

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

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Available at <https://pascalnichailat.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 \approx HYPERBOLA



► Time series on log scale

US BEVERIDGE CURVE \approx HYPERBOLA



► Time series on log scale

US BEVERIDGE CURVE \approx HYPERBOLA



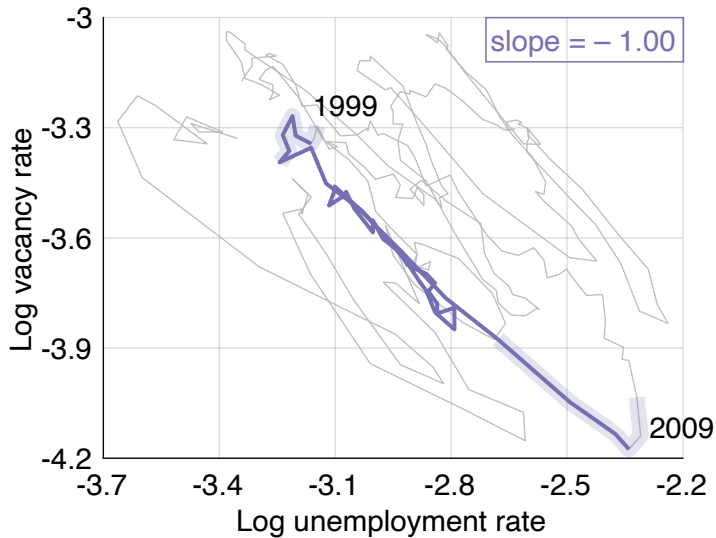
► Time series on log scale

US BEVERIDGE CURVE \approx HYPERBOLA



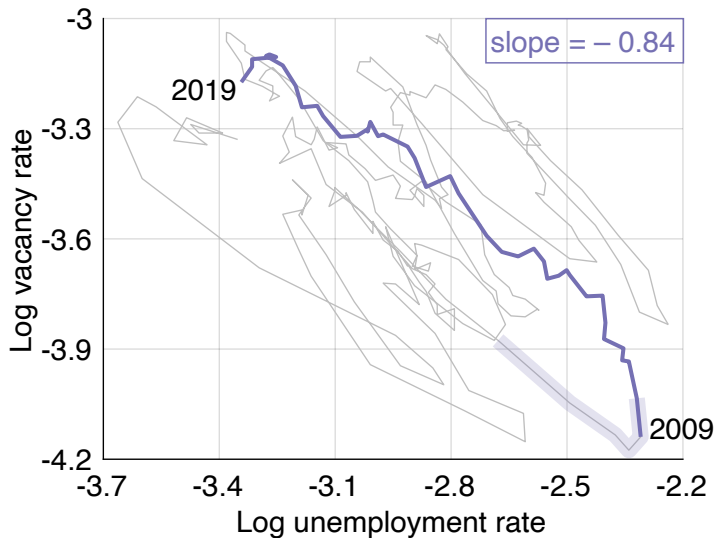
► Time series on log scale

US BEVERIDGE CURVE \approx HYPERBOLA



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US BEVERIDGE CURVE \approx HYPERBOLA



► 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:

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

- solution is full-employment, efficient unemployment rate:

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

CRITERION FOR FULL EMPLOYMENT, EFFICIENCY

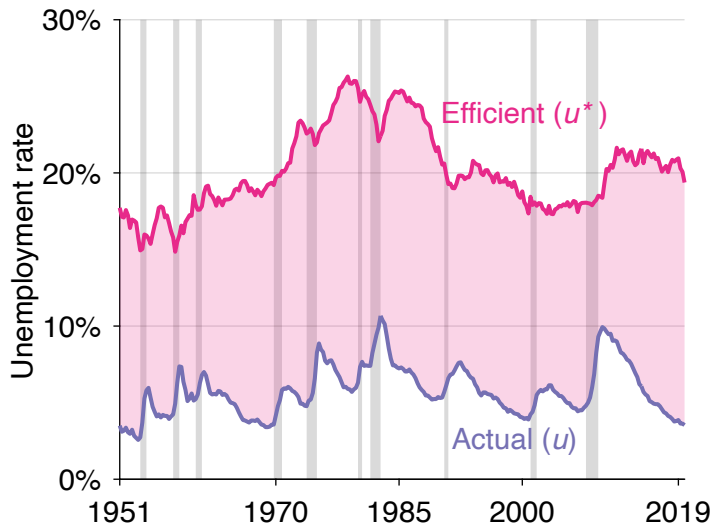
- recall: $u^* = \sqrt{uv}$ is geometric average of u and v
- economy is at full employment, efficient when $u = u^*$
 - ~> efficient when $u = v$
- economy is above full employment, inefficiently tight when $u < u^*$
 - ~> inefficiently tight when $u < v$
- economy is below full employment, inefficiently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

MORE GENERAL FORMULA (MICHAILLAT, SAEZ 2021)

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

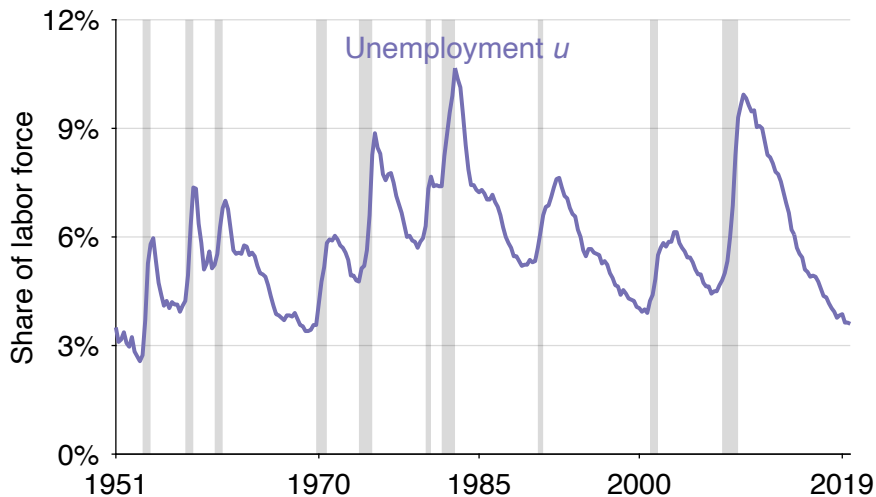
$$u^* = \sqrt{uv} \quad \rightarrow \quad u^* = \left(\frac{\kappa \cdot \epsilon}{1 - \zeta} \cdot v \cdot u^\epsilon \right)^{1/(1+\epsilon)}$$

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

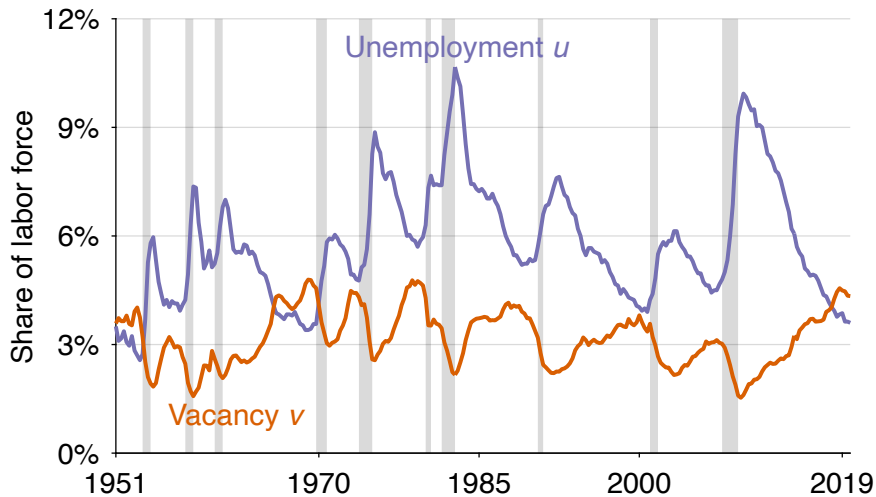


POSTWAR IN THE UNITED STATES

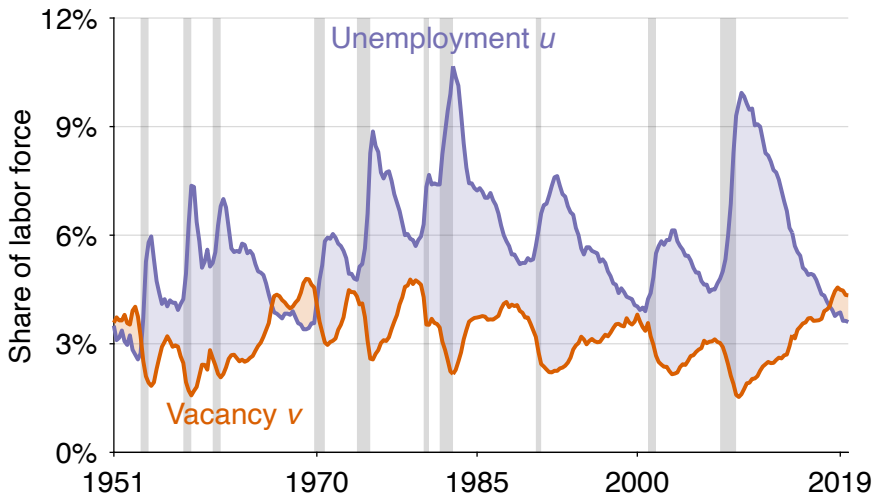
UNEMPLOYMENT RATE (CPS)



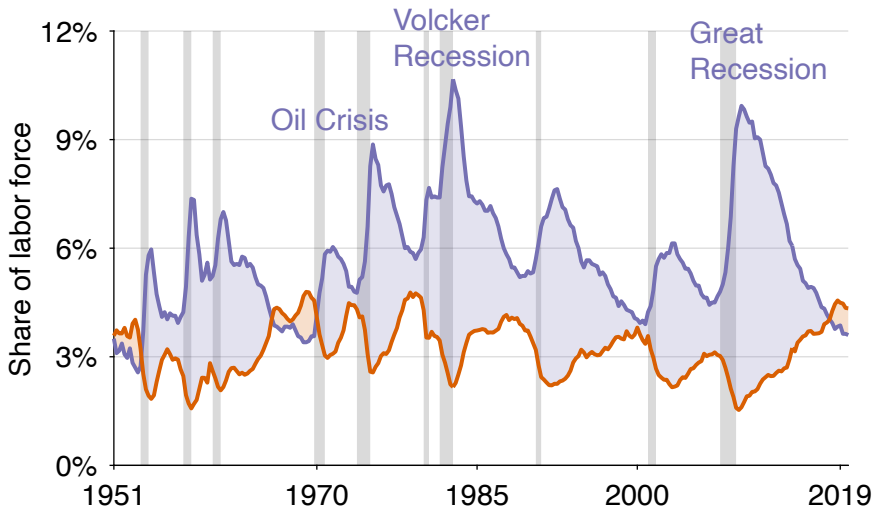
VACANCY RATE (BARNICHON 2010, JOLTS)



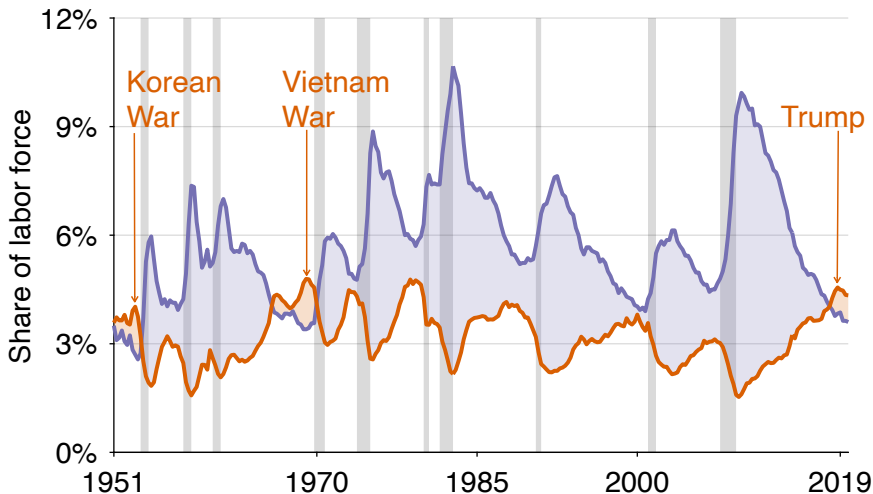
LABOR MARKET IS GENERALLY TOO SLACK...



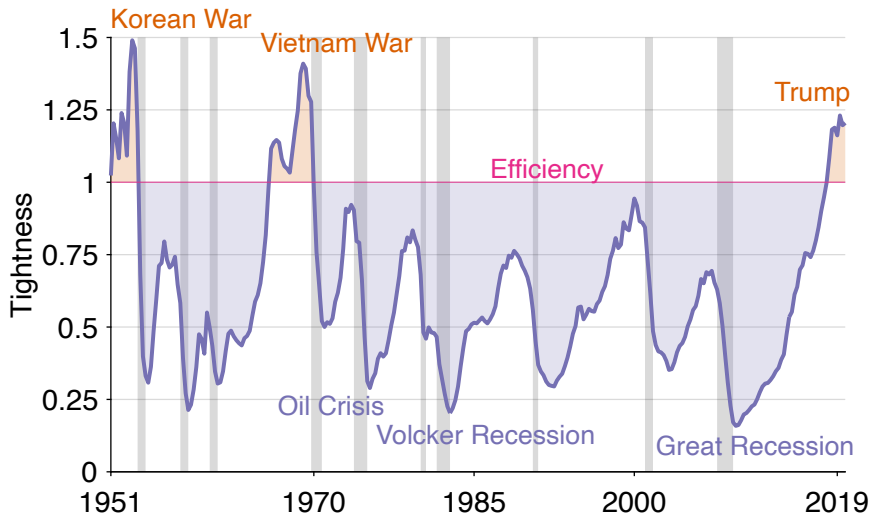
...AND IS ESPECIALLY SLACK IN SLUMPS



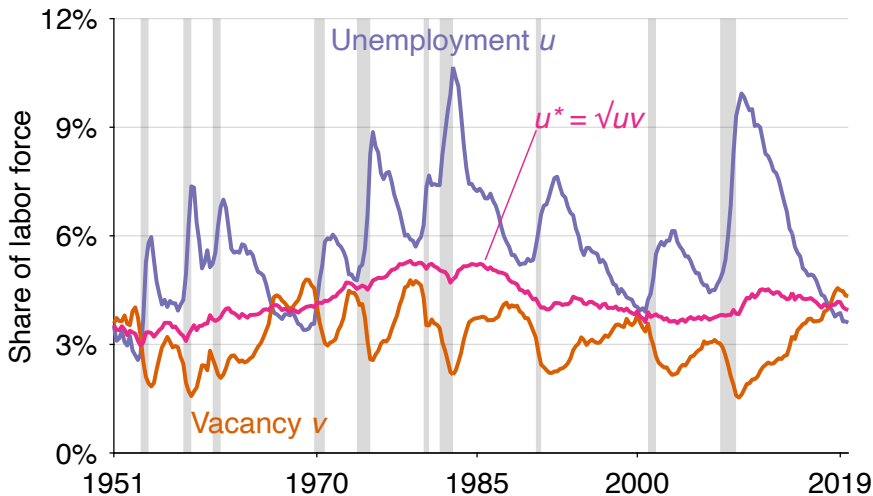
LABOR MARKET IS TOO TIGHT DURING WARS



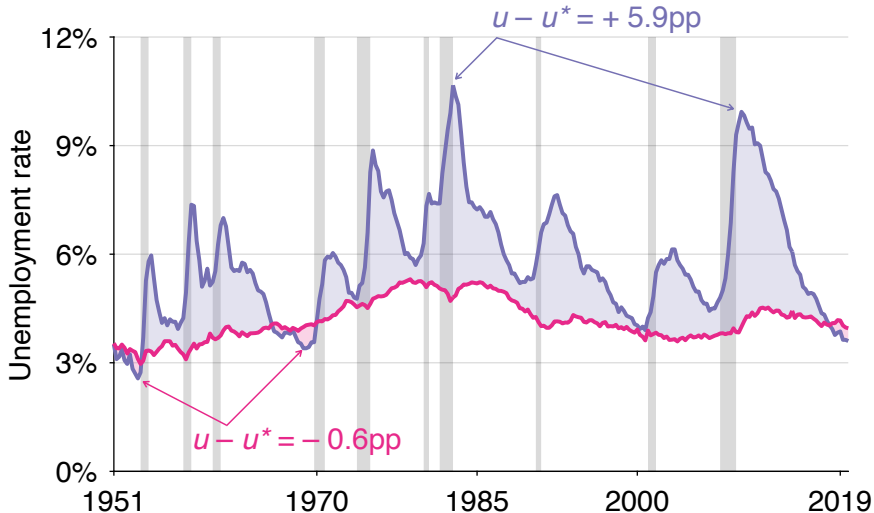
TIGHTNESS v/u SUMMARIZES STATE OF LABOR MARKET



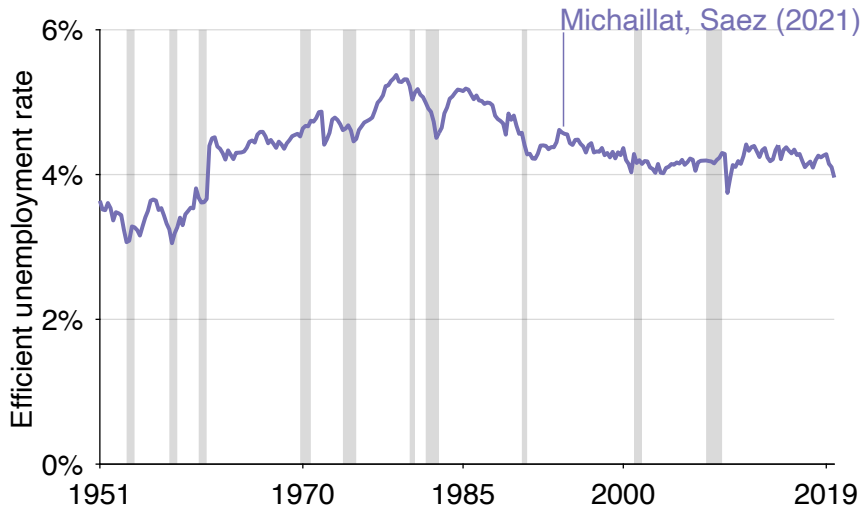
u^* REMAINS IN 3.0%–5.3%, AVERAGES 4.2%



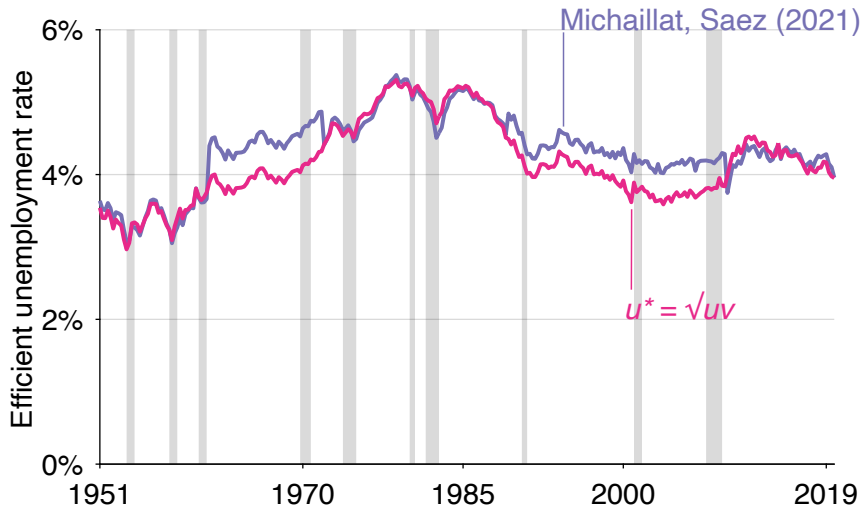
UNEMPLOYMENT GAP IS COUNTERCYCLICAL



COMPARISON WITH MICHAILLAT, SAEZ (2021)

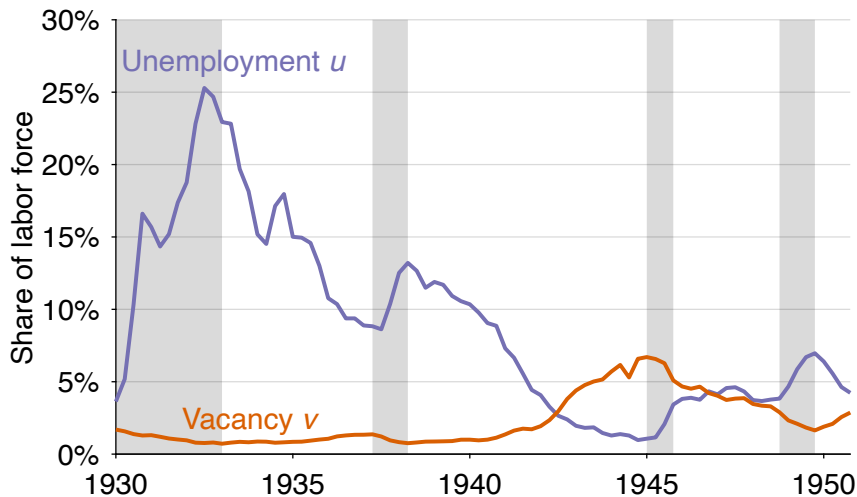


COMPARISON WITH MICHAILLAT, SAEZ (2021)



GREAT DEPRESSION IN THE UNITED STATES

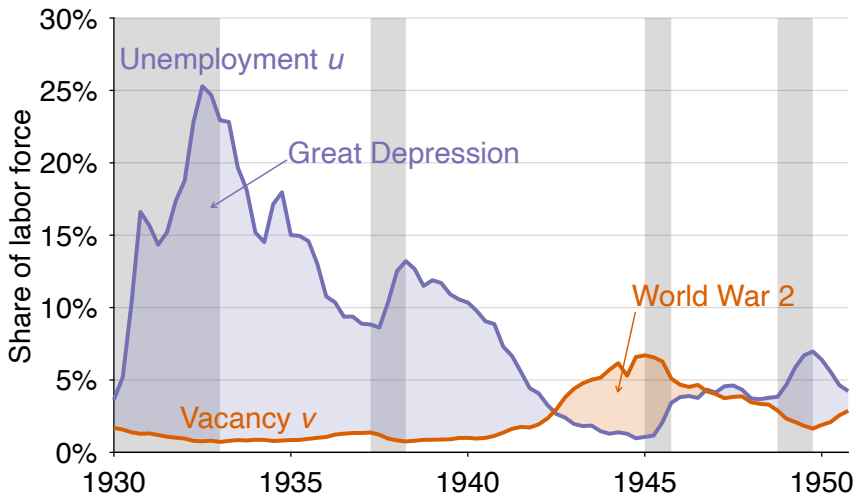
NBER DATA (PETROSKY-NADEAU, ZHANG 2021)



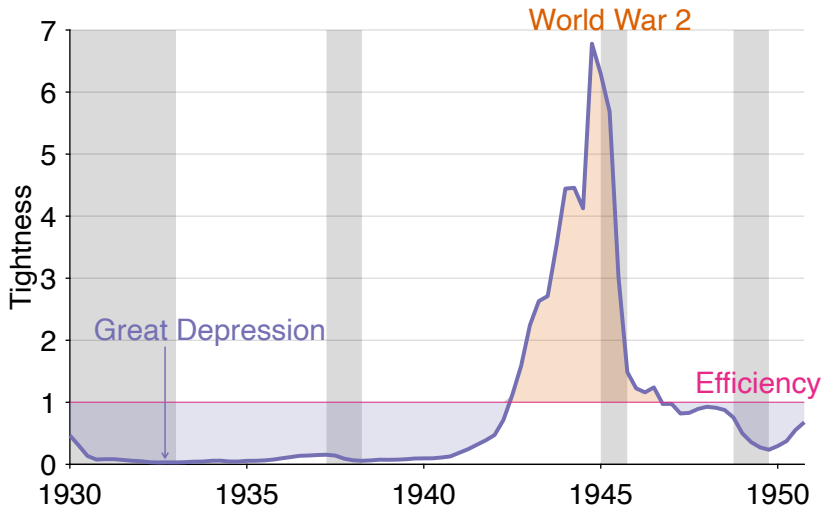
BEVERIDGE CURVE \approx HYPERBOLA



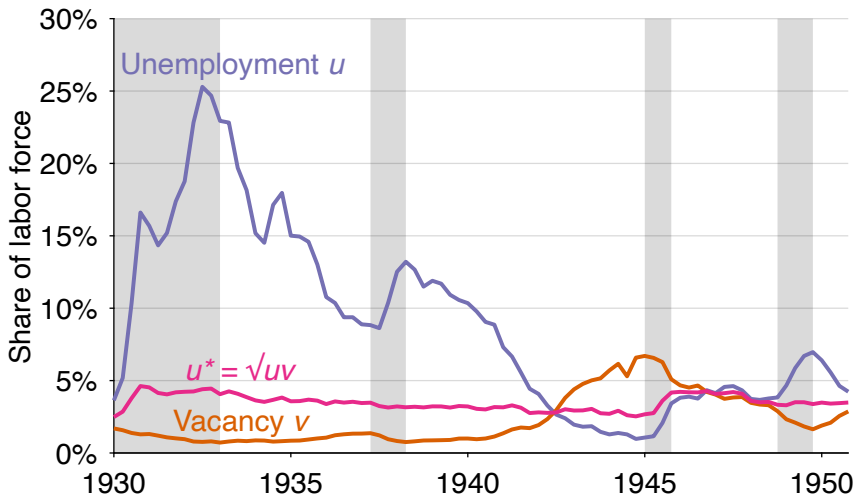
LABOR MARKET WAS TOO SLACK UNTIL WW2



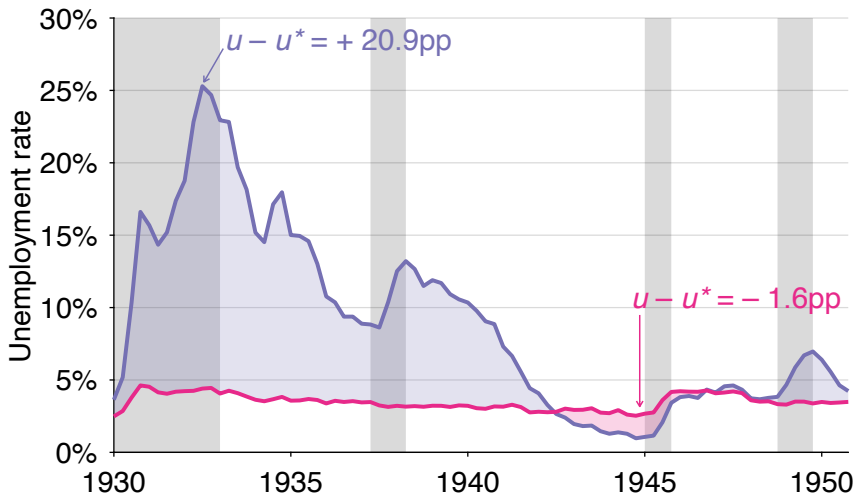
LOWEST AND HIGHEST TIGHTNESS ON RECORD



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

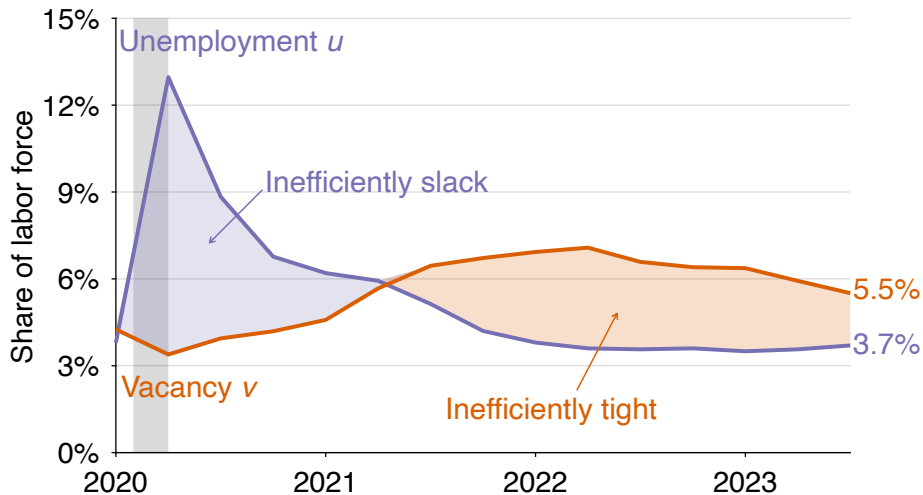


MOST EXTREME UNEMPLOYMENT GAPS ON RECORD

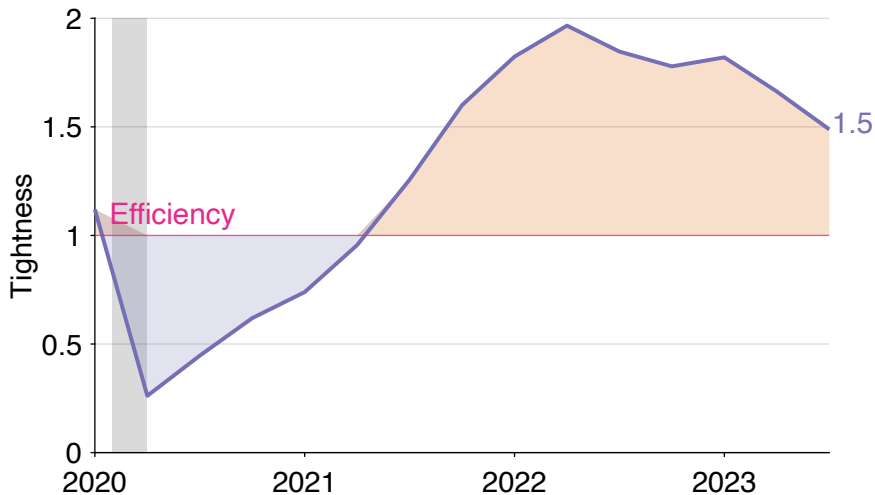


PANDEMIC IN THE UNITED STATES

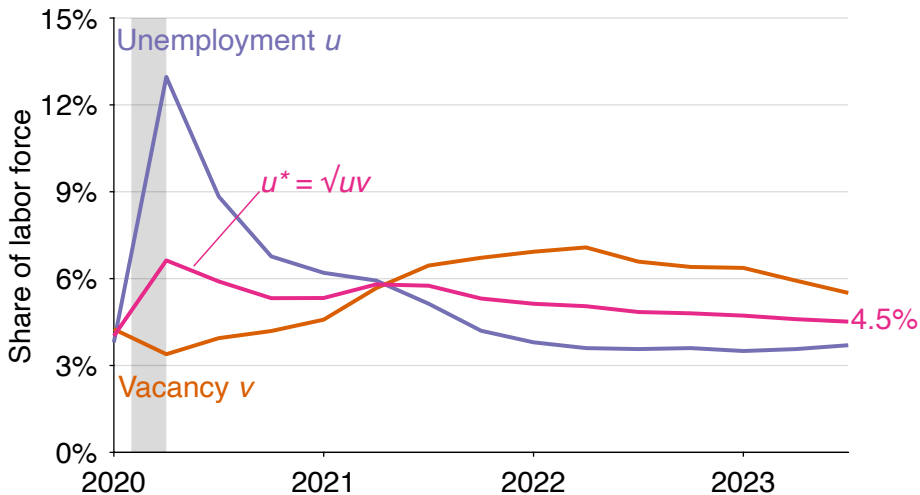
LABOR MARKET HAS BEEN TOO TIGHT SINCE 2021Q3...



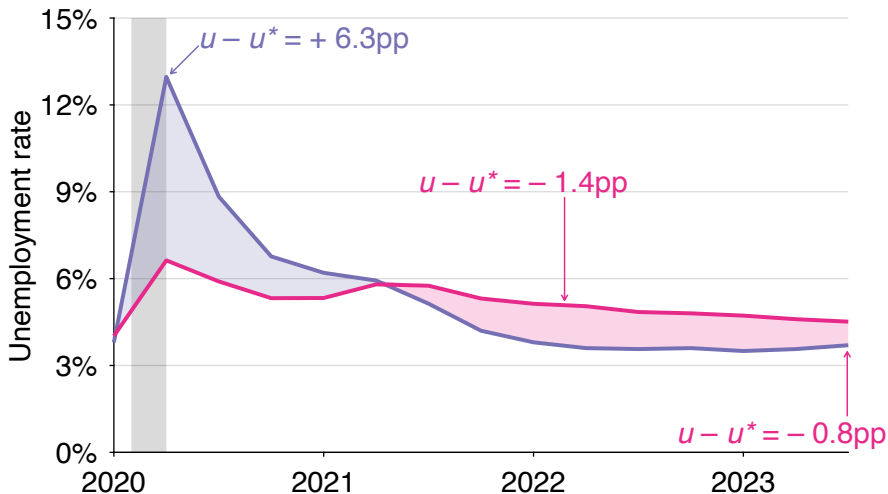
...BUT IT HAS BEEN COOLING SINCE 2022Q2



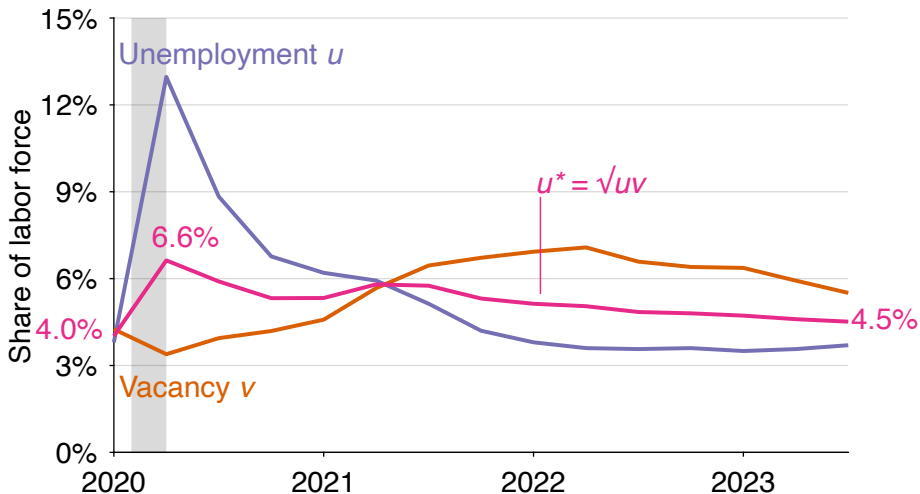
CURRENT TARGET FOR MONETARY POLICY: $u^* = 4.5\%$



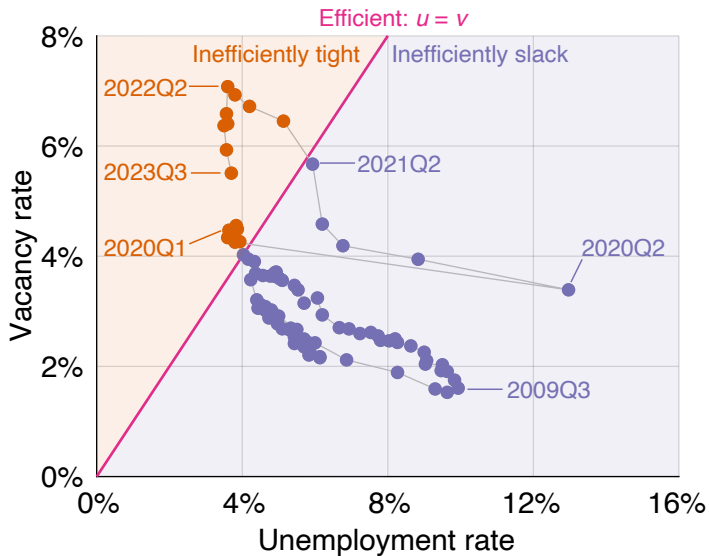
MOST EXTREME UNEMPLOYMENT GAPS SINCE WW2



WHY DID u^* INCREASE SO MUCH IN 2020?

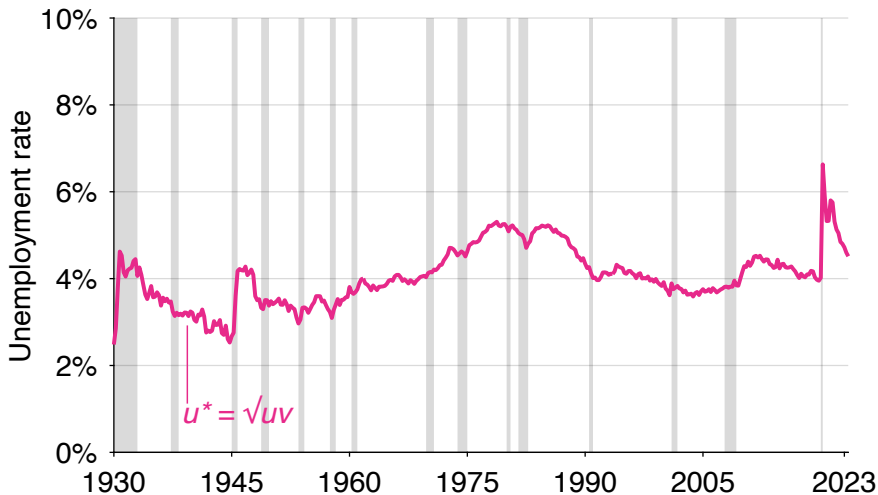


BECAUSE OF LARGE SHIFT OF BEVERIDGE CURVE IN 2020Q2

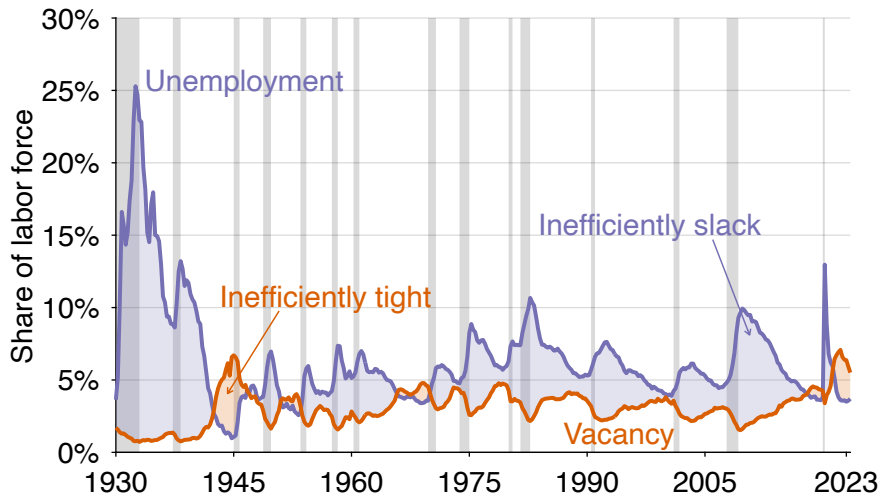


SUMMARY

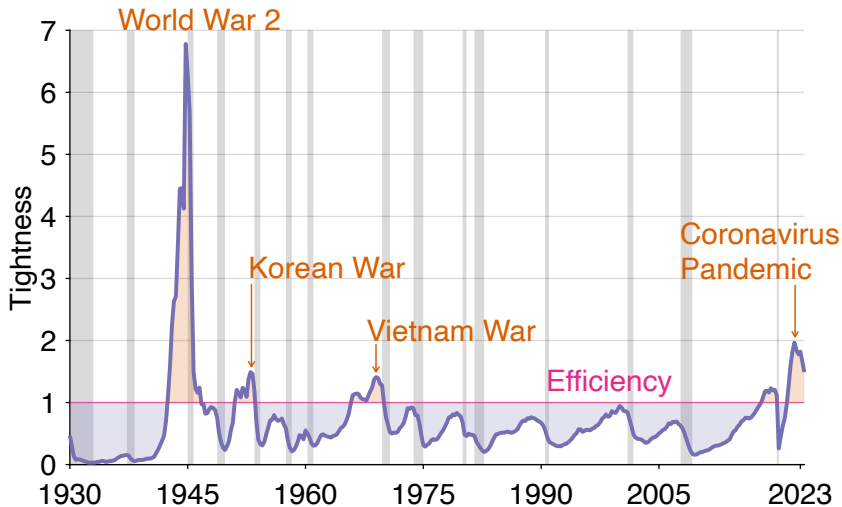
u^* AVERAGES 4.1% OVER 1930–2023



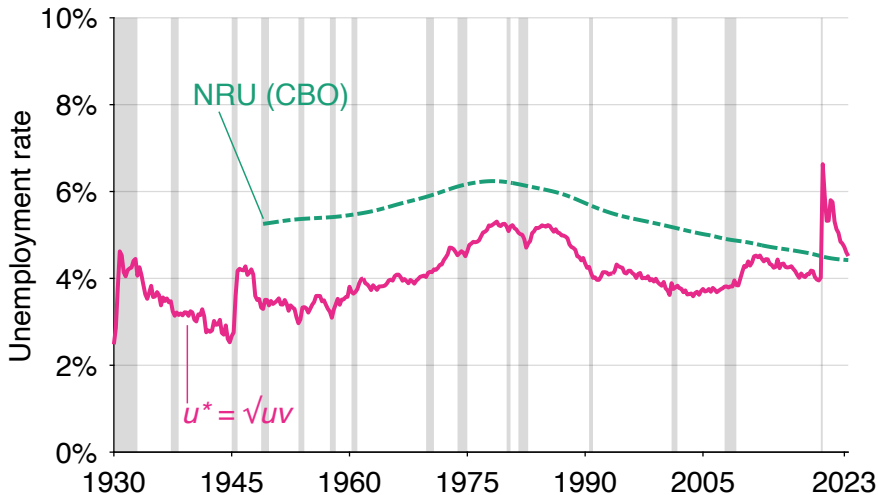
EFFICIENCY CRITERION FOR US LABOR MARKET



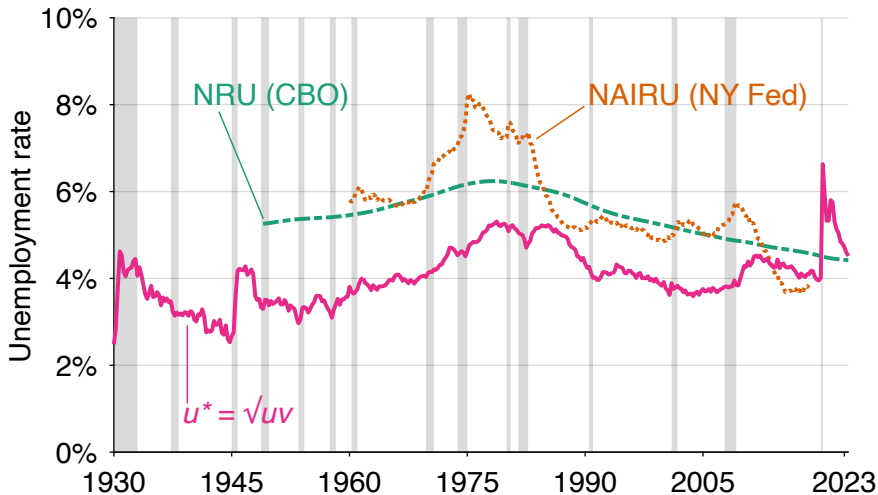
AN EQUIVALENT EFFICIENCY CRITERION



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

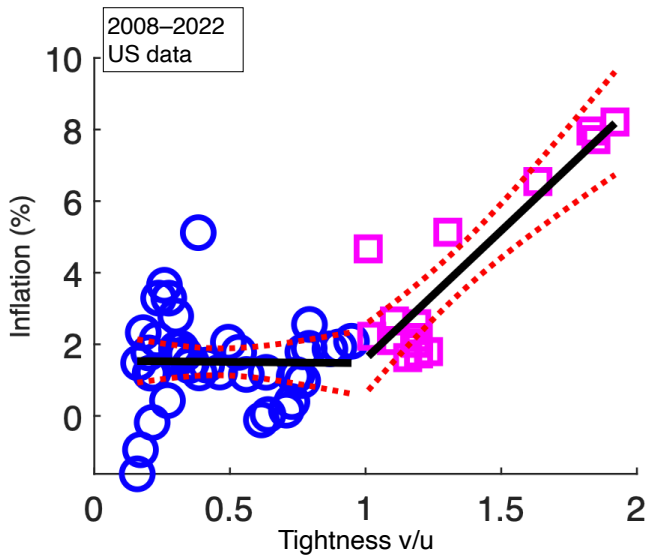


$u^* = \sqrt{uv}$ IS LOWER THAN EXISTING TARGETS

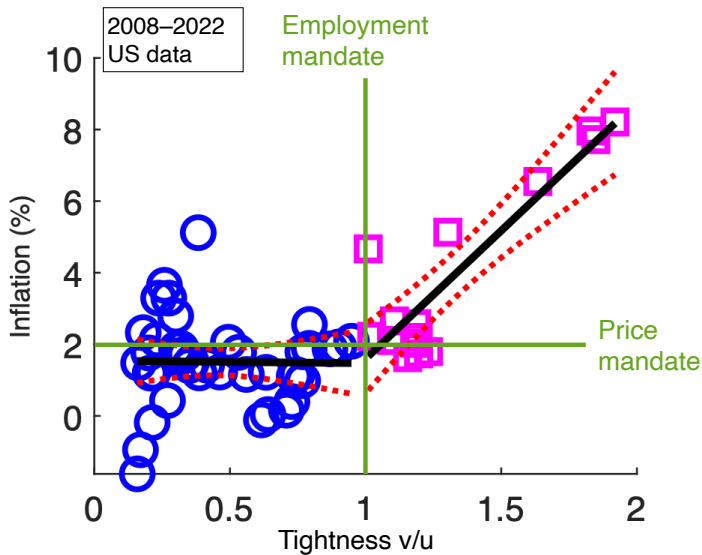


WHAT ABOUT THE PRICE MANDATE?

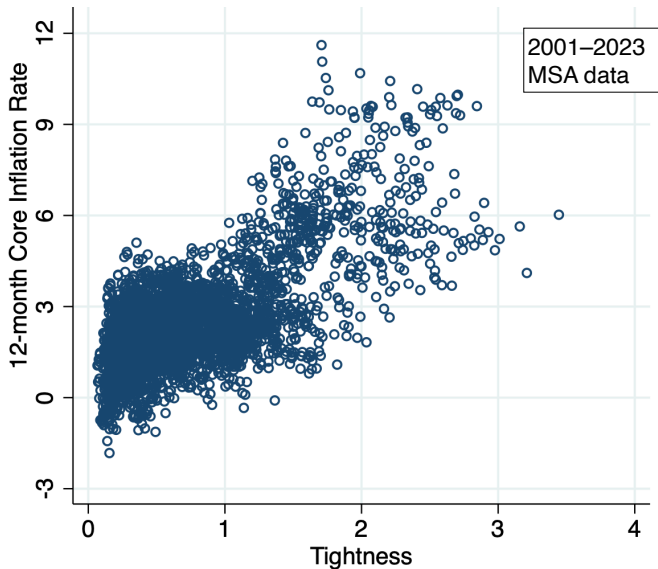
BENIGNO, EGGERTSSON (2023): DIVINE COINCIDENCE?



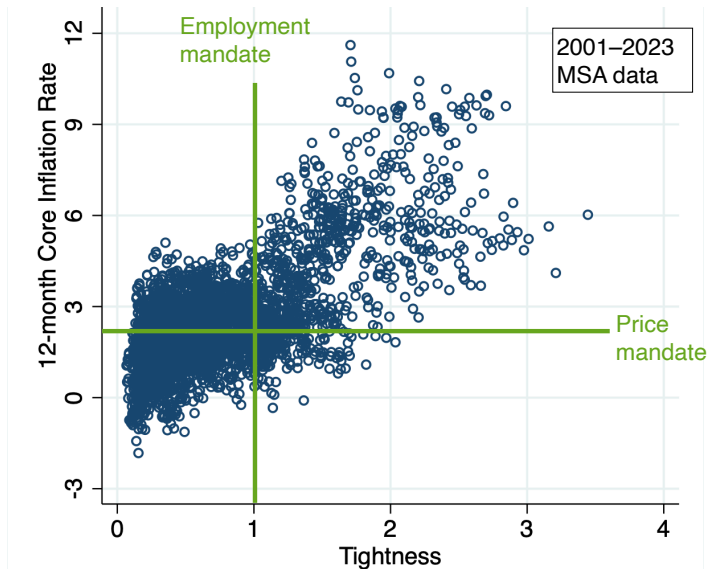
BENIGNO, EGGERTSSON (2023): DIVINE COINCIDENCE?



GITTI (2023): DIVINE COINCIDENCE?



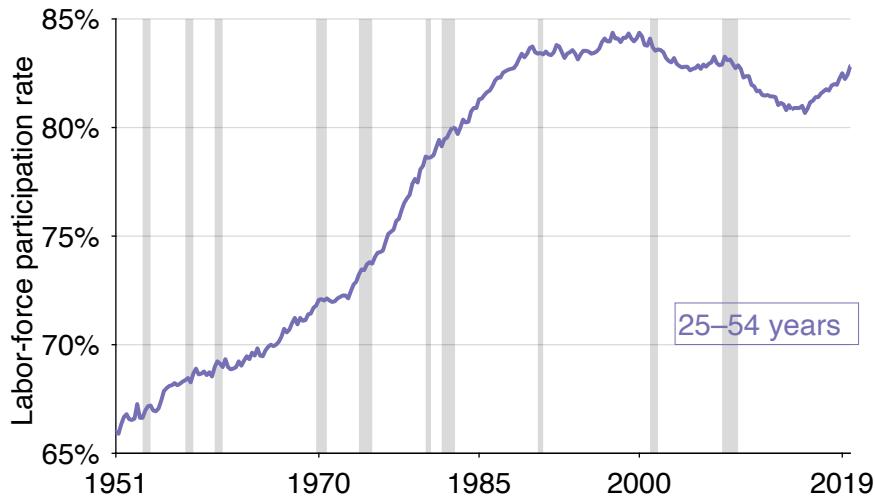
GITTI (2023): DIVINE COINCIDENCE?



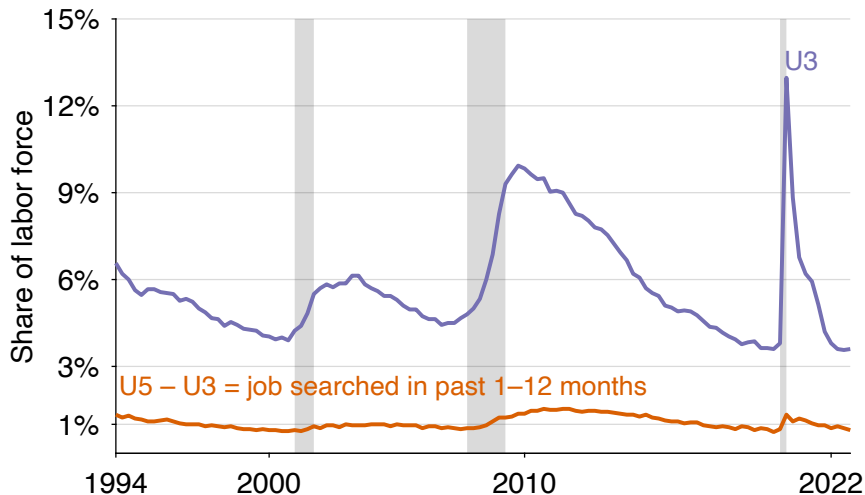
AN EARTHLY MODEL OF DIVINE COINCIDENCE

- 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: $\pi = \bar{\pi} \Leftrightarrow u = u^*$

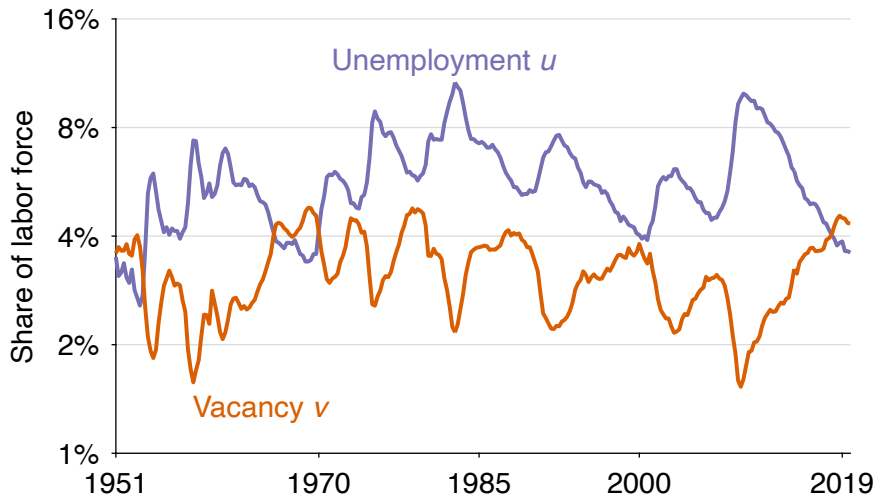
US LABOR-FORCE PARTICIPATION \approx ACYCLICAL



US MARGINAL ATTACHMENT RATE $\approx 1\%$ LABOR FORCE



LOG UNEMPLOYMENT AND VACANCY RATES



► Return to Beveridge curve