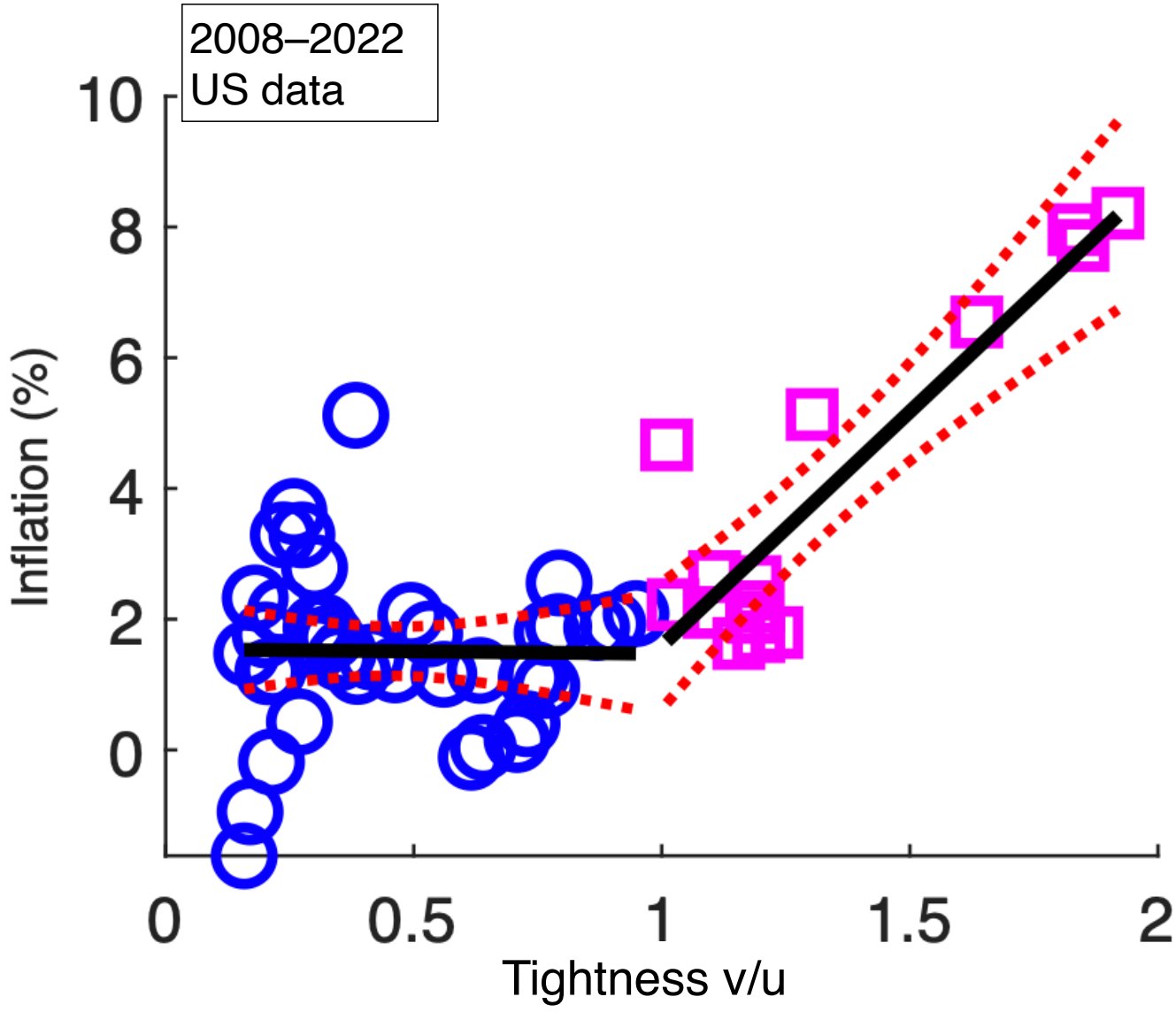
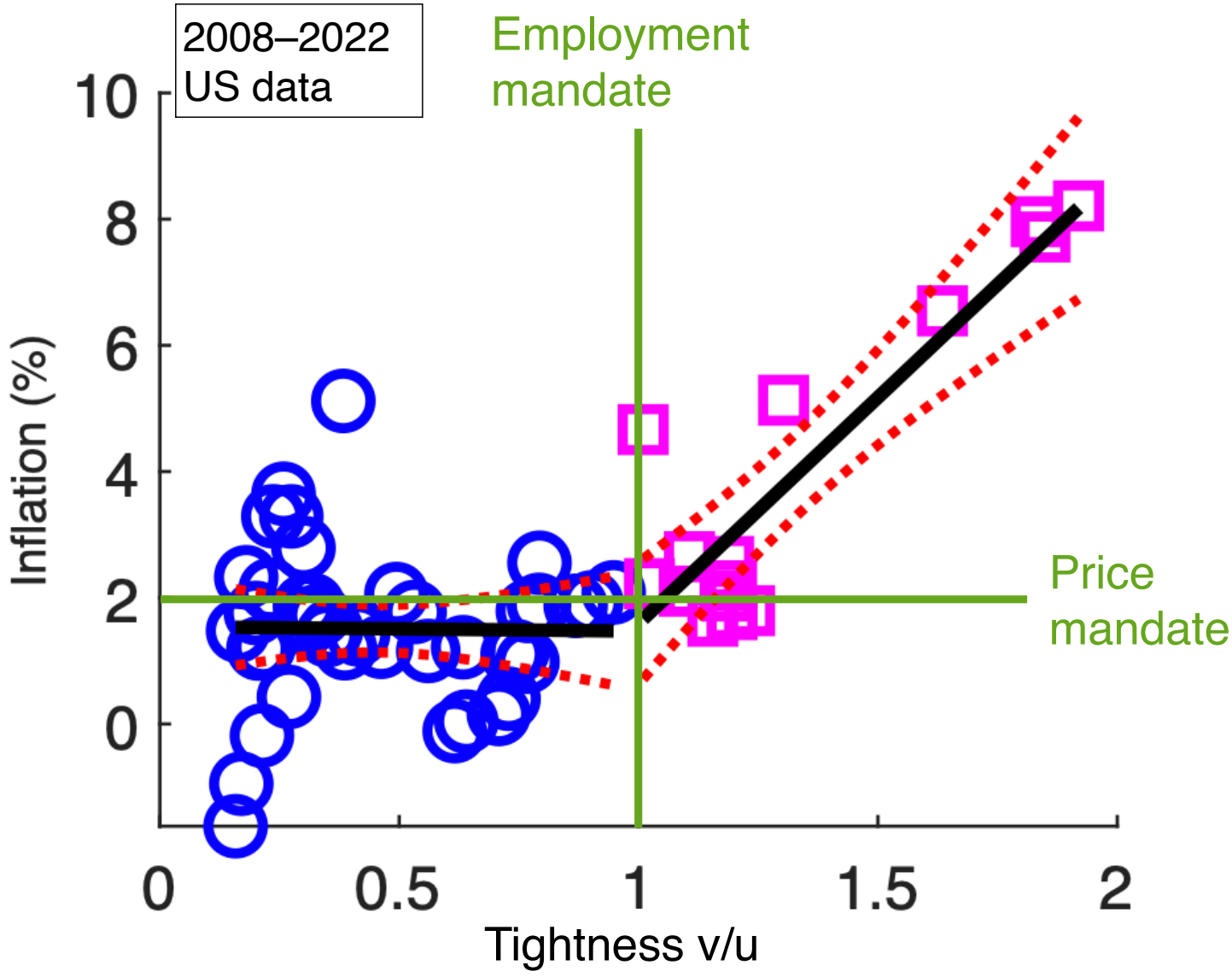


WHAT ABOUT THE PRICE MANDATE?

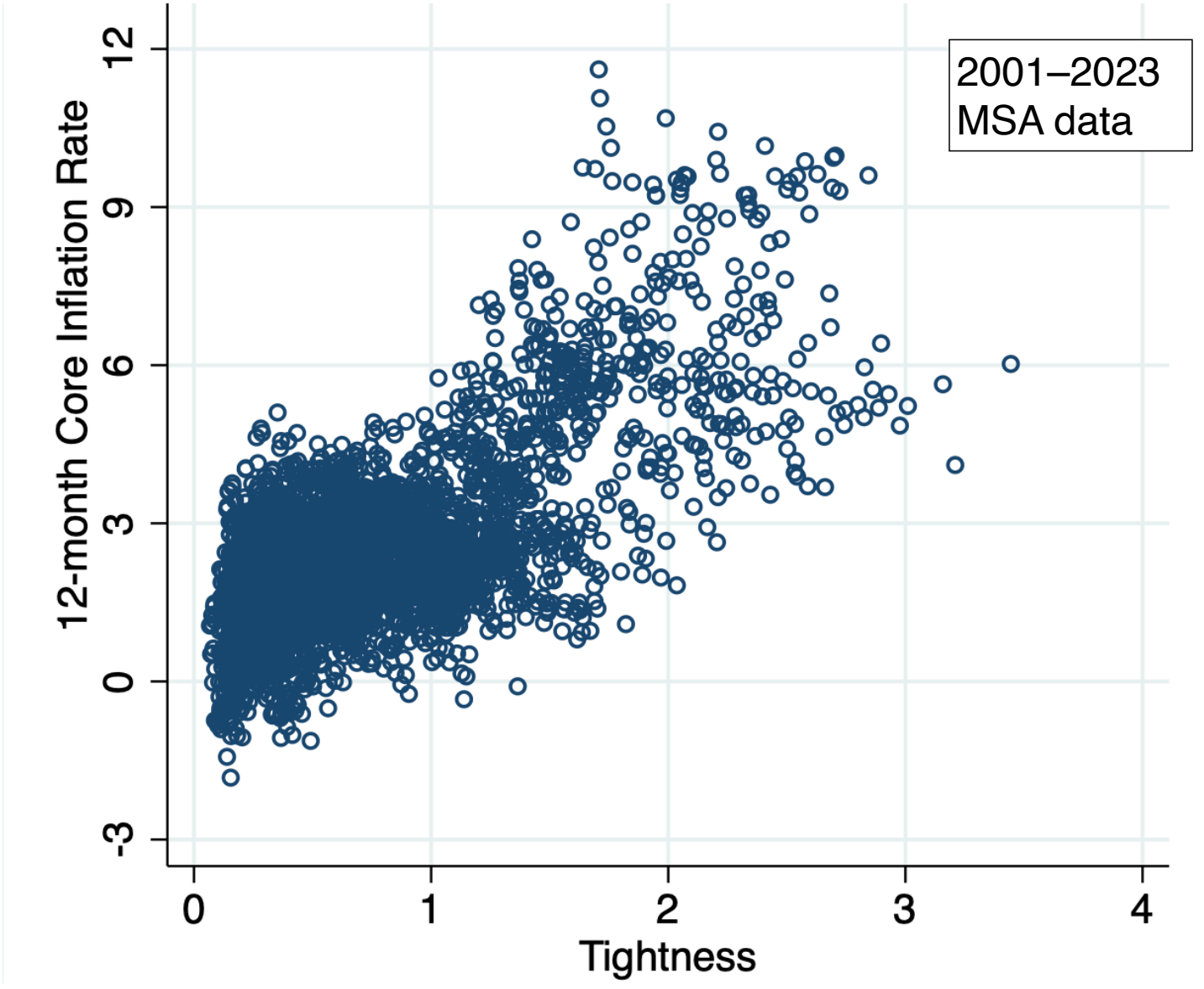
BENIGNO, EGGERTSSON (2023): DIVINE COINCIDENCE?



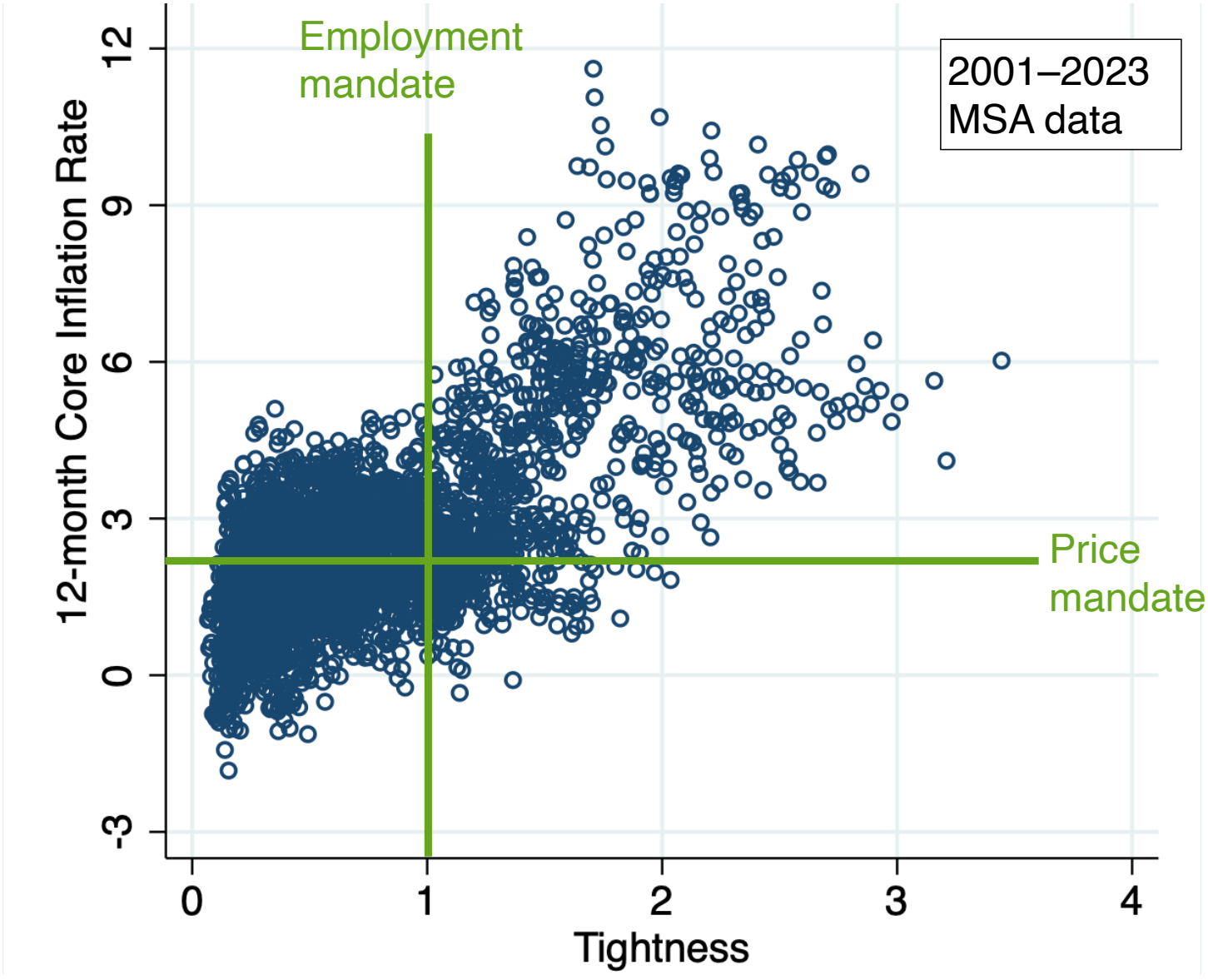
BENIGNO, EGGERTSSON (2023): DIVINE COINCIDENCE?



GITTI (2023): DIVINE COINCIDENCE?



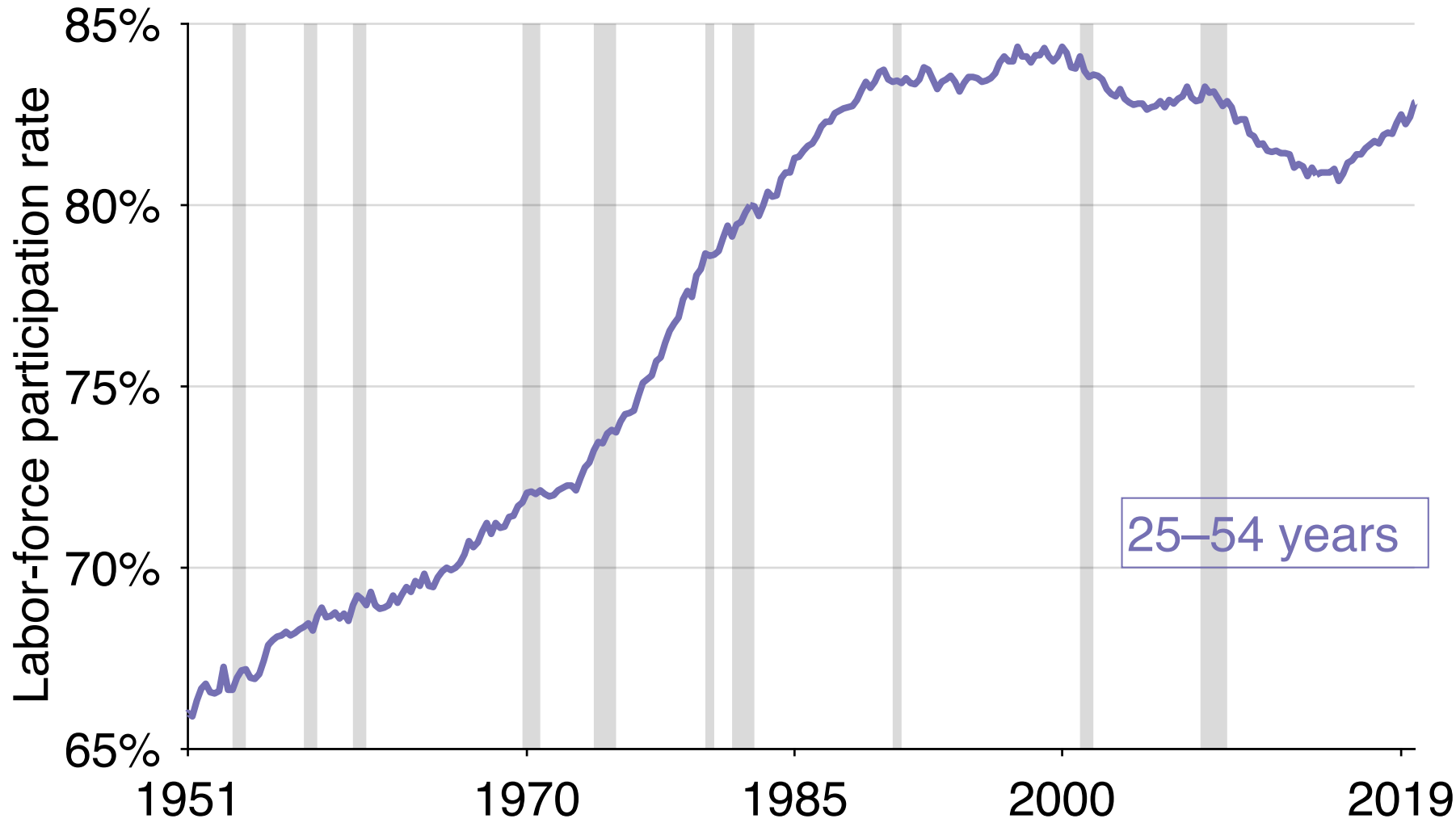
GITTI (2023): DIVINE COINCIDENCE?



AN EARTHLY MODEL OF DIVINE COINCIDENCE

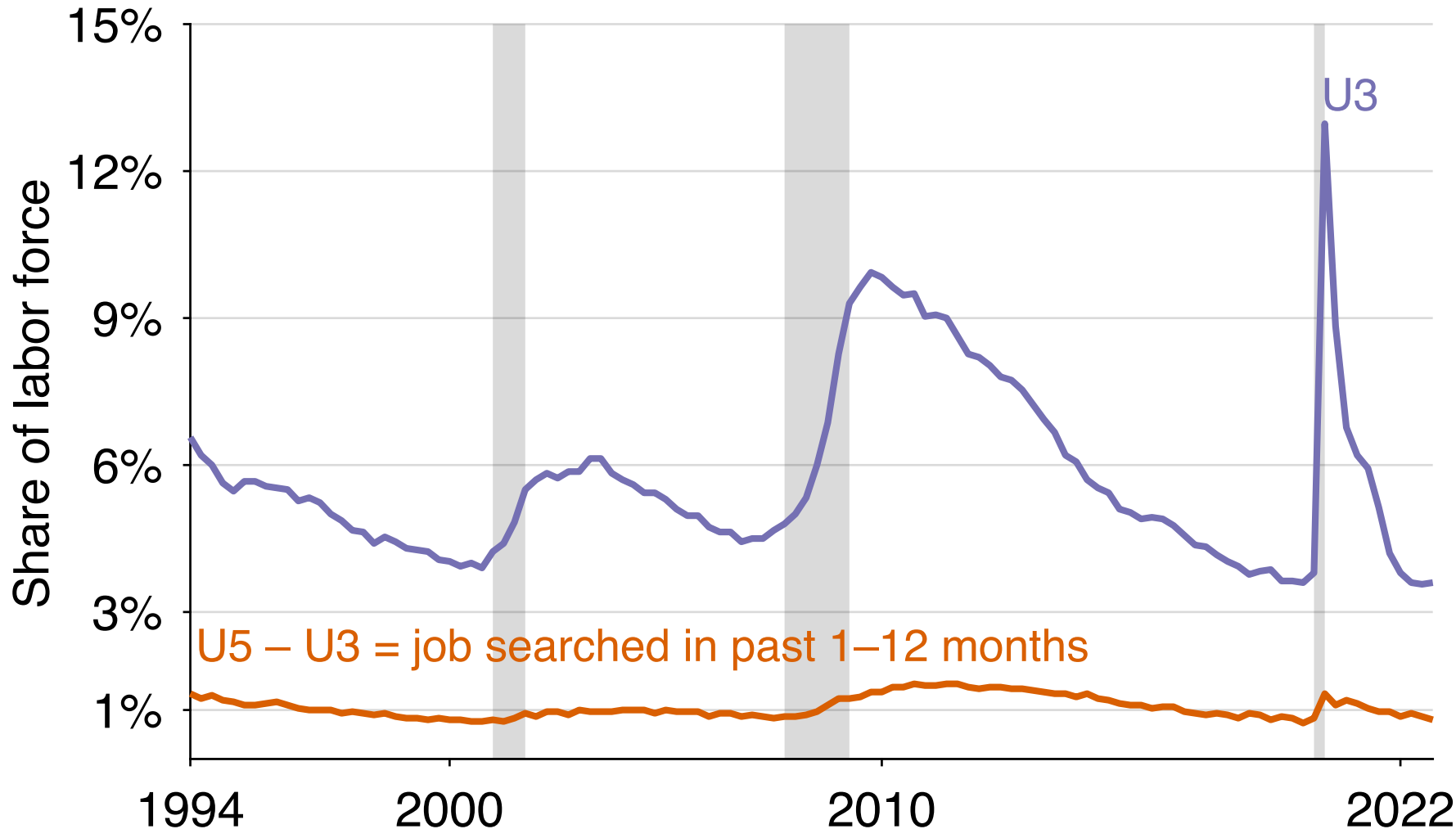
- economical business-cycle model structure (Michaillat, Saez 2022)
  - identical households sell and buy chauffeur services
  - drivers find customers through matching $\Rightarrow$ unemployment
  - utility from being chauffeured and wealth $\Rightarrow$ AD curve
- price competition through directed search (Moen 1997)
  - chauffeurs with higher prices are hired more slowly
  - chauffeurs with lower prices are hired more quickly
- price rigidity from quadratic price-adjustment costs (Rotemberg 1982)
- divine coincidence appears: $\pi = \bar{\pi} \Leftrightarrow u = u^*$

US LABOR-FORCE PARTICIPATION ≈ ACYCLICAL



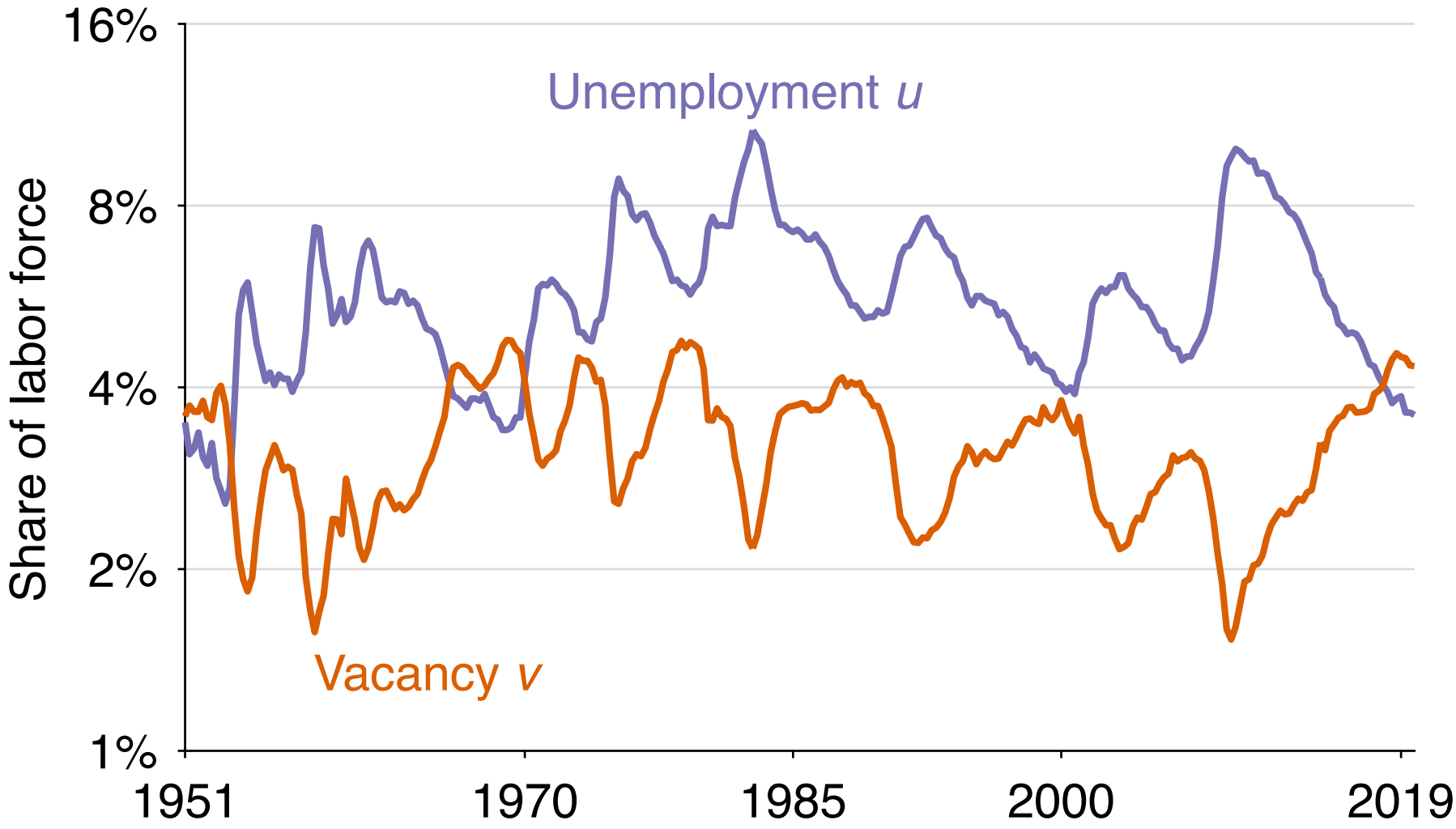
▸ Return to theory

US MARGINAL ATTACHMENT RATE ≈ 1% LABOR FORCE



▸ Return to theory

LOG UNEMPLOYMENT AND VACANCY RATES



▸ Return to Beveridge curve