

# Aspects of the Post-Pandemic Economic Outlook

*a presentation prepared for the*  
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TZ ECONOMICS





# The 2020 Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2022 “for research on banks and financial crises”\*

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# Remember why we're here: what banks do (non-profit ones, too)

- Diamond and Dybvig (1983)\* microfoundations approach to existence of financial intermediation: banks create deposits more liquid than assets they hold
  - Borrowers match funding maturity with investment—vehicles, houses—loans with low liquidity
  - Depositors' unpredictable needs imply high liquidity preference (*e.g.* share draft accounts)
  - Bank intermediation more efficient than “crowd-funding” (more below)
  - Deposit-gathering institutions end up with maturity-mismatch (illiquid LR assets, SR deposits)
- Stability problems and Nash Equilibria
  - Ordinary liquidity needs are randomly distributed; depositor Nash game (others' beliefs given)
  - Absent confidence, depositors simultaneously may seek to hold more liquidity (*i.e.* cash)
  - Players' moves reveal others' liquidity need—no longer “given” that they won't withdraw
  - Multiple equilibria: (1) only you withdraw (others don't); (2) everybody expects others will
  - Bank run: self-fulfilling prophecy if *bank* has a liquidity problem (difficult to sell assets)



## Remember why we're here: what banks do (non-profit ones, too)

Jimmy Stewart as George Baily in *It's A Wonderful Life* (1946) when Charlie, a depositor, asks if old Mr. Potter has “guaranteed this place,” the Bailey Brothers Building & Loan.

*No, but you...you...you're thinking of this place all wrong.*

*As if I had the money back in a safe.*

*The, the money's not here.*

*Well, your money's in Joe's house...that's right next to yours.*

*And in the Kennedy House, and Mrs. Macklin's house, and, and a hundred others.*

*Why, you're lending them the money to build, and then, they're going to pay it back to you as best they can.*

*Now what are you going to do? Foreclose on them?*

# Remember why we're here: what banks do (non-profit ones, too)

- Silicon Valley Bank: rapid deposit growth 2020-2021, deployed mostly into U.S. Treasury securities (assets: \$62 bil. (2019), \$212 bil. (2022); equity (\$6.5 bil. (2019), \$16.0 bil. (2022))
  - Available-for-sale (marked to market; FASB 157): \$10 billion (2019), \$26 billion (2022)
  - Held-to-maturity (no mark): \$14 billion (2019), \$91 billion (2022)
  - FOMC (2022-23) raised fed funds rate 500 b.p., T-Note yields rose 400 b.p.: mark-to-market?
  - [Reasonable question: who on planet earth (2022) didn't know that the Fed would raise rates?]
  - March 8-9, 2023, depositors observe others' withdrawals—fear broadcast on Twitter\*

*“Those who forget history are condemned to retweet it” (George Santayana, not)*

- Jump to “other” equilibrium (bank run) so fast that FDIC received SVB by midday Friday, 3/10
  - Contagion spread to Signature Bank (shut down March 12, Sunday!)
  - UBS took over UBS backed by Swiss National Bank (March 19)
  - First Republic received by FDIC, JPM acquires deposits, most assets (May 1)

# Remember why we're here: what banks do (non-profit ones, too)

- Fundamental problems solved by financial intermediaries
  - *Information asymmetry*: borrowers know more about themselves than lenders; bankers know more about the bank than their depositors, *etc.*; information is costly to acquire
  - *Adverse selection*: don't select adversely from pool of borrowers those unlikely to repay
  - *Moral hazard*: once the borrower has gotten the loan, is stated purpose fulfilled?
  - Aforementioned *maturity transformation*: creating deposits more liquid than bank assets
- Why not everybody on smartphone, crowdfunding? Because mitigating these problems is costly—better if institutions populated with expertise to intermediate deposits and loans
  - Screening, scoring, relationship-building to mitigate adverse selection
  - Monitoring, enforcement of loan covenants to mitigate morally hazardous behavior
  - Goal of incentive-compatibility (both parties have repayment incentive)
- Regulation, examination, bank capital requirements to ensure investors have skin in the game





# Remember why we're here: what banks do (non-profit ones, too)

- Important contribution(s) of third 2022 Nobel Laureate: Ben Bernanke\*
  1. Banks were decisive factor in Great Depression of the 1930s becoming deep, prolonged
  2. Collapse of banks—no deposit insurance, no Fed liquidity provision—valuable information about borrowers lost, costly to recreate, financial intermediation “supply chain” breakdown
  3. Credit channel of transmission of monetary policy
  4. Inflation targeting
  5. Monetary policy arsenal: ZLB, quantitative easing/tightening, forward guidance
- Previous theories of money focused mostly on changes in the money stock, rather than other channels of transmission (e.g. interest rates, exchange rates) to asset prices, collateral values



Among the greats  
(2003)



Ned  
Gramlich

Alan  
Greenspan

Ben  
Bernanke

Don  
Kohn



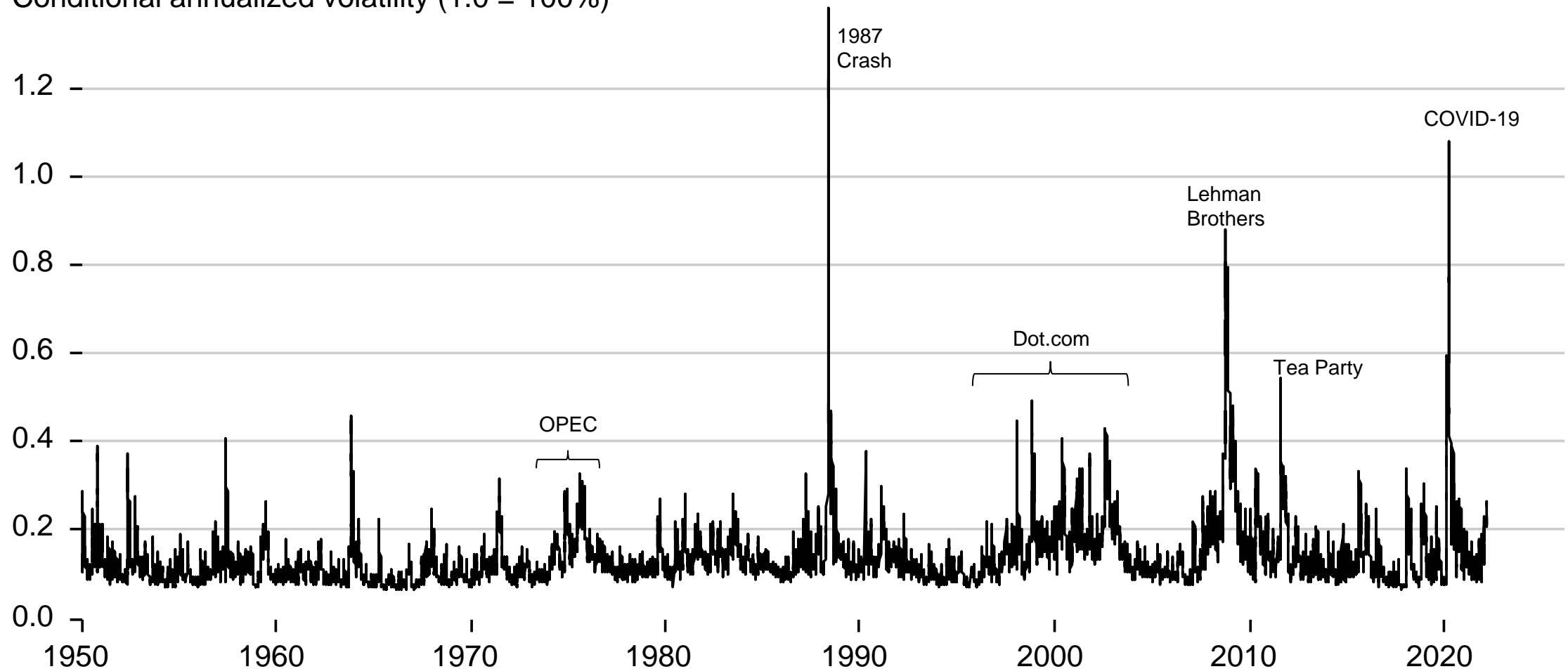


# Volatility visualizations of intrinsic and extrinsic risks

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# Daily conditional annualized volatility, closing values S&P 500 Index through March 2022: clusters and jumps with an average $\bar{x} = 13.9\%$

Conditional annualized volatility (1.0 = 100%)

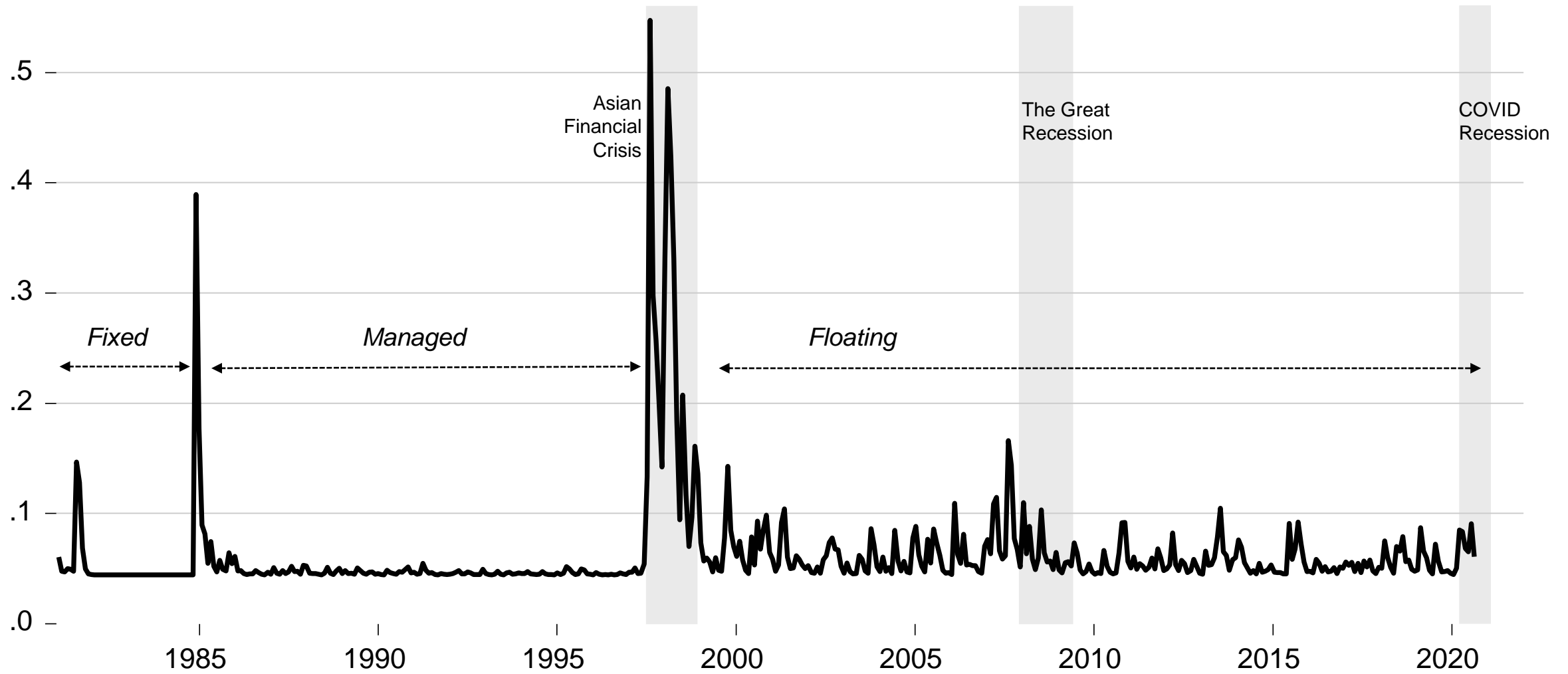


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Source: S&P Dow Jones Indices LLC, S&P 500 [SP500], retrieved from FRED, Federal Reserve Bank of St. Louis (<https://fred.stlouisfed.org/series/SP500>); conditional annualized Threshold Autoregressive Conditional Heteroskedasticity standard deviations of daily log changes. See Robert Engle (Fall 2001), GARCH 101: The Use of ARCH/GARCH Models in Applied Econometrics," *Journal of Economic Perspectives*, vol. 15 no. 4 pp 157-168 and his Nobel address, "Risk and Volatility: Econometric Models and Financial Practice" *American Economic Review*, vol. 94, No. 3, June 2004, pp. 405-420.



# Jumps and clusters: Thai baht / U.S. \$ exchange rate conditional annualized volatility—*time-varying* and “fat-tailed” distributions

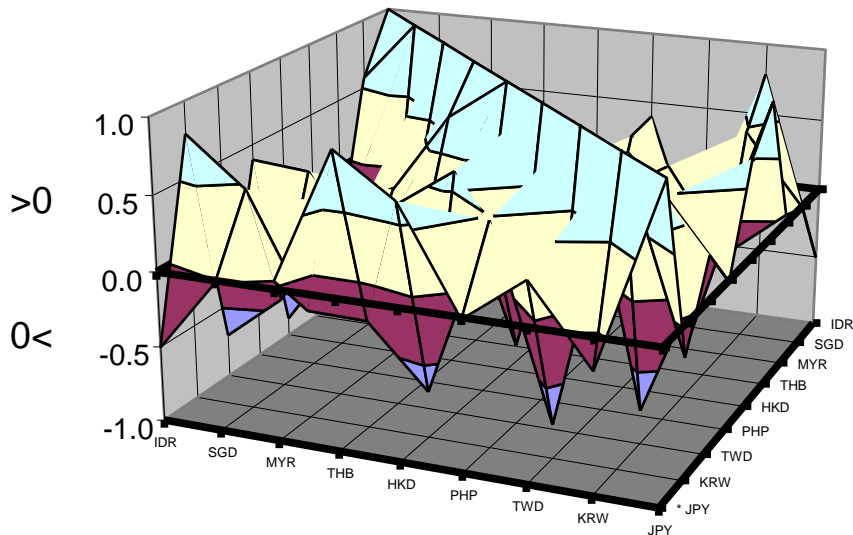


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Source: Board of Governors of the Federal Reserve System (US), Thailand / U.S. Foreign Exchange Rate [EXTHUS], retrieved from FRED, Federal Reserve Bank of St. Louis (<https://fred.stlouisfed.org/series/EXTHUS>), September 14, 2020; Generalized Autoregressive Conditional Heteroskedasticity estimates of monthly annualized standard deviations calculated by TZ Economics.

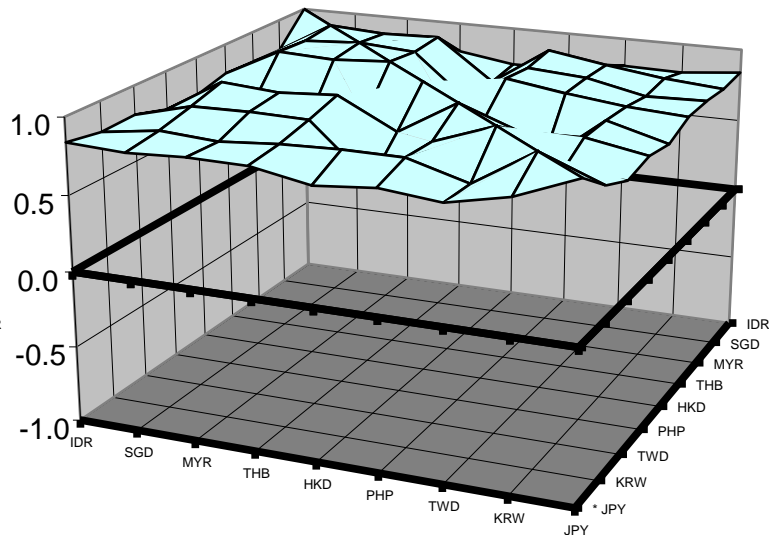
# Diverse set of ASEAN + Japan currencies normally has uncorrelated movements, during financial crisis co-movements reflect “contagion”

Diversity



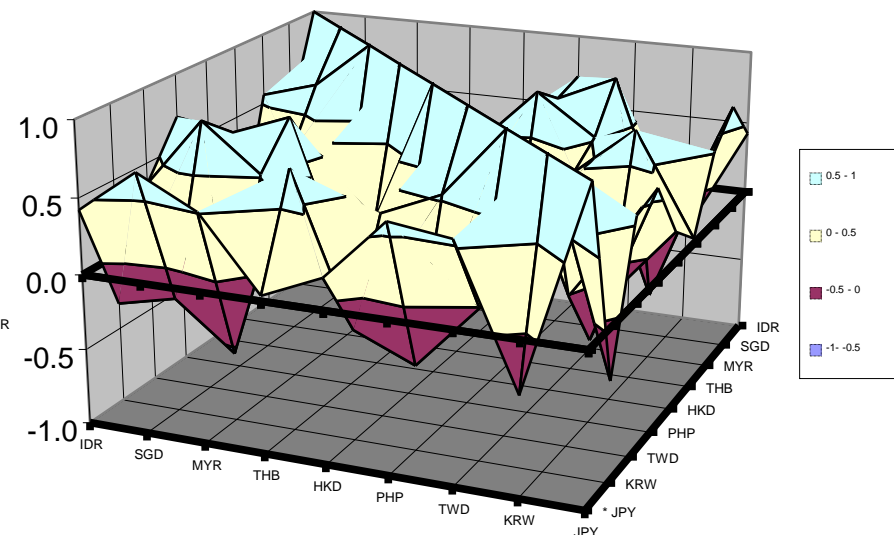
July-September 1996

Financial contagion (correlation)



November 1997–January 1998

Diversity



July-September 1998

Map of cross-correlation matrix of log changes of the Indonesian rupiah, Singapore dollar, Malaysian ringgit, Thai baht, Hong Kong dollar, Philippine peso, New Taiwan dollar, South Korean won, Japanese yen; correlations range from -1 to +1, diverse pattern of co-movement, positive and negative, *reduces* portfolio risk. Collective but independent depreciations of all these currencies at the start of the Asian Financial Crisis (second half 1997) reflected regional capital flight (investors selling assets and bailing out), collapse of collateral asset values such as commercial real estate and stock prices, dramatic rise in credit default risk.



You thought you had problems?





# WHAT PEOPLE IMAGINE THE HAWAII LAVA FLOWS LOOK LIKE



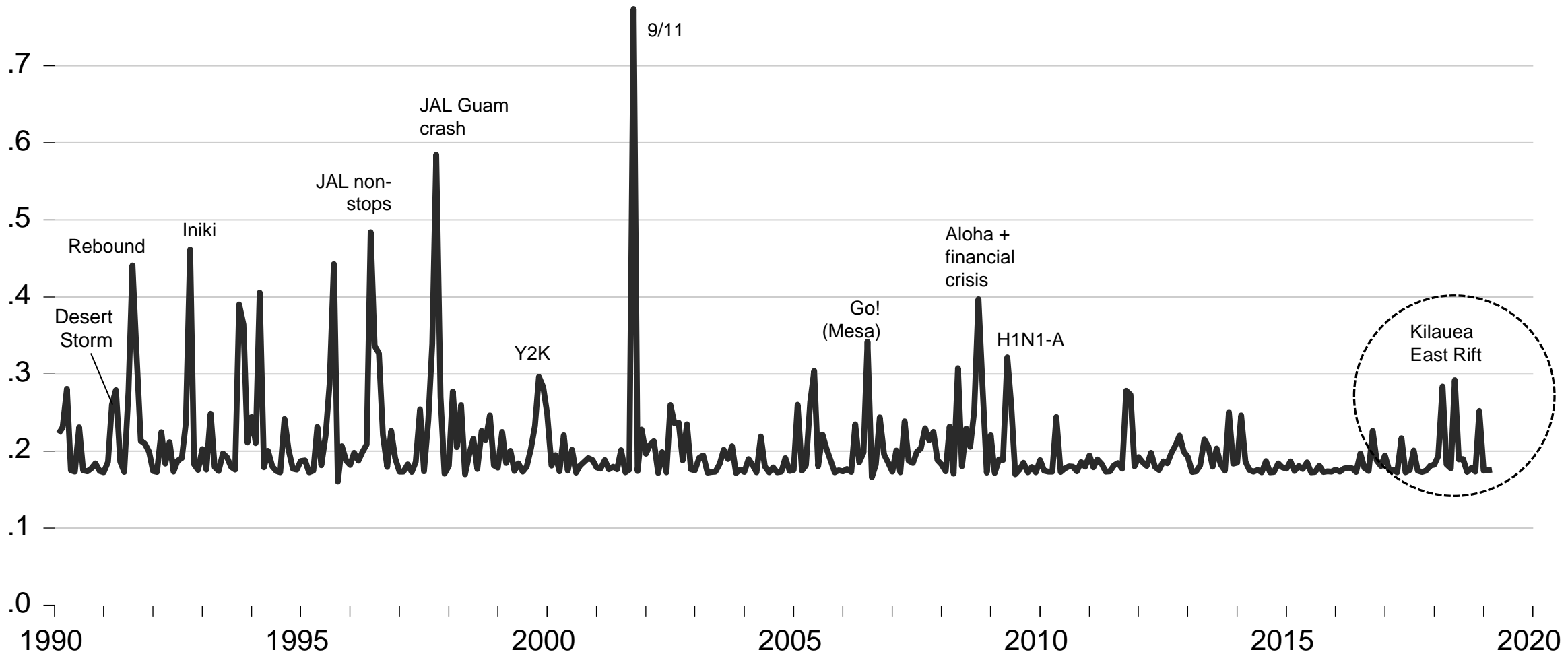
# WHAT THE HAWAII LAVA FLOWS LOOK LIKE





# Like stock prices: conditional annualized monthly volatility of Hawaii (Big) Island visitor arrivals: geopolitical, biological, geophysical risks

0.1 = 10%

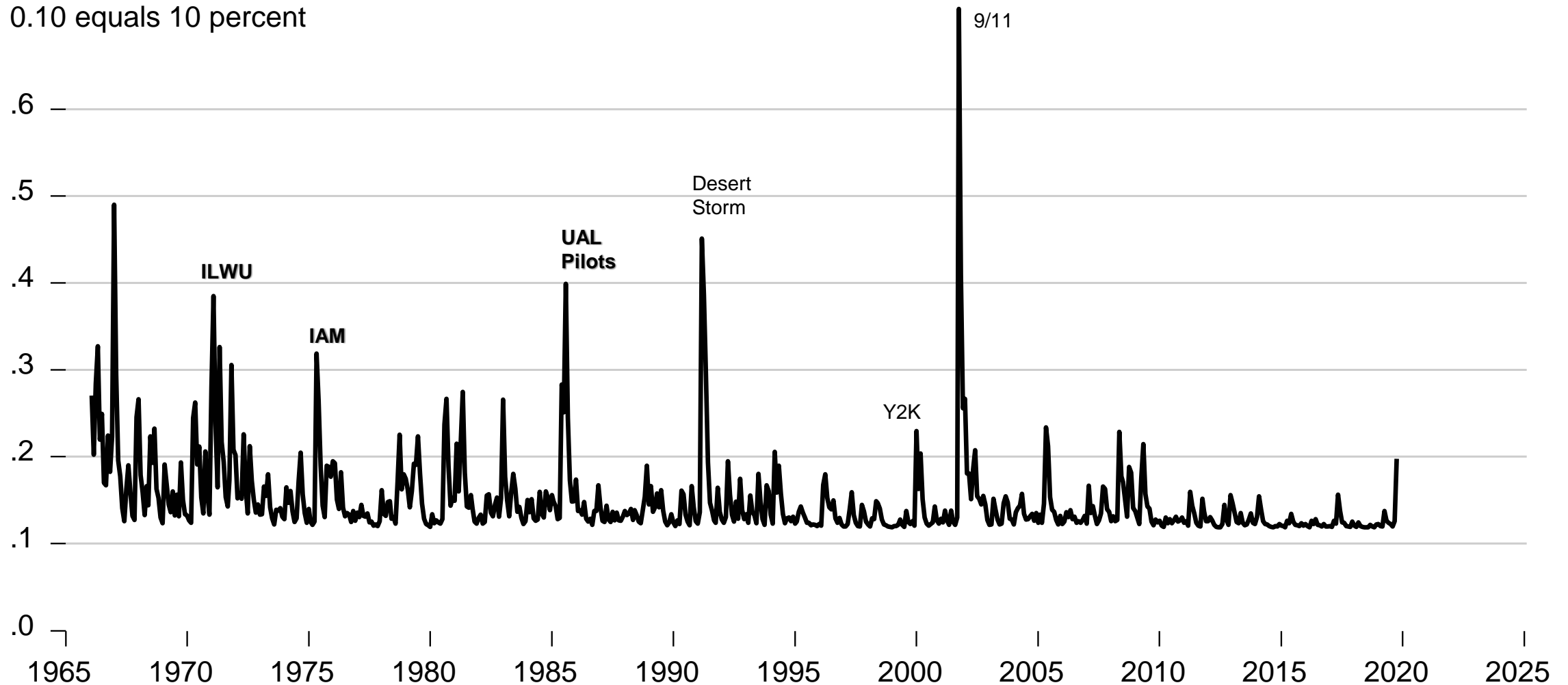


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Sources: Monthly data through February 2019 from Hawaii Tourism Authority, Hawaii DBEDT (<http://dbedt.hawaii.gov/economic/mei>), Generalized Autoregressive Conditional Heteroskedasticity (GARCH) estimates of annualized standard deviation of log changes of seasonally adjusted monthly visitor arrivals by TZE

# Monthly conditional annualized volatility of pre-pandemic Hawaii visitor arrivals (s.a.): exports as channel of transmission

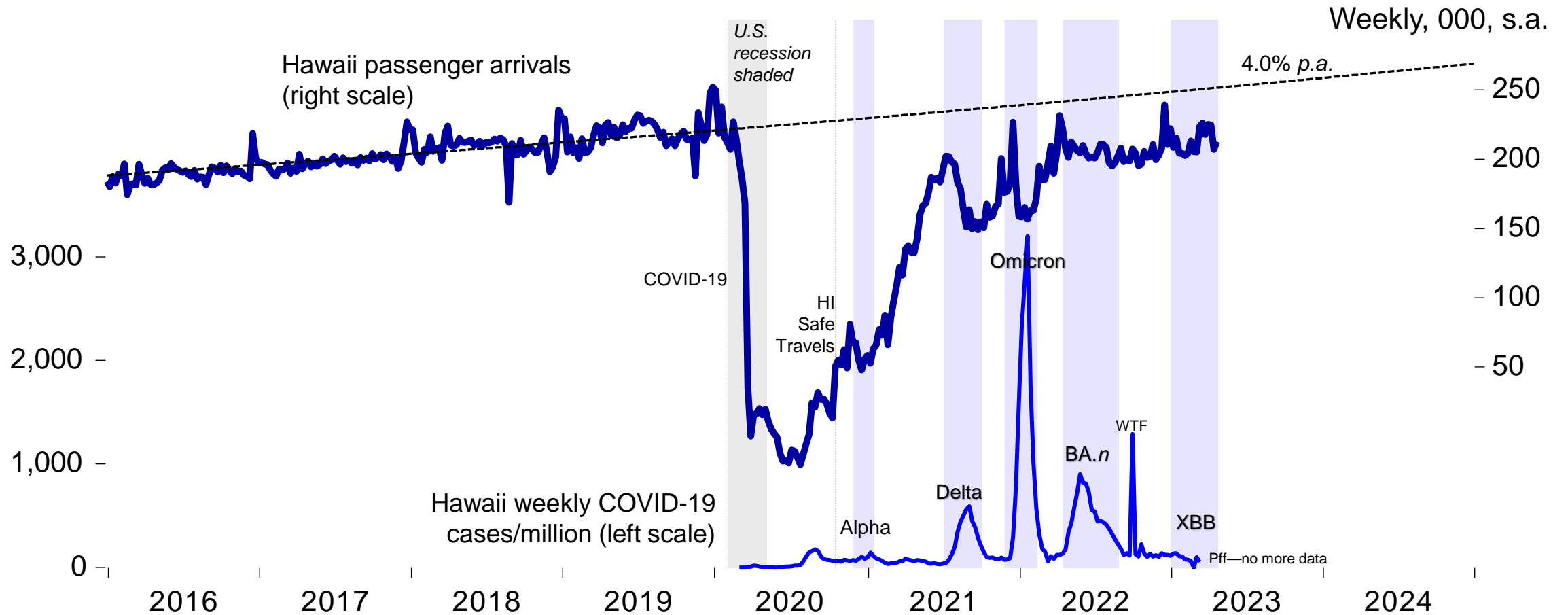
0.10 equals 10 percent



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# Each covid variant-subvariant wave in the post-vaccination era throttled Hawaii passenger arrivals and suppressed recovery



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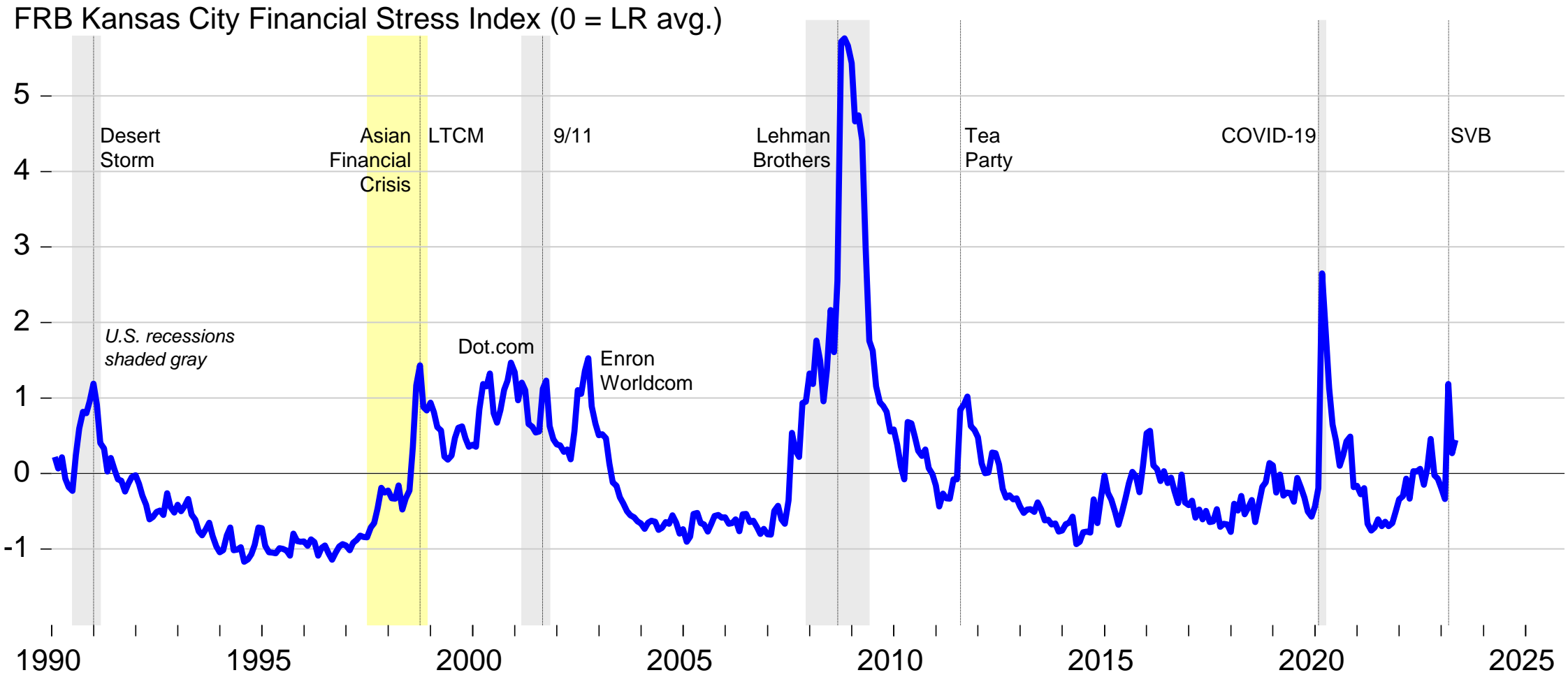
# The Kansas City Fed index of financial stress

- 2009 index published by Craig Hakkio and William Keeton\* (FRBKC *Economic Review* (2009Q2))
- Organized around five identifiers:
  - Fundamental asset valuation uncertainty
  - Uncertainty about other investors' behavior
  - Increased information asymmetry
  - Flight to quality
  - Flight to liquidity
- Two basic groups of data:
  - Interest rate spreads
  - Volatility and cross-correlation (contagion)
- Consequences: (1) noise drowns signal (asset prices); (2) higher risk premia (interest rates); (3) tightened credit standards; compounding each other, depressing macroeconomic activity

“Dynamic stochastic non-collusive herding games with asymmetric information” (real paper title)



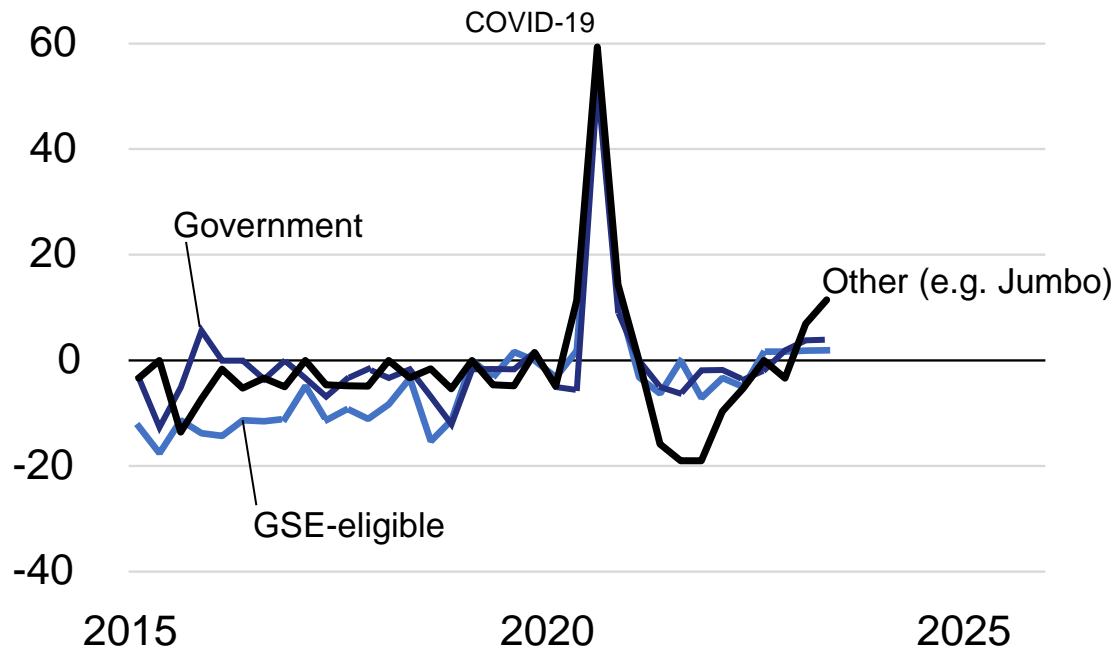
# Recent financial stressors: the 2007-08 financial crisis, 2011 Tea Party obstinance (debt-ceiling), 2020 pandemic, 2023 regional bank hubris



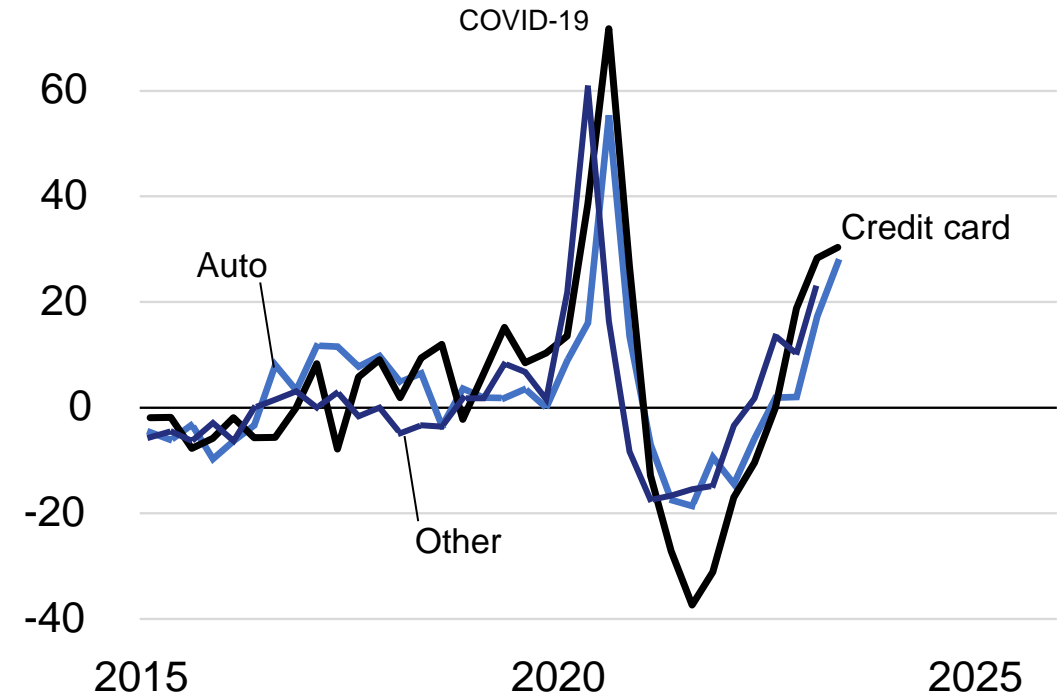
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# FRB SLOOS data: net percentages of domestic respondents (senior loan officers) tightening credit standards—Jumbo, consumers, CRE

Higher = tighter



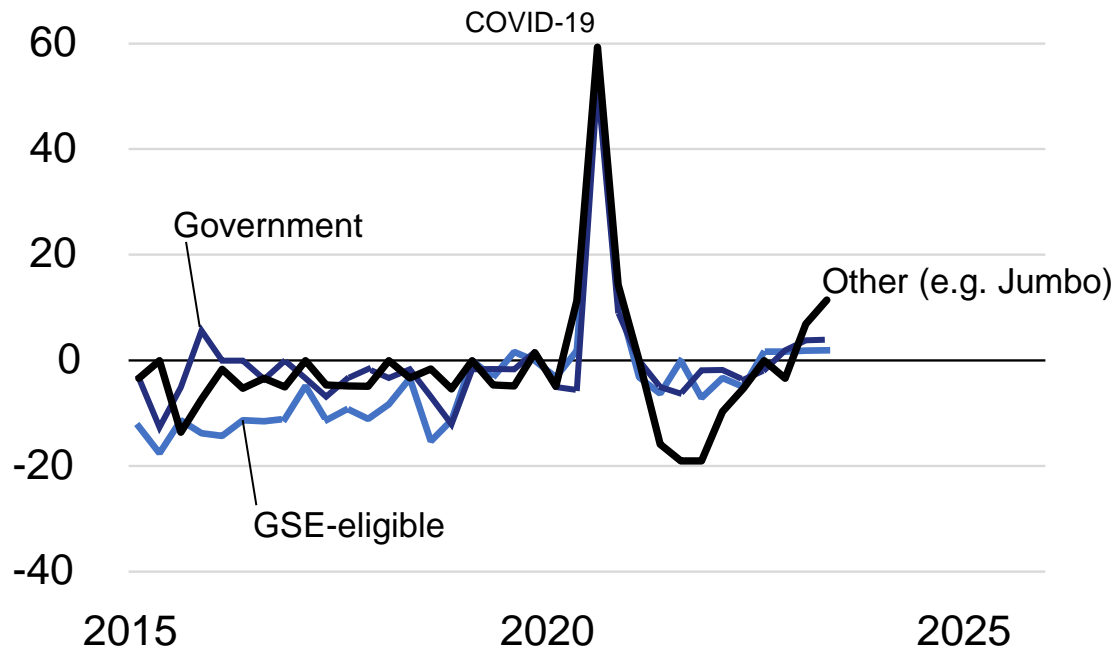
Mortgage lending



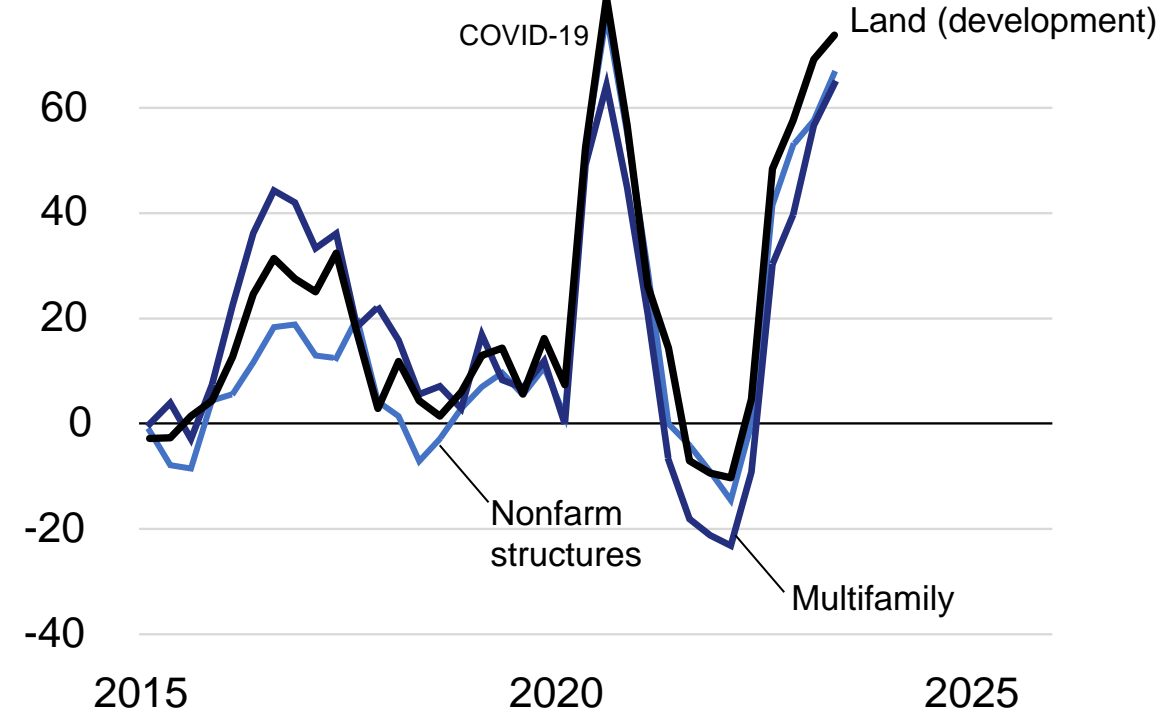
Consumer lending

# FRB SLOOS data: net percentages of domestic respondents (senior loan officers) tightening credit standards—Jumbo, consumers, CRE

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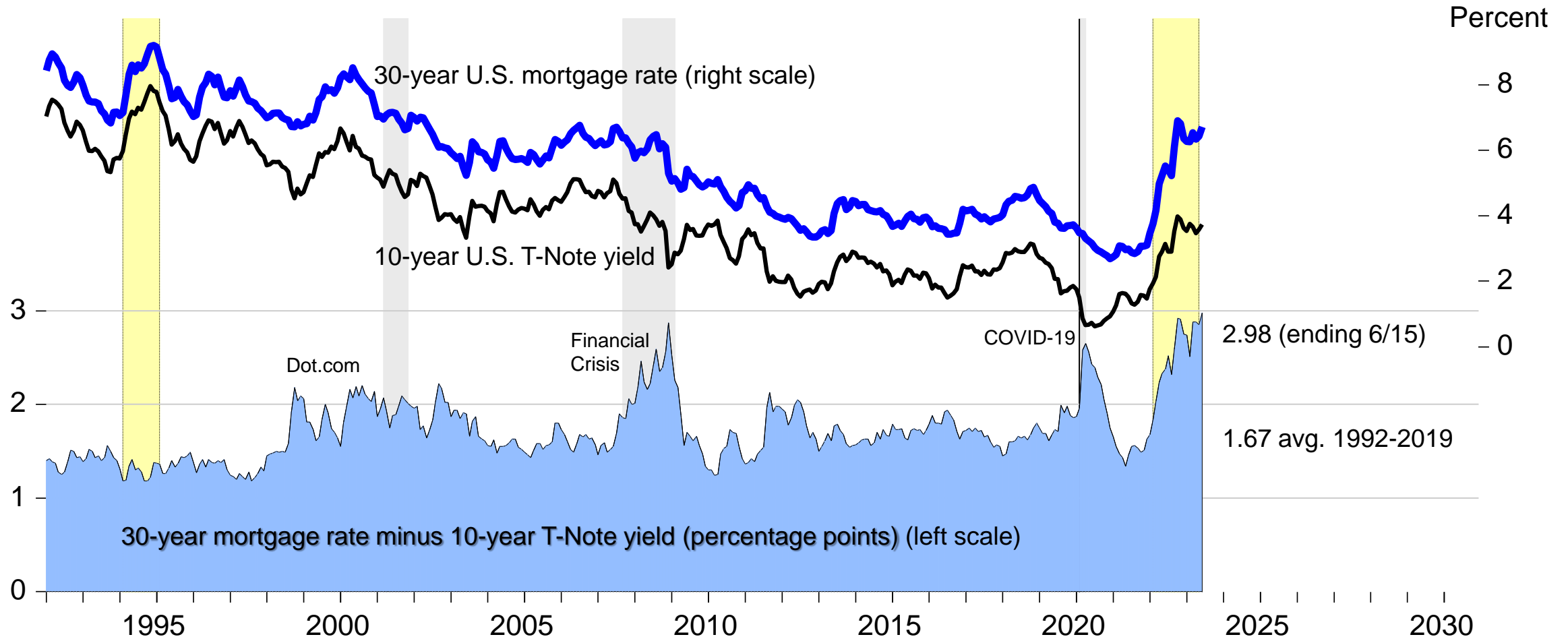
Mortgage lending



Commercial real estate lending



# Recent credit tightening: increase in one version of the “external finance premium”—spread from mortgage rates to risk-free rates\*

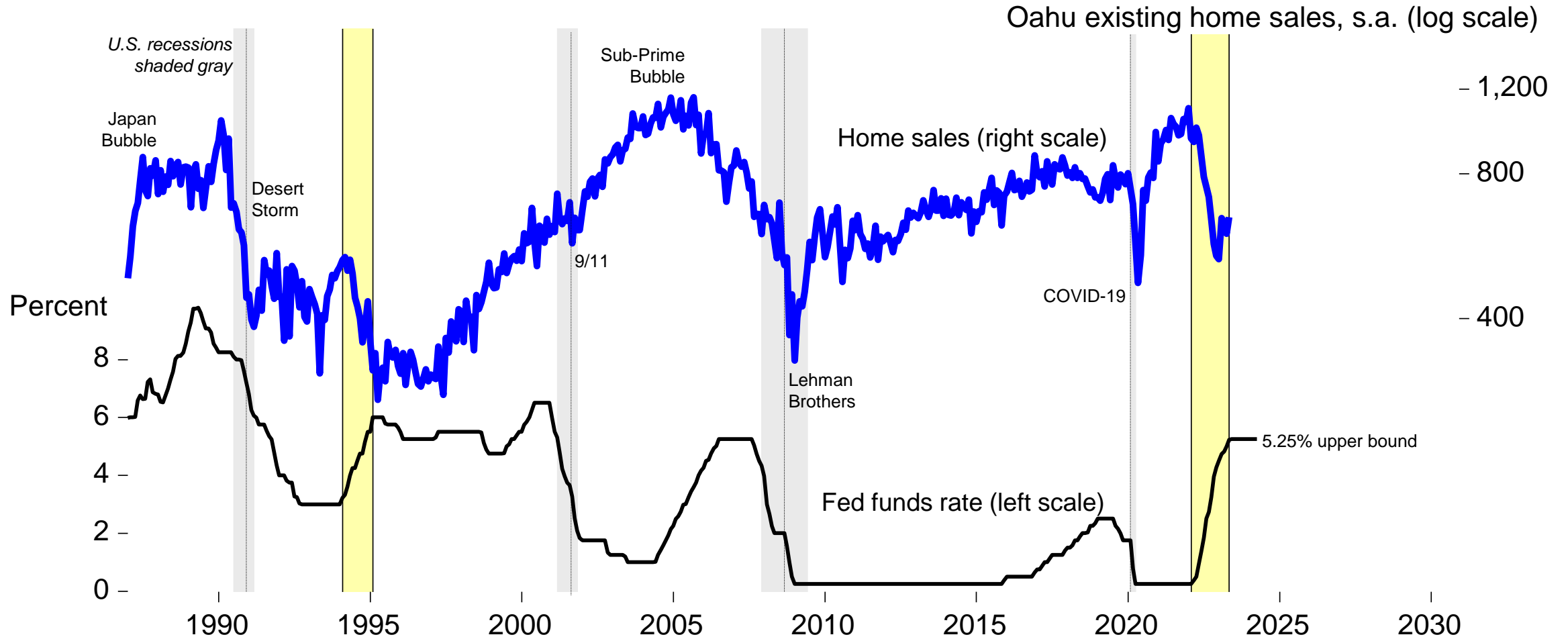


\*Ben Bernanke (December 2022), “Banking, credit, and economic fluctuations: Nobel Prize lecture” (<https://www.brookings.edu/blog/up-front/2022/12/12/banking-credit-and-economic-fluctuations-bernankes-nobel-prize-lecture/>) and <https://www.youtube.com/watch?v=BB Cp28YF-hg>.

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Sources: Freddie Mac, 30-Year Fixed Rate Mortgage Average in the United States [MORTGAGE30US]; Board of Governors of the Federal Reserve System (US), Market Yield on U.S. Treasury Securities at 10-Year Constant Maturity, Quoted on an Investment Basis [DGS10], retrieved from FRED (<https://fred.stlouisfed.org/series/MORTGAGE30US>, <https://fred.stlouisfed.org/series/DGS10>).

# The Fed lowers rates in recessions, but not all target rate increases *cause* recessions\*: 1994 Soft Landing could be much like 2022-23



\*Ellen E. Meade, Yoshio Nozawa, Lubomir Petrasko, and Joyce K. Zickler (September 24, 2015), "The Effects of FOMC Communications before Policy Tightening in 1994 and 2004," *FEDS Notes* (<https://www.federalreserve.gov/econresdata/notes/feds-notes/2015/effects-of-fomc-communications-before-policy-tightening-in-1994-and-2004-20150924.html>).

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Sources: Honolulu Board of Realtors, Hawaii, existing home sales through May 2023; DBEDT Board of Governors of the Federal Reserve System (US), Federal Funds Target (to 2008) and Target Range - Upper Limit [DFEDTAR and DFEDTARU] through early June 2023, retrieved from FRED, Federal Reserve Bank of St. Louis (<http://dbedt.hawaii.gov/economic/mei/>, <https://fred.stlouisfed.org/series/DFEDTARU>).

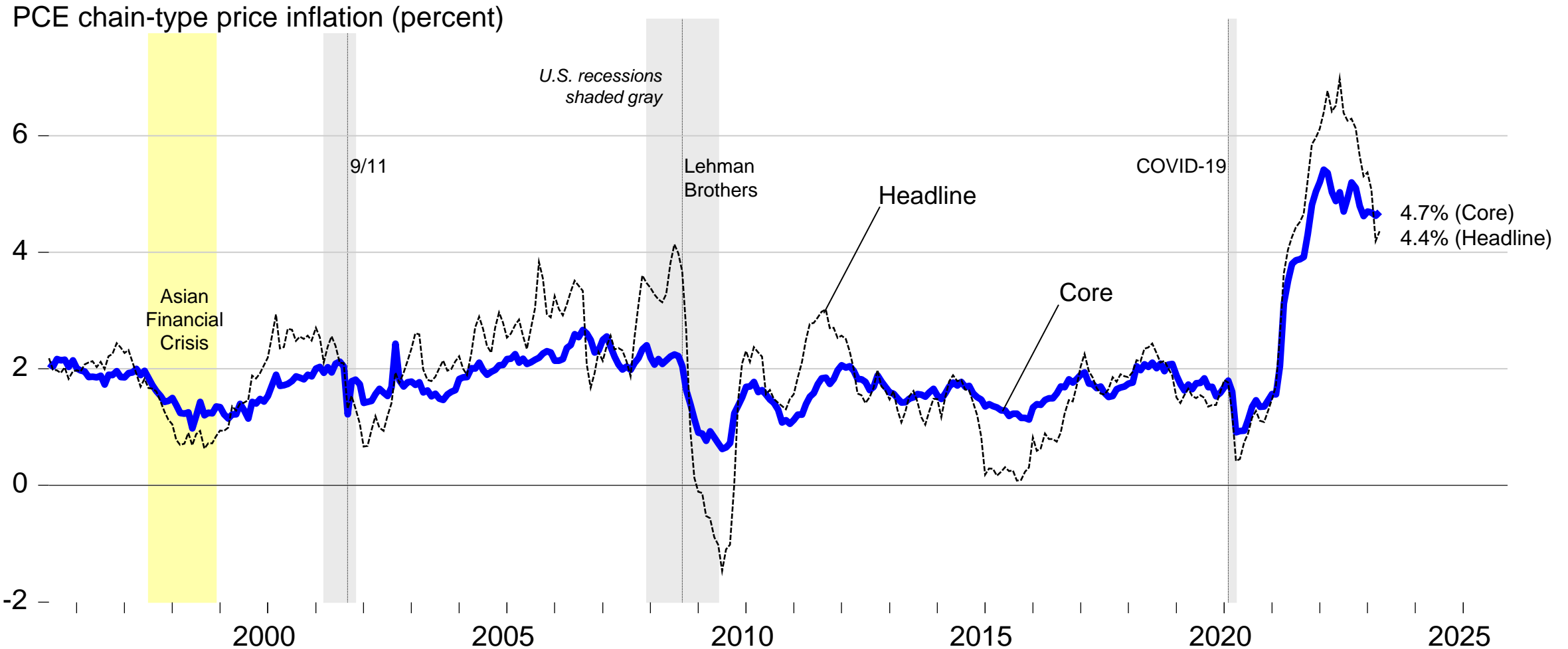


# Hawaii inflation unwinding as expected but U.S. core inflation “sticky”

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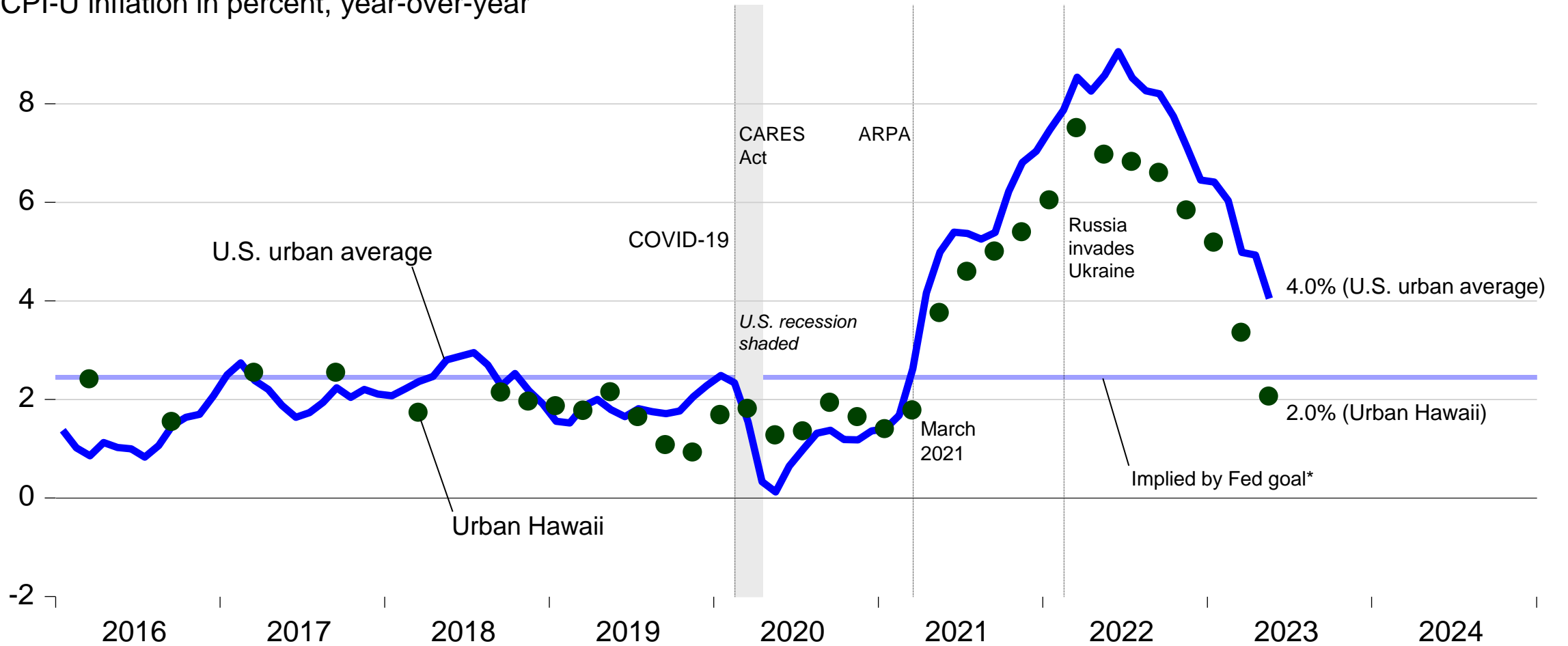


# The Fed's inflation goal: 2 percent core PCE inflation (AIT (2020)), but in the post-pandemic event, core PCE inflation "sticky downward"



# Inflation has fallen for more than a year, as fast as they rose—special factors: pandemic supply chains, fiscal stimuli, geopolitical shocks

CPI-U inflation in percent, year-over-year

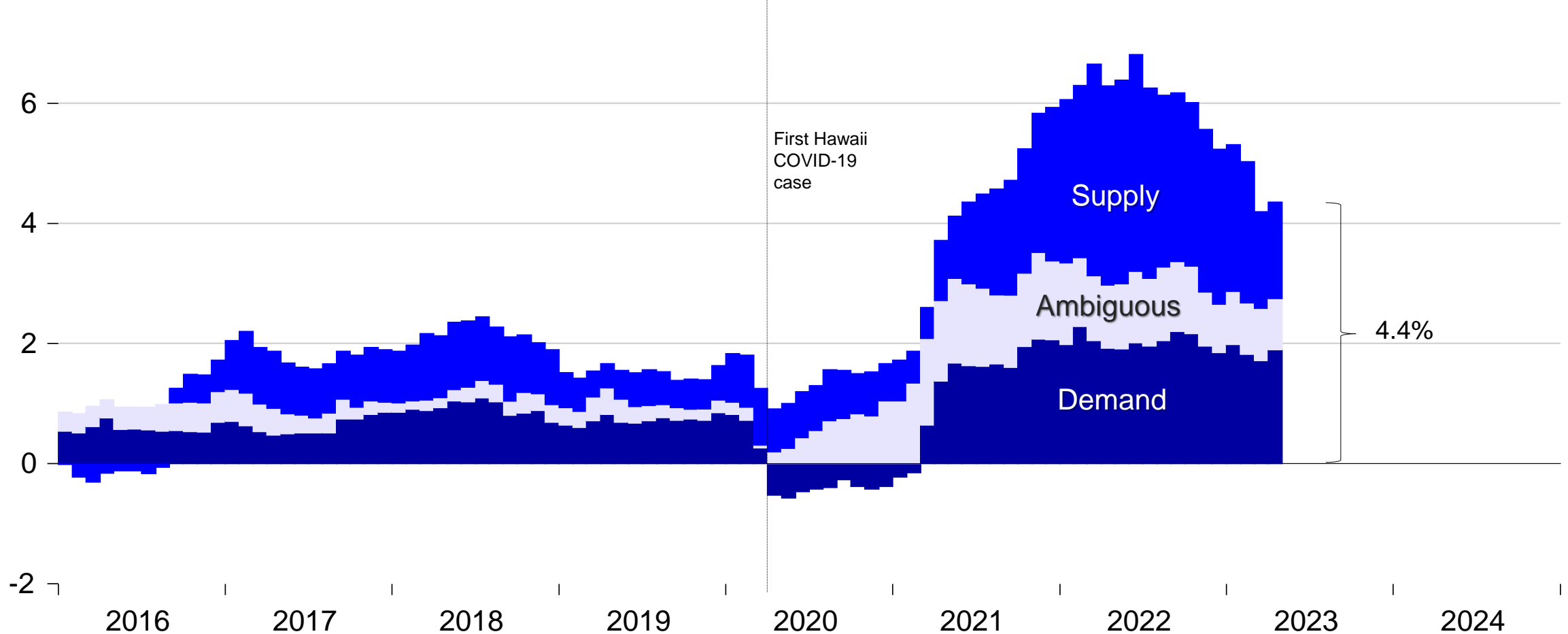


\*Federal Reserve Board ([https://www.federalreserve.gov/monetarypolicy/files/FOMC\\_LongerRunGoals.pdf](https://www.federalreserve.gov/monetarypolicy/files/FOMC_LongerRunGoals.pdf))



# Contributions to PCE deflator headline inflation divided into supply- and demand-driven isolate *unexpected* component (not LR factors)

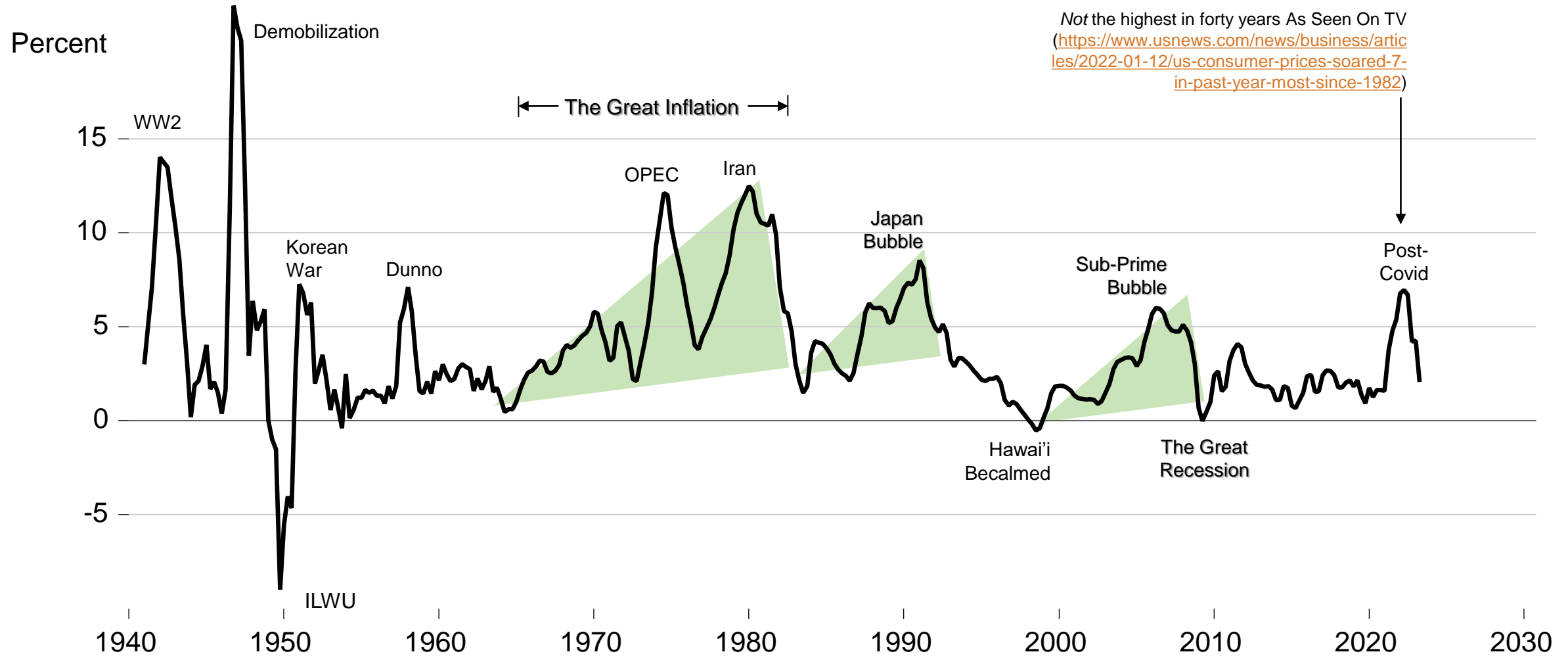
Percent changes stacked (in) U.S. headline PCE deflator components (year-over-year)



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Source: Federal Reserve Bank of San Francisco (<https://www.frbsf.org/economic-research/indicators-data/supply-and-demand-driven-pce-inflation/>), monthly data through April 2023. See Adam Hale Shapiro (June 2022), "A Simple Framework to Monitor Inflation," *FRB San Francisco Working Paper 2020-29* (<https://www.frbsf.org/economic-research/publications/working-papers/2020/29/>).

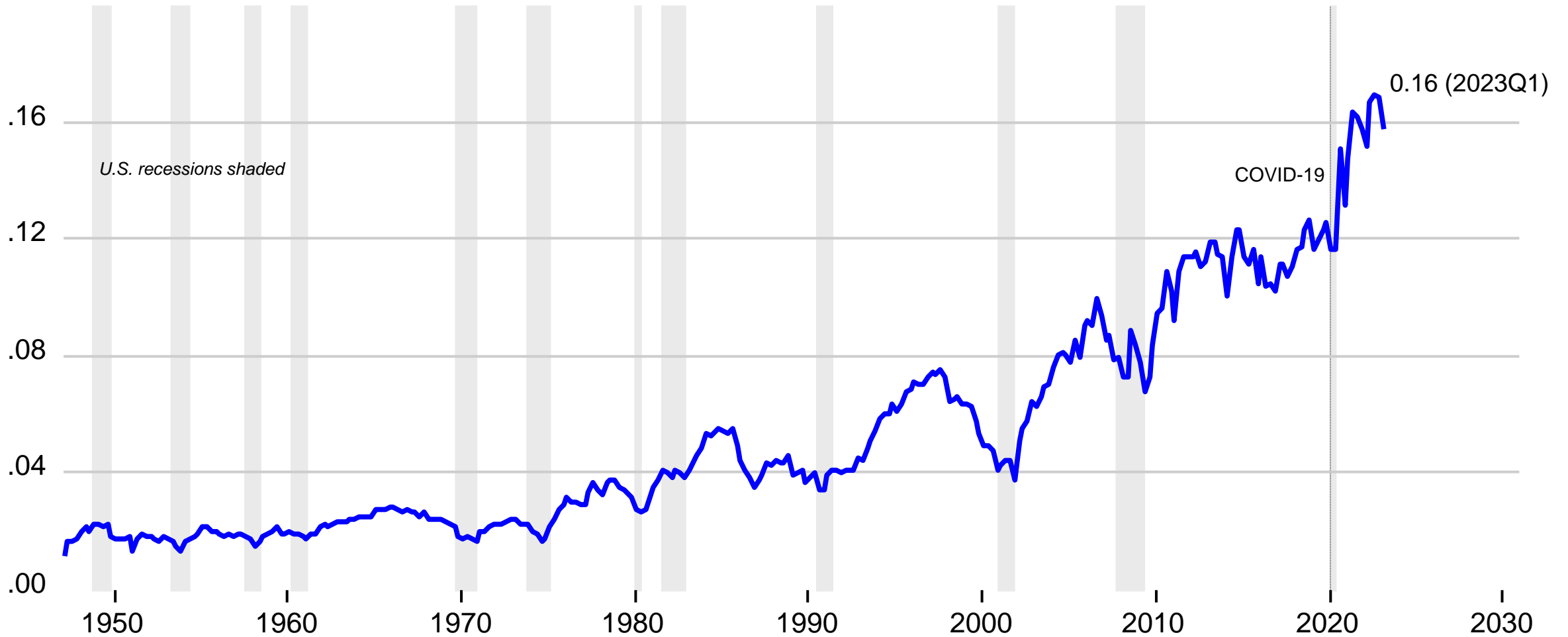
# Historical context: Urban Hawaii *consumer* price inflation never was the highest in 40 years; not a macroeconomic *crescendo* as in past



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# Inflation factor mitigated neither by monetary policy nor supply chain re-articulation: corporate profits as fraction of unit U.S. value-added

Nonfinancial corporate profits as a share of U.S. value-added



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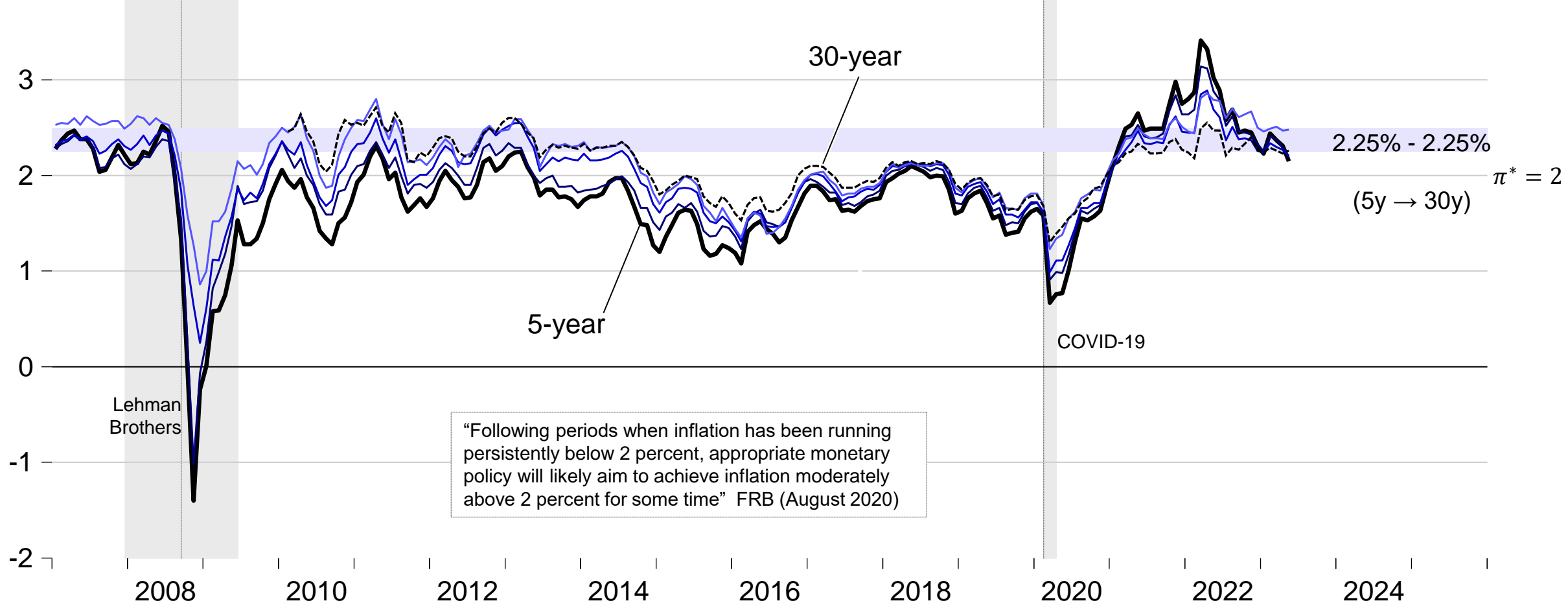


# Monetary policy response

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# Why this is not the 1970s: (nominal minus real) U.S. Treasury yields: LR inflation expectations $2.25\% \leq \pi^e \leq 2.50\%$ remain well-anchored

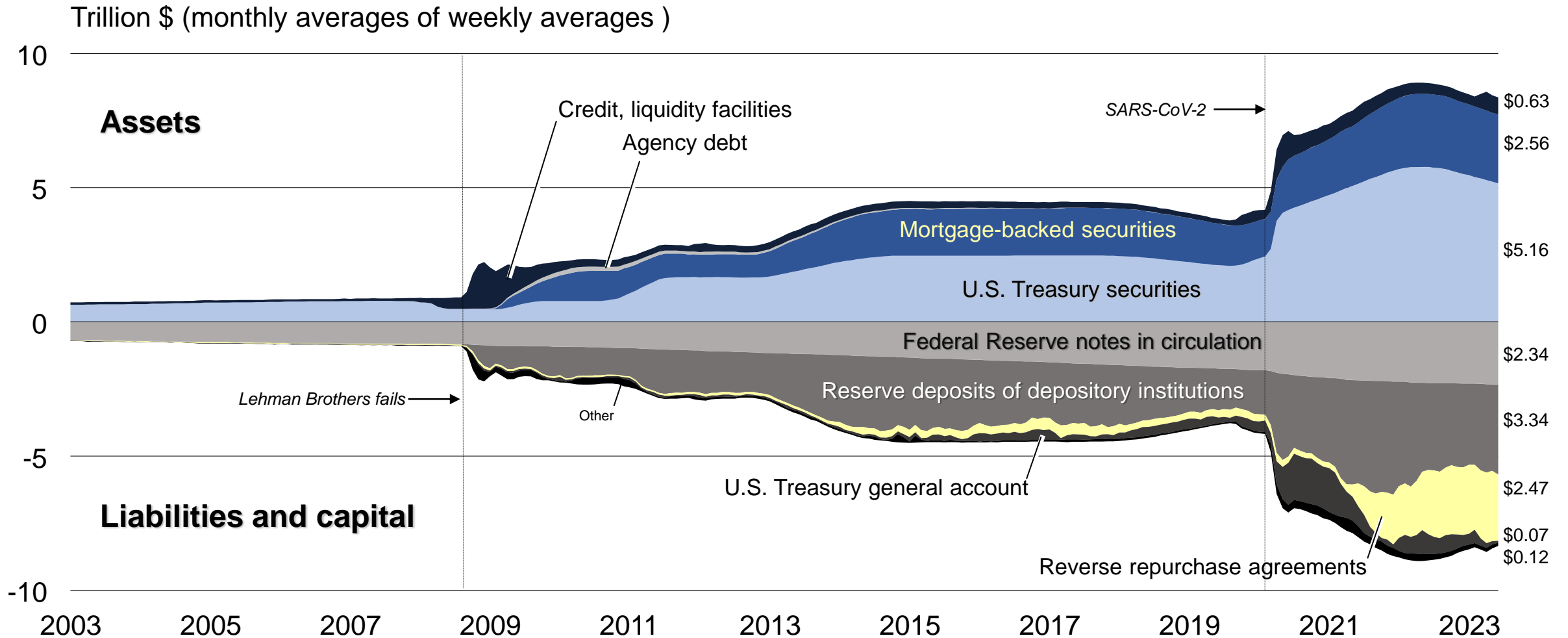
Term structure of expected inflation from nominal Treasury yields minus TIPS yields



\*Nominal U.S. Treasury yields minus TIPS yields at same maturities

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# Quantitative tightening (Treasury, MBS run-off); SVB failure led to BTFP\* for re-injection of bank reserves, reverse repos (liquidity)

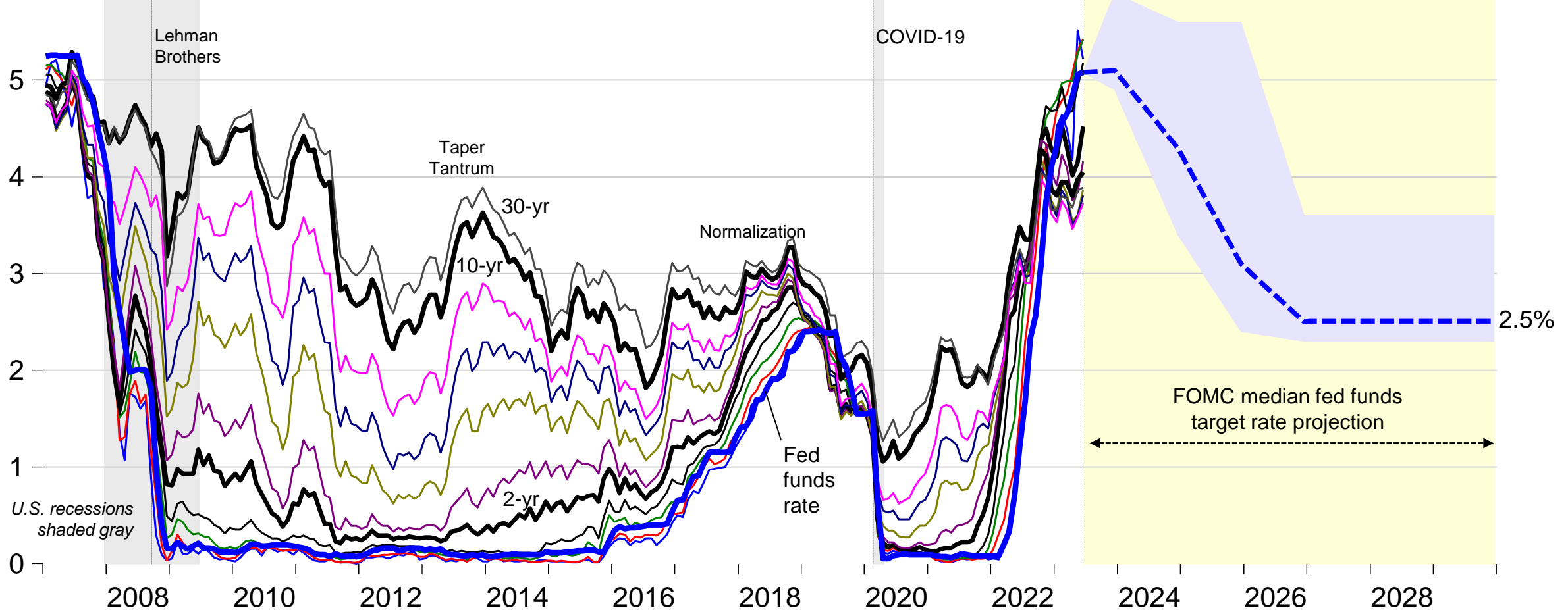


\*Federal Reserve Board (<https://www.federalreserve.gov/financial-stability/bank-term-funding-program.htm>)



# U.S. Treasury yield curve: FOMC moved aggressively to contain inflation, anchor expectations; now validates pause for disinflation

U.S. Treasury yields and the overnight rate, in percent



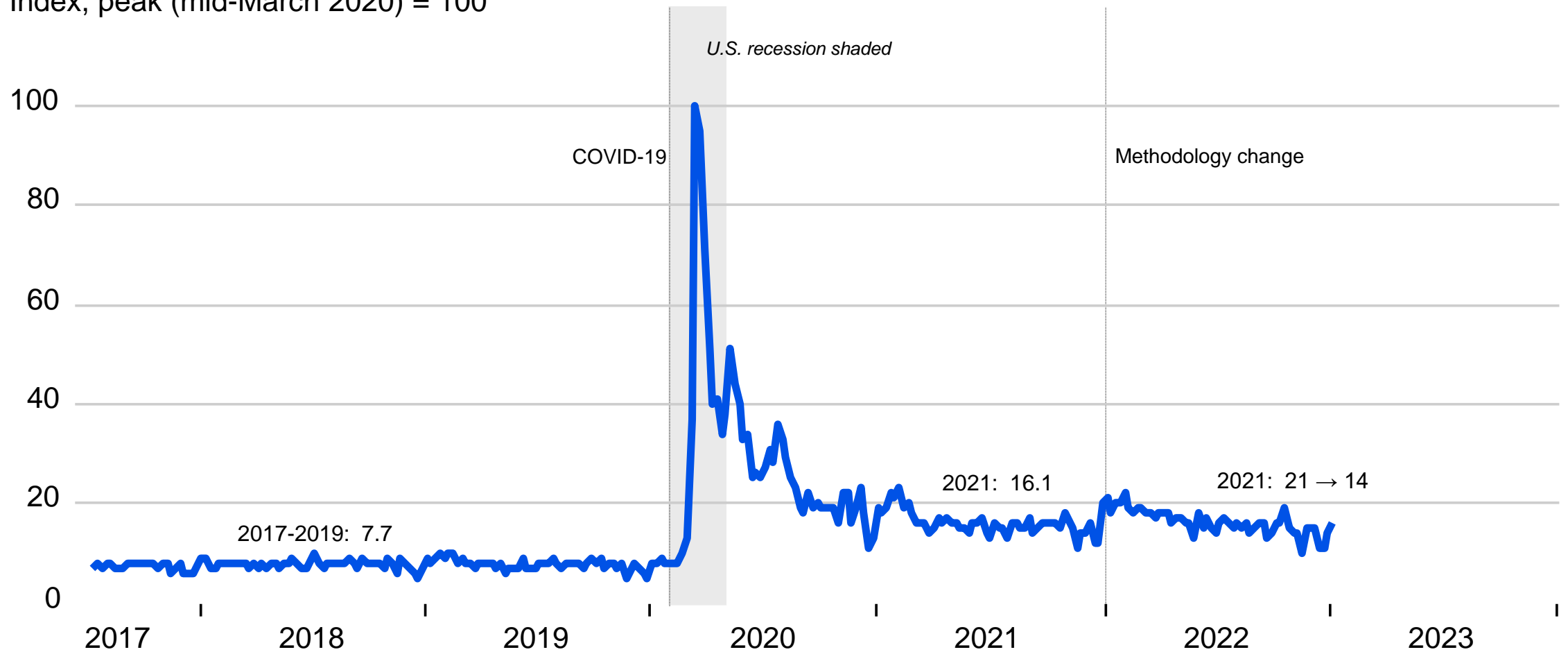


# Remote work: labor market *hysteresis* (changes thought temporary which are permanent) and implications for housing and real estate

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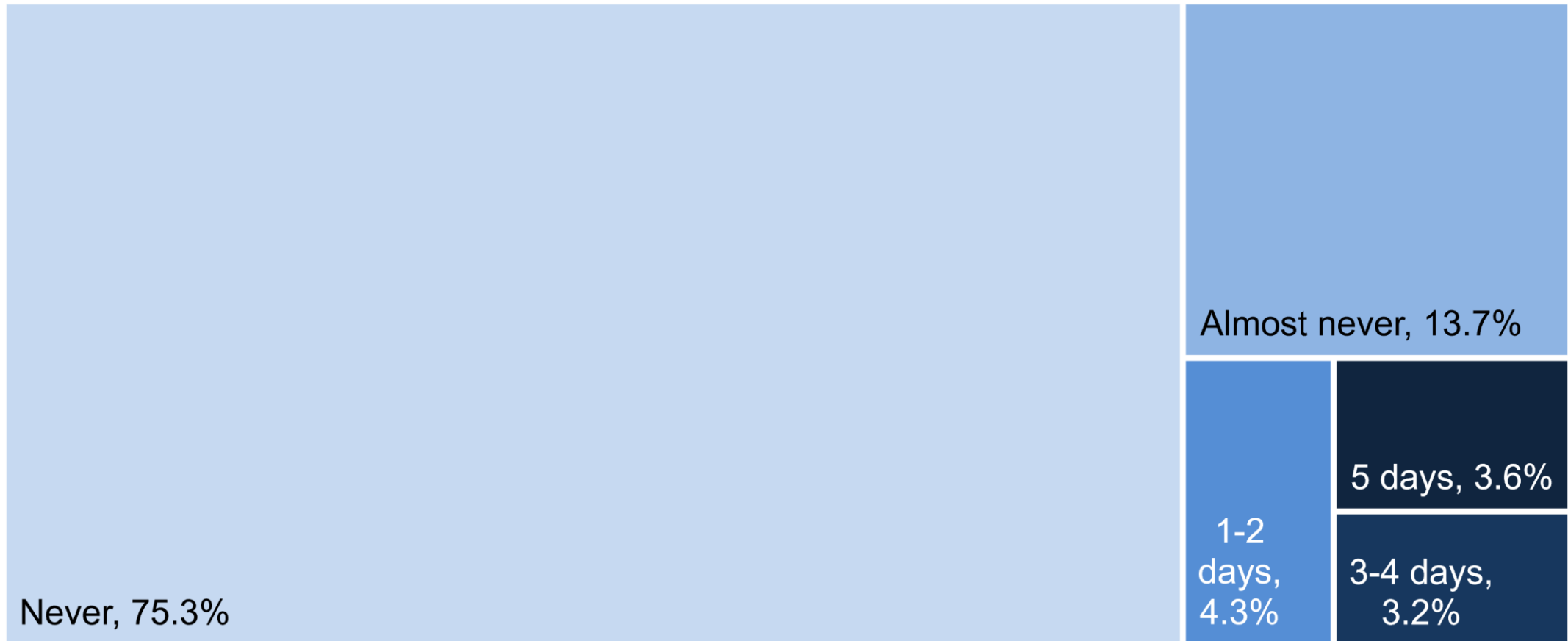
# Google searches on phrase “working from home” exploded after COVID-19, settling but persisting roughly double pre-covid volumes

Index, peak (mid-March 2020) = 100

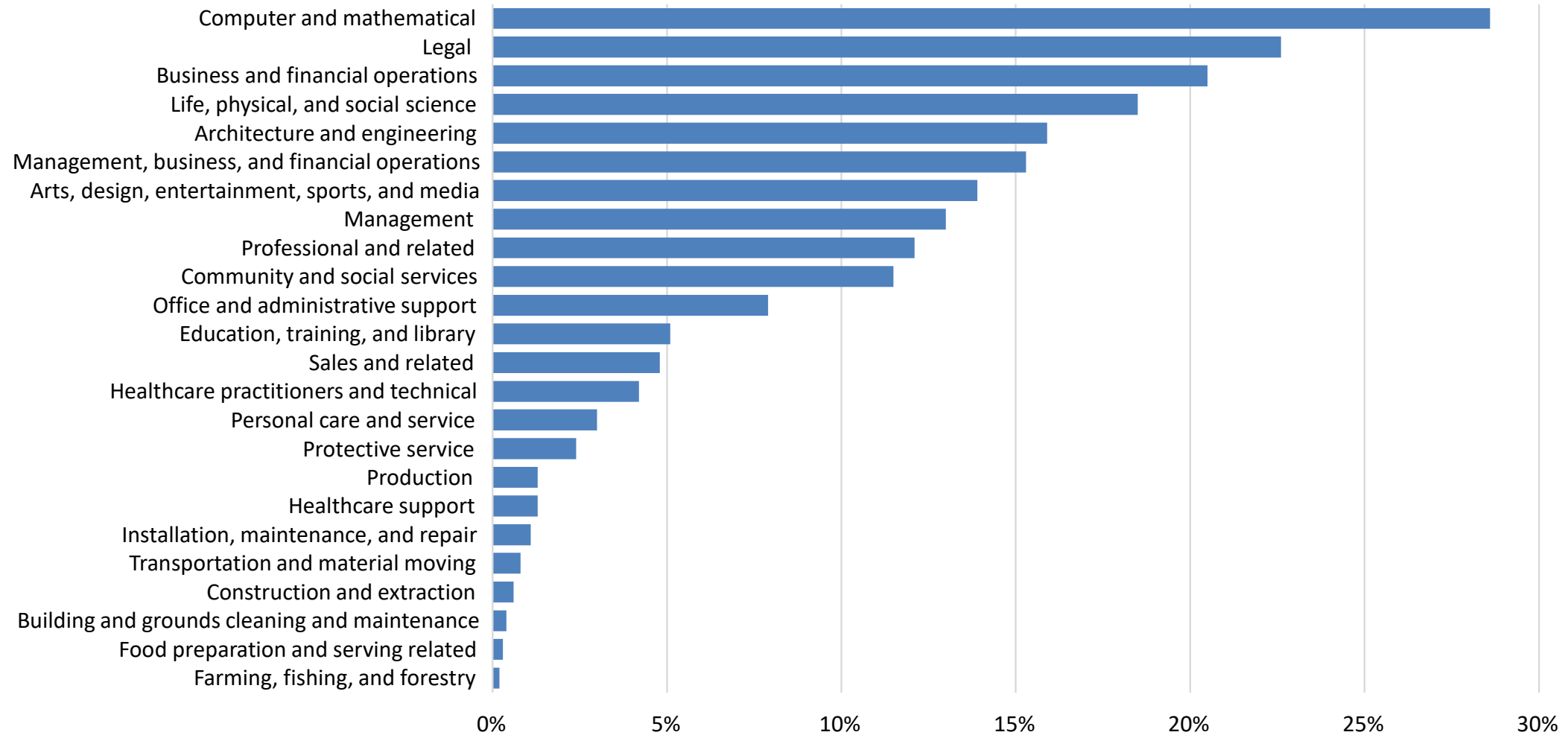




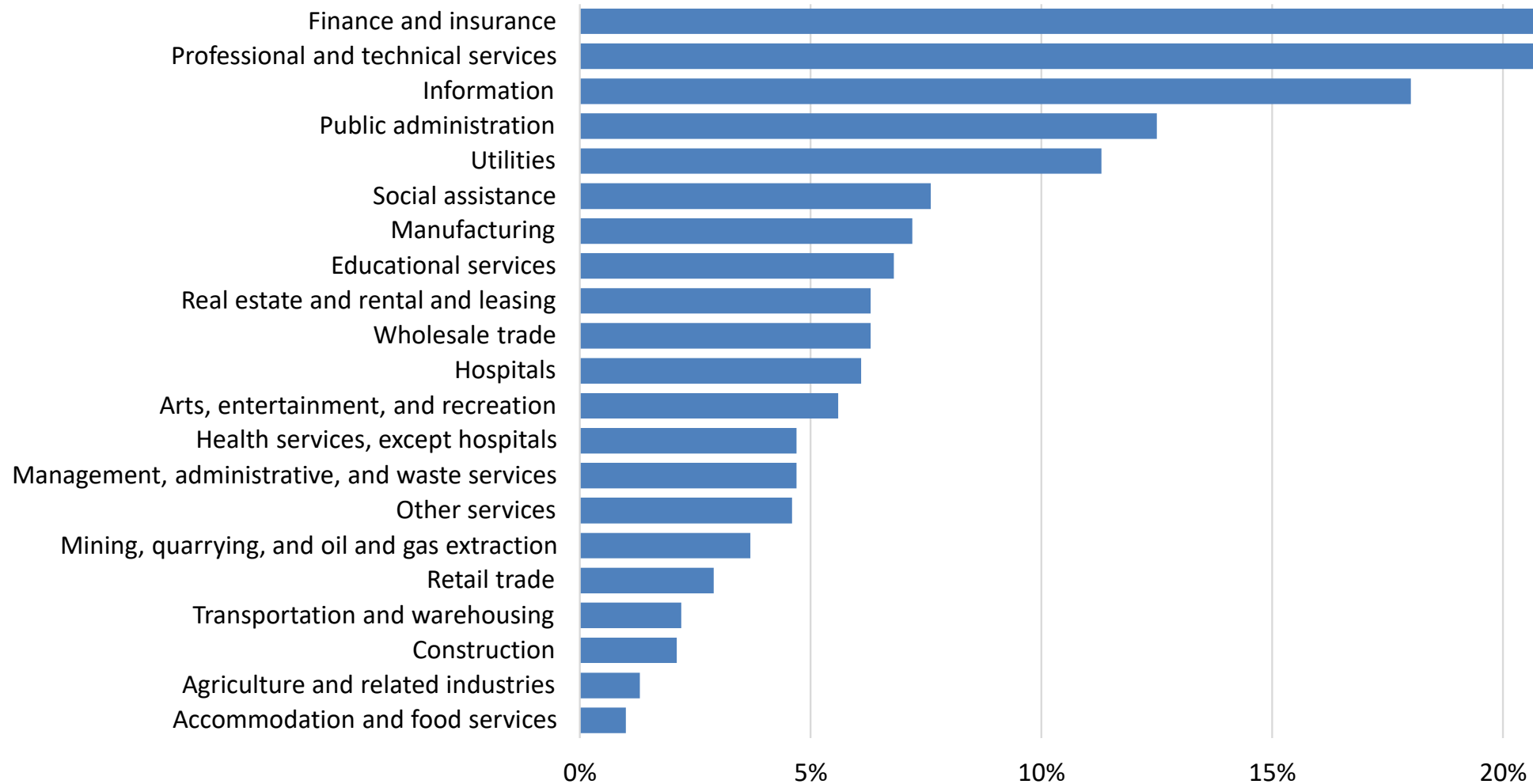
# Pre-pandemic distribution of U.S. workers who worked at home and how often, 2017-2018: almost 90% never or almost never WFH



# U.S. employed persons who teleworked *by occupation*, May 2022; why it “pays” in math, law, finance, science, engineering, etc.

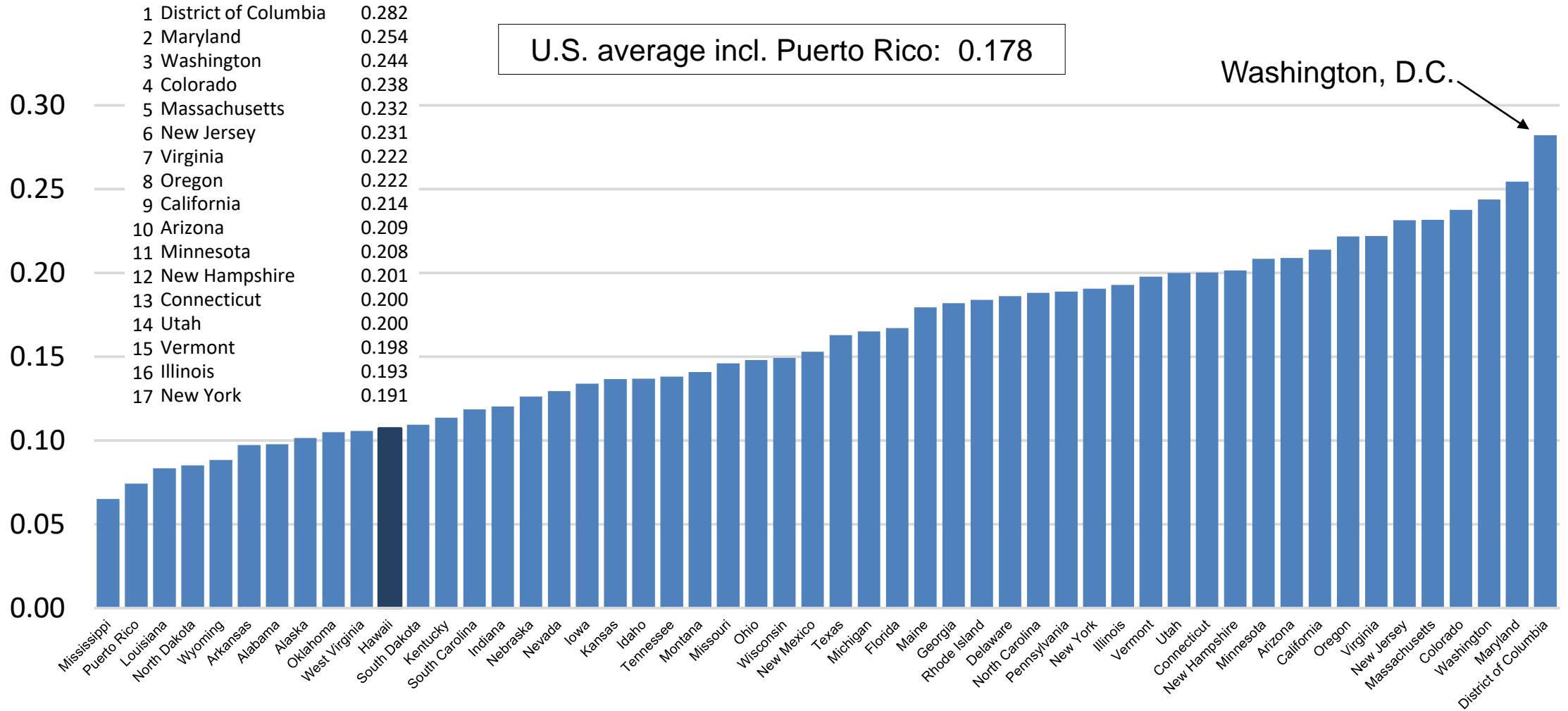


# U.S. employed persons who teleworked *by industry*, May 2022: financial, professional, technical, information, public sectors

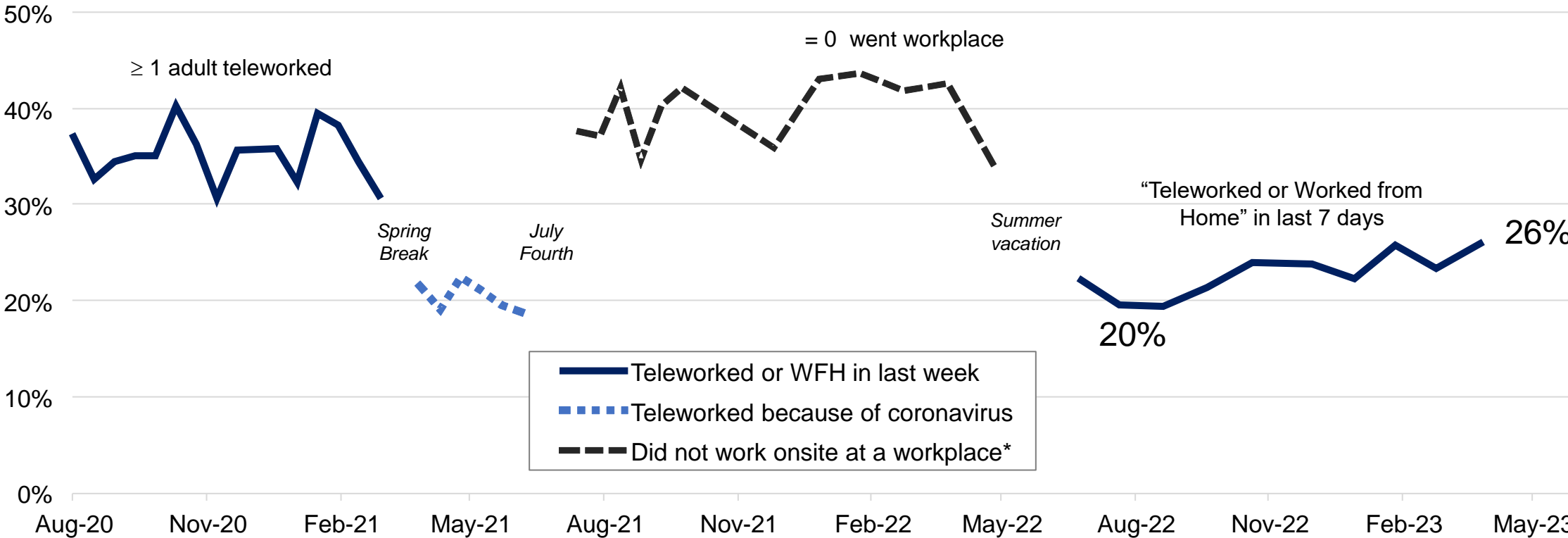




# Census Bureau ACS “work from home” (full-time) ranking by state: mix of political, economic structural attributions (Hawaii = 0.107)

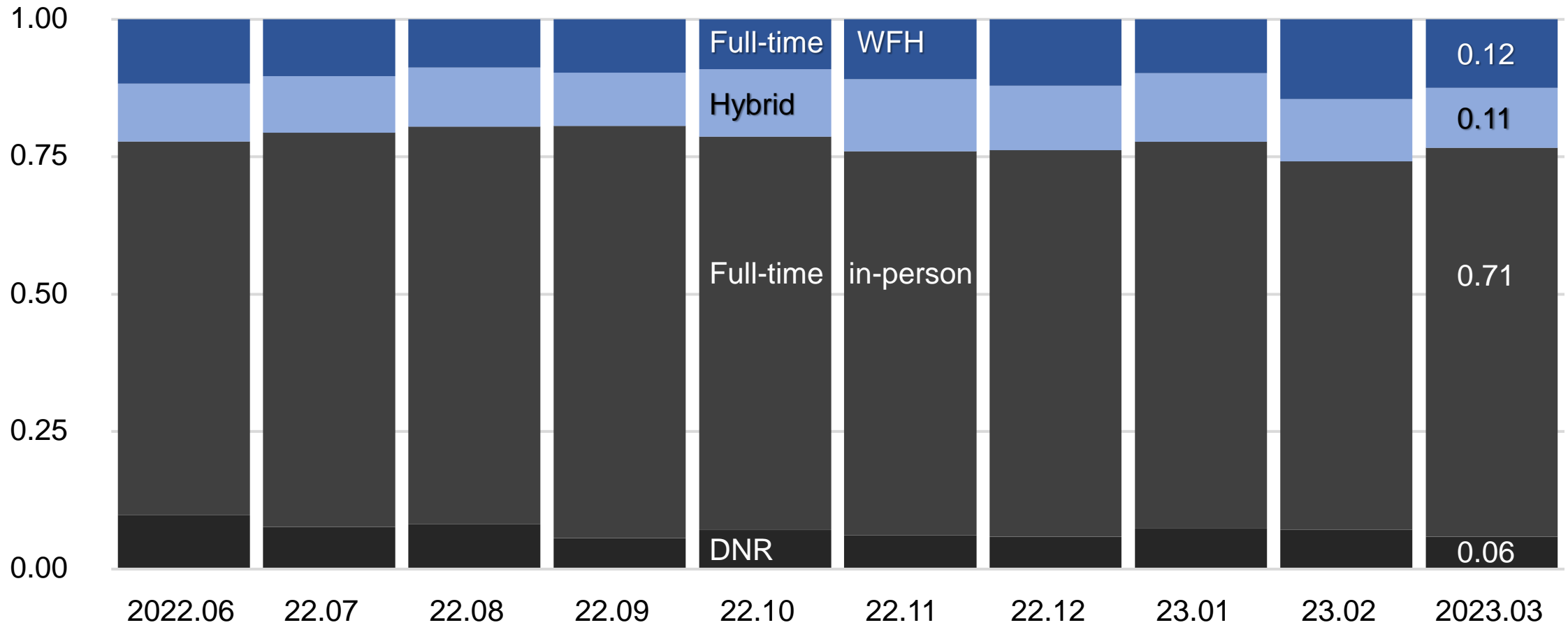


# Household pulse data\* for *Hawaii* respondents show that $\geq 1/5$ lived in 2022-2023 households in which at least one adult teleworked or WFH



\* Surveys before April 2021 define “Percentage of adults living in households where at least one adult has substituted some or all of their typical in-person work for telework because of the coronavirus pandemic,” from April-June 2021 “Percentage of adults living in households where at least one adult has teleworked because of the coronavirus pandemic in the last 7 days,” and beginning in July 2021, “Percentage of adults in households where someone worked onsite at a workplace in the last 7 days” (i.e. 65.8% between April 27 and May 9, 2022 or one-third who did not). Surveys June 1, 2022 through April 10, 2023 identified population shares from households where someone “Teleworked or Worked from Home in the Last 7 Days.”

# Proportions of Hawaii WFH—full-time and hybrid—and in-person (or unreported) stabilizing in Census Bureau Household Pulse Surveys





# Tremendous amount of new literature appearing in economics on working from home—all accessible to readers who know econ (you)

Cevat Giray Aksoy, Jose Maria Barrero, Nicholas Bloom, Steven J. Davis, Mathias Dolls, Pablo Zarate (January 2023)  
“Time Savings When Working From Home” *NBER Working Paper 30866* (prepared for AEA Papers & Proceedings)  
(<https://wfhresearch.com/wp-content/uploads/2023/01/w30866.pdf>)

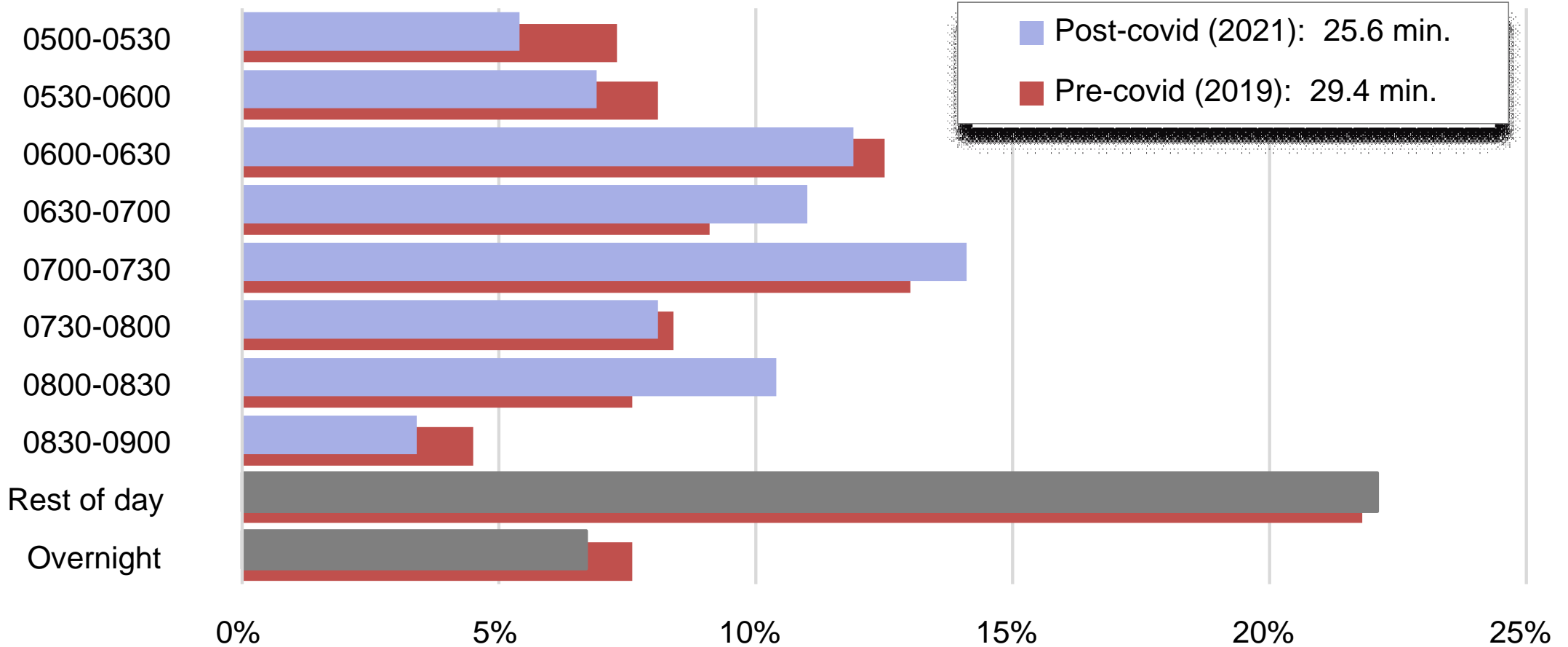
*The average daily time savings when working from home is 72 minutes in our sample [27 countries]. We estimate that work from home saved about two hours per week per worker in 2021 and 2022, and that it will save about one hour per week per worker after the pandemic ends. Workers allocate 40 percent of their time savings to their jobs and about 11 percent to caregiving activities. People living with children allocate more of their time savings to caregiving.*

Jose Maria Barrero, Nicholas Bloom, Shelby Buckman, and Steven J. Davis (February 2023), “Benchmarking SWAA Estimates of the Prevalence of Working From Home,” *Presentation* ([https://wfhresearch.com/wp-content/uploads/2023/02/Benchmarking\\_SWAA-1-February-2023.pdf](https://wfhresearch.com/wp-content/uploads/2023/02/Benchmarking_SWAA-1-February-2023.pdf))

ACS: 18.4% full remote; 82.6% in-person and hybrid  
SWAA: 20.0% full remote; 52.3% full in-person; 27.7% hybrid

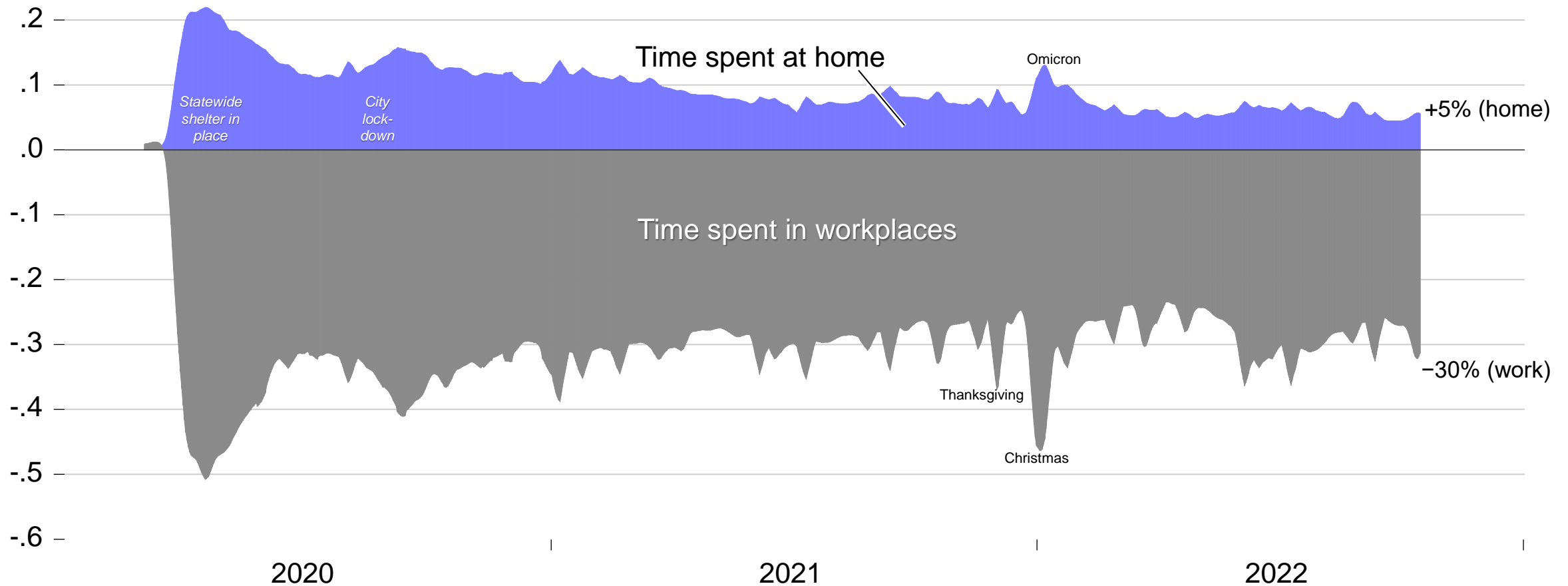
# Pandemic may have altered Oahu commuting by: (1) shrinking the economy; (2) increasing WFH, 3-min. shorter and later commutes

Time of departure for work



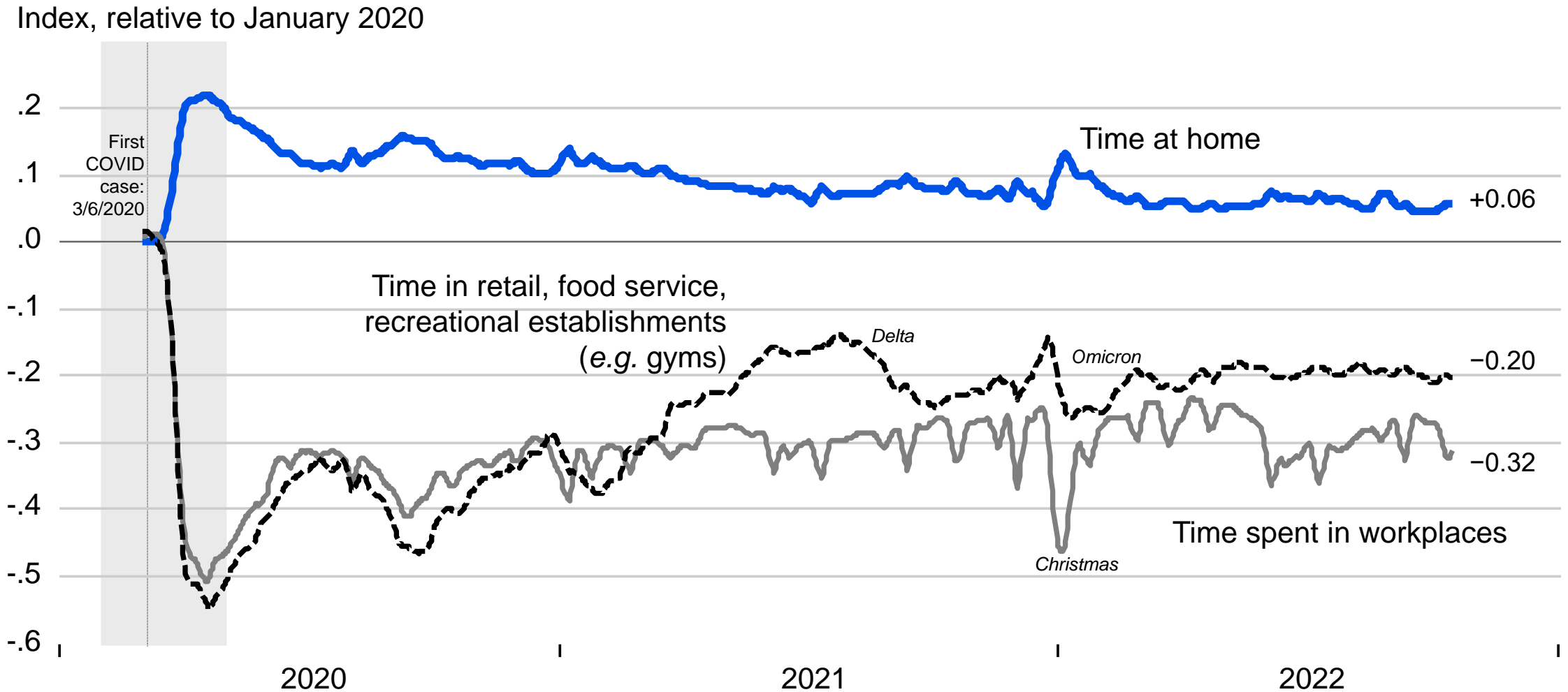
# Daily Google smartphone mobility data: Hawaii residents spend 30 percent less time in workplaces relative to pre-pandemic

Google smartphone GPS mobility indexes for Hawaii residents, relative to January 2020





# First round v. second round impacts: less time in workplaces means fewer stops at malls, restaurants, gyms—*spillover* impacts





# Hysteresis: changes thought temporary which are permanent

- WFH around the world: simultaneous, unplanned, universal shift in working arrangements
  - Hybrid WFH: 1.5 days/week (27 country sample); workers want 1.7 days, firms want 0.7 days
  - WFH 2-3 days/week option value = 5% of pay; higher for women (6%), parents, long commuters
- “We’re not going to go back to normal because the changes already are noticeably permanent in certain areas. That’s what our surveys...are beginning to shed light on this—I don’t what to call it—maybe it’s The New Economy” (William Beach, U.S. Bureau of Labor Statistics Commissioner)
- “[...]in surveys] the near- and medium-term effect on firm-level TFP [total factor productivity] was more likely to be positive for firms where more of the work can be done from home, and where sales do not depend as much on face-to-face contact with customers.” (John Fernald, Federal Reserve Bank of San Francisco and Professor, INSEAD)

Sources: Cevat Giray Aksoy *et al* (August 2022), “Working from home around the world,” prepared for the *Brookings Papers on Economic Activity* (<https://wfhresearch.com/wp-content/uploads/2022/09/Working-from-Home-Around-the-World-23-August-2022.pdf>), Nicholas Bloom *et al* (July 2022) “How hybrid working from home works out,” *NBER Working Paper 30292* (<http://www.nber.org/papers/w30292>); comments of William Beach, Commissioner, U.S. Bureau of Labor Statistics, National Association for Business Economics 2021 Economic Measurement Seminar (August 9-11, 2021), 31:41 of panel discussion on “Maintaining the Quality and Integrity of U.S. Government Data” (August 11, 2021); John Fernald and Huiyu Li (August 8, 2022) “The Impact of COVID on Productivity and Potential Output” ([https://www.kansascityfed.org/Jackson%20Hole/documents/9032/JH\\_Paper\\_Fernald.pdf](https://www.kansascityfed.org/Jackson%20Hole/documents/9032/JH_Paper_Fernald.pdf)), presented at the Jackson Hole Economic Policy Symposium: Reassessing Constraints on the Economy and Policy (Thursday, August 25, 2022),

# Remote work and a one-time structural shift in housing preferences: rogue wave away from urban core, backwash returning inward

- Two views: Nick Bloom *et al* (Harvard of the West Coast): “The Donut Effect”<sup>\*</sup>—rogue wave  
Ed Glaeser (Stanford of the East Coast): “Survival of the City”<sup>†</sup>—backwash
- More recent empirical analysis: John Mondragon and Johannes Wieland (May 2022), “Housing Demand and Remote Work” Federal Reserve Bank of San Francisco<sup>‡</sup>—suggesting that **one-half of U.S. annual home price appreciation since 2019 is attributable to remote work**
  - General technology (personal computing, connectivity) enabled distributed work—productivity latent in technology catalyzed by pandemic response (*e.g.* Zoom)
  - Up to 1/3 of workforce *could* work remotely (up from 1/10 pre-covid), full-time or hybrid
  - Hybrid work expands spatial scope of labor market, affected housing market in suburban areas; full-time remote disconnects spacetime from workplace, spillovers to ex-urban areas

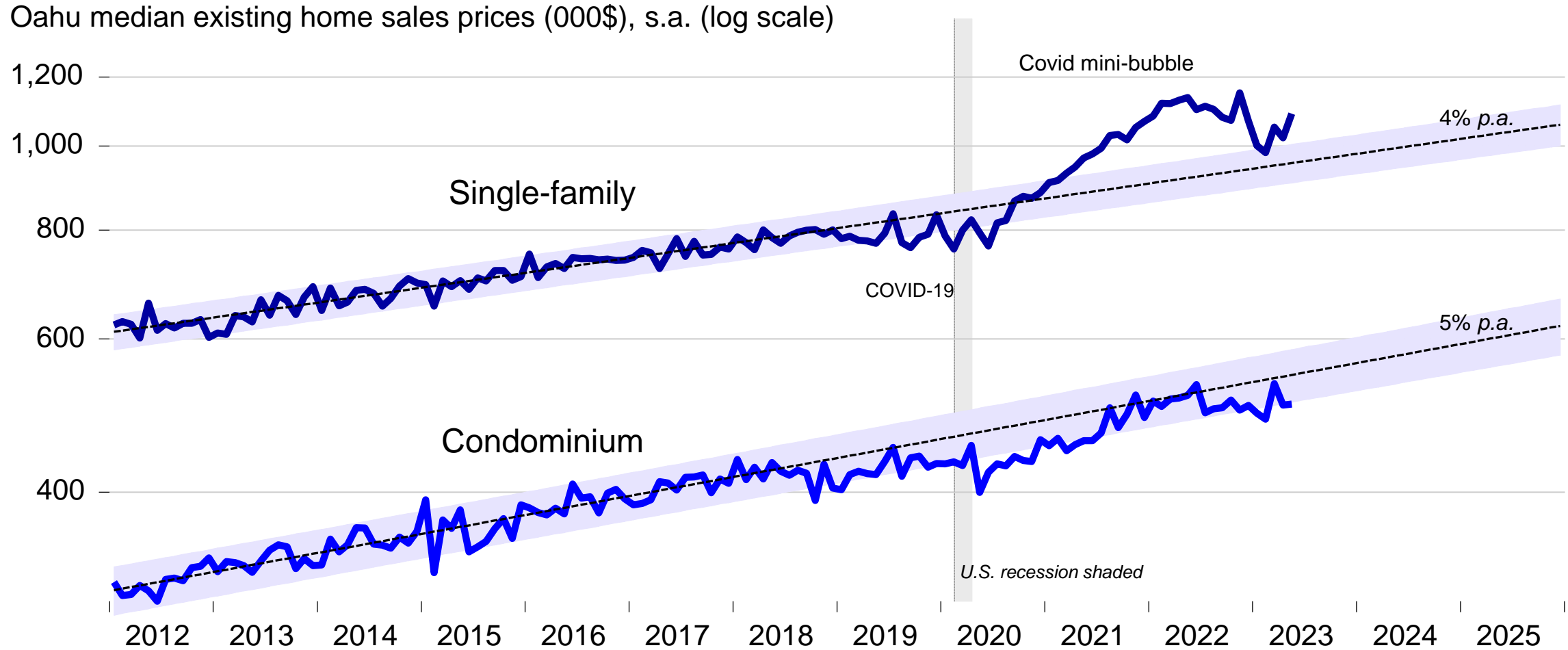
<sup>\*</sup> Arjun Ramani & Nicholas Bloom (May 2021), “The Donut Effect of Covid-19 on Cities,” *NBER Working Paper* 28876 (<https://www.nber.org/papers/w28876>) and “Nick Bloom on Working From Home...Will it Persist?” Bendheim Center for Finance (Princeton) webinar (<https://bcf.princeton.edu/events/nick-bloom-working-from-home-will-it-persist/>)

<sup>†</sup> Edward Glaeser (October 2021), “Survival of the City,” Bendheim Center for Finance (Princeton) webinar (<https://bcf.princeton.edu/events/edward-glaeser-on-triumph-of-the-city-the-future-of-urban-life-and-work/>).

<sup>‡</sup> John Mondragon and Johannes Wieland (May 2022), “Housing Demand and Remote Work” *NBER Working Paper* No. w30041 (<https://www.frbsf.org/wp-content/uploads/sites/4/wp2022-11.pdf>)



# Oahu median existing home sales prices, s.a.: big differences in post-covid segment dynamics, less condominium bubbliciousness



# *Pau*



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Paul H. Brewbaker, Ph.D., CBE

TZ E C VO N O M I C S

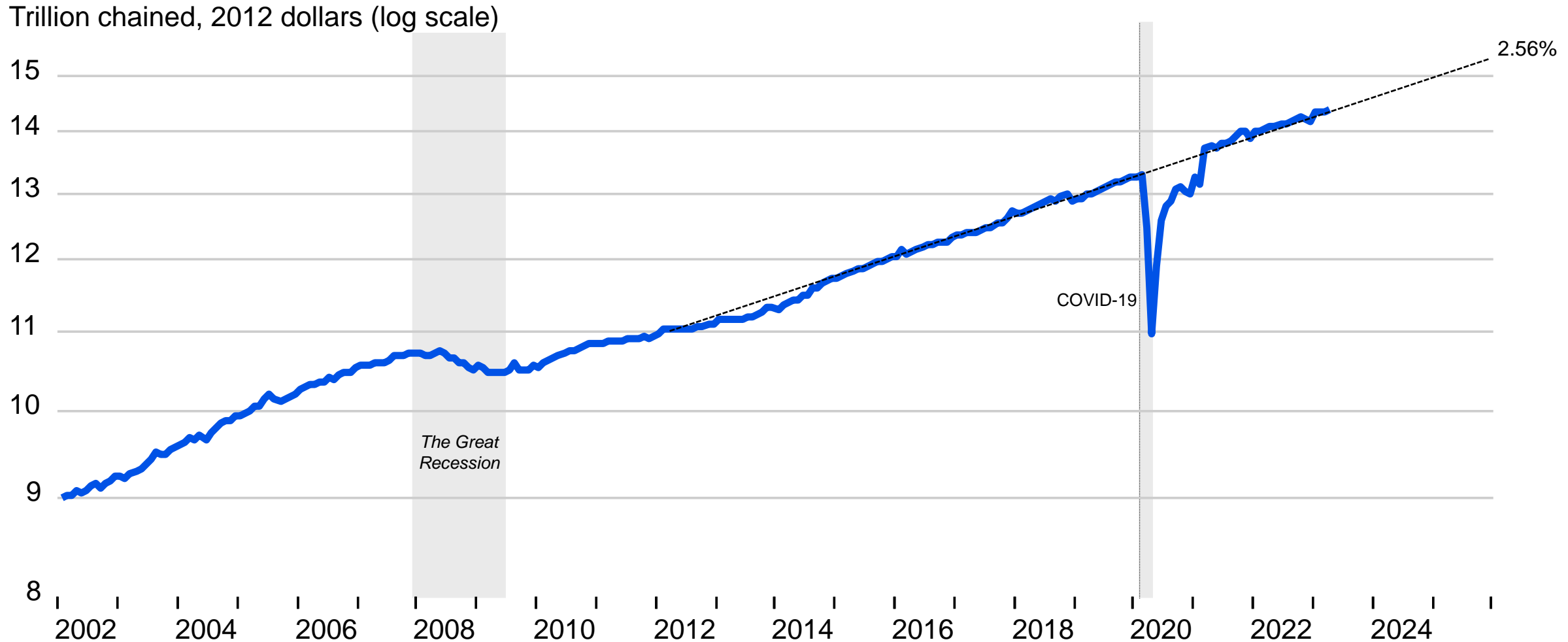


# Appendix: U.S. on autopilot (soft landing); Hawaii, unraveling?

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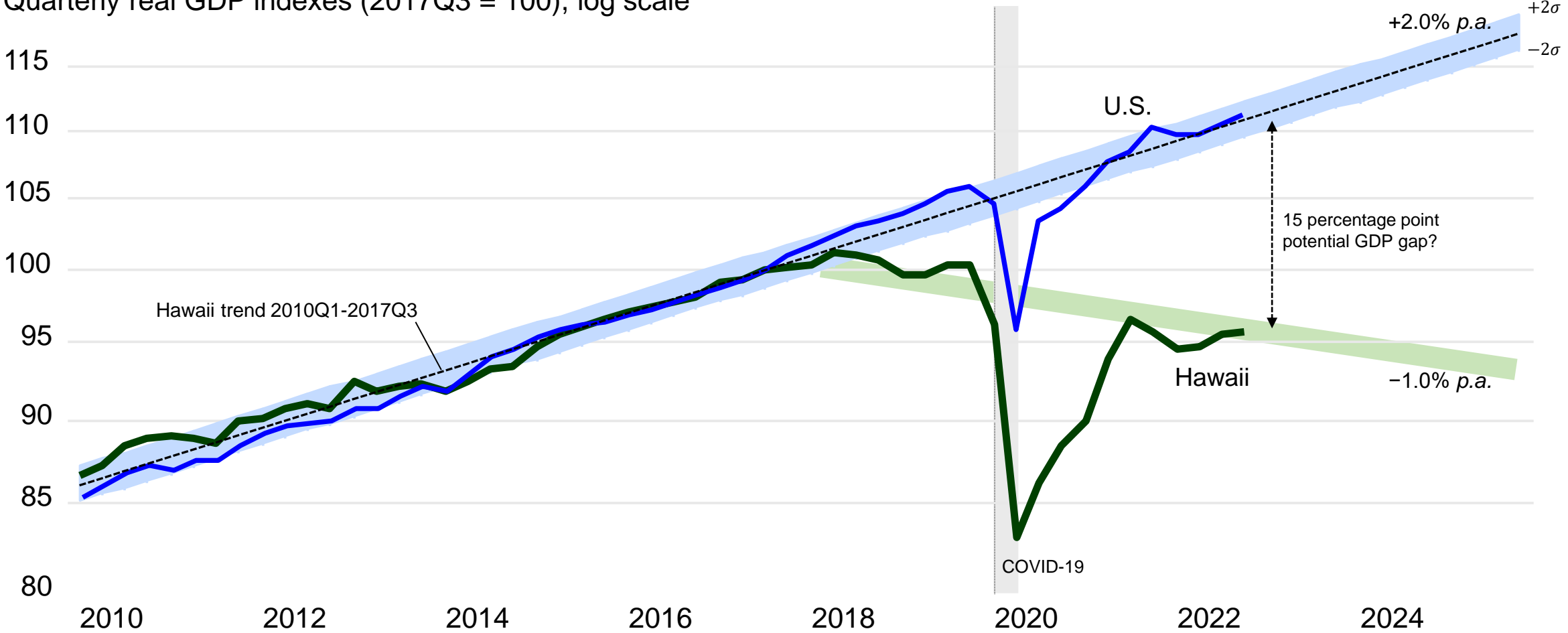


# Difference-stationary (2008) vs. trend-stationary (2020) responses of U.S. real personal consumption expenditure: getting back on track



# Hawaii real GDP took economic growth off-ramp in 2018, five years ago (pre-covid); real Hawaii output now 15 percent below its potential

Quarterly real GDP indexes (2017Q3 = 100), log scale



Sources: U.S. Bureau of Economic Analysis (<https://www.bea.gov/data/gdp/gdp-state>, <https://www.bea.gov/itable/national-gdp-and-personal-income>), re-indexing and trend regression estimate by TZ Economics; potential U.S. real GDP growth estimates range from 1.7-1.9 percent *per annum* for the 2020s, see Congressional Budget Office (<https://www.cbo.gov/data/budget-economic-data#4>) and Federal Reserve Open Market Committee (<https://www.federalreserve.gov/monetarypolicy/fomcproptabl20230614.htm>).

# Why commercial banks don't need as many economists: FOMC projections

$$\hat{y} = 1.0\% (2023), 1.8\% (LR)$$

$$\hat{p} = 3.2\% (2023), 2.0\% (LR)$$

$$i_{FF} = 5.6\% (2023), 2.5\% (LR)$$

Table 1. Economic projections of Federal Reserve Board members and Federal Reserve Bank presidents, under their individual assumptions of projected appropriate monetary policy, June 2023  
Percent

Variable	Median <sup>1</sup>				Central Tendency <sup>2</sup>				Range <sup>3</sup>			
	2023	2024	2025	Longer run	2023	2024	2025	Longer run	2023	2024	2025	Longer run
Change in real GDP	1.0	1.1	1.8	1.8	0.7–1.2	0.9–1.5	1.6–2.0	1.7–2.0	0.5–2.0	0.5–2.2	1.5–2.2	1.6–2.5
March projection	0.4	1.2	1.9	1.8	0.0–0.8	1.0–1.5	1.7–2.1	1.7–2.0	-0.2–1.3	0.3–2.0	1.5–2.2	1.6–2.5
Unemployment rate	4.1	4.5	4.5	4.0	4.0–4.3	4.3–4.6	4.3–4.6	3.8–4.3	3.9–4.5	4.0–5.0	3.8–4.9	3.5–4.4
March projection	4.5	4.6	4.6	4.0	4.0–4.7	4.3–4.9	4.3–4.8	3.8–4.3	3.9–4.8	4.0–5.2	3.8–4.9	3.5–4.7
PCE inflation	3.2	2.5	2.1	2.0	3.0–3.5	2.3–2.8	2.0–2.4	2.0	2.9–4.1	2.1–3.5	2.0–3.0	2.0
March projection	3.3	2.5	2.1	2.0	3.0–3.8	2.2–2.8	2.0–2.2	2.0	2.8–4.1	2.0–3.5	2.0–3.0	2.0
Core PCE inflation <sup>4</sup>	3.9	2.6	2.2		3.7–4.2	2.5–3.1	2.0–2.4		3.6–4.5	2.2–3.6	2.0–3.0	
March projection	3.6	2.6	2.1		3.5–3.9	2.3–2.8	2.0–2.2		3.5–4.1	2.1–3.1	2.0–3.0	
Memo: Projected appropriate policy path												
Federal funds rate	5.6	4.6	3.4	2.5	5.4–5.6	4.4–5.1	2.9–4.1	2.5–2.8	5.1–6.1	3.6–5.9	2.4–5.6	2.4–3.6
March projection	5.1	4.3	3.1	2.5	5.1–5.6	3.9–5.1	2.9–3.9	2.4–2.6	4.9–5.9	3.4–5.6	2.4–5.6	2.3–3.6

Note: Projections of change in real gross domestic product (GDP) and projections for both measures of inflation are percent changes from the fourth quarter of the previous year to the fourth quarter of the year indicated. PCE inflation and core PCE inflation are the percentage rates of change in, respectively, the price index for personal consumption expenditures (PCE) and the price index for PCE excluding food and energy. Projections for the unemployment rate are for the average civilian unemployment rate in the fourth quarter of the year indicated. Each participant's projections are based on his or her assessment of appropriate monetary policy. Longer-run projections represent each participant's assessment of the rate to which each variable would be expected to converge under appropriate monetary policy and in the absence of further shocks to the economy. The projections for the federal funds rate are the value of the midpoint of the projected appropriate target range for the federal funds rate or the projected appropriate target level for the federal funds rate at the end of the specified calendar year or over the longer run. The March projections were made in conjunction with the meeting of the Federal Open Market Committee on March 21–22, 2023. One participant did not submit longer-run projections for the change in real GDP, the unemployment rate, or the federal funds rate in conjunction with the March 21–22, 2023, meeting, and one participant did not submit such projections in conjunction with the June 13–14, 2023, meeting.

1. For each period, the median is the middle projection when the projections are arranged from lowest to highest. When the number of projections is even, the median is the average of the two middle projections. [Return to table](#)
2. The central tendency excludes the three highest and three lowest projections for each variable in each year. [Return to table](#)
3. The range for a variable in a given year includes all participants' projections, from lowest to highest, for that variable in that year. [Return to table](#)
4. Longer-run projections for core PCE inflation are not collected. [Return to table](#)

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