



HAWAII INFORMATION SERVICE

Hawaii's Economy meets COVID-19

*Presentation prepared for
Hawaii Information Service*

*on behalf of the
Hawai'i Island REALTORS®
West Hawaii Association of REALTORS®
Kauai Board of REALTORS®*

*by Paul H. Brewbaker, Ph.D., CBE
TZ Economics, Kailua, Hawaii
April 9, 2020*

TZ E C O N O M I C S

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Paul H. Brewbaker, Ph.D., CBE



The Way We Were: overview of local housing markets one month ago

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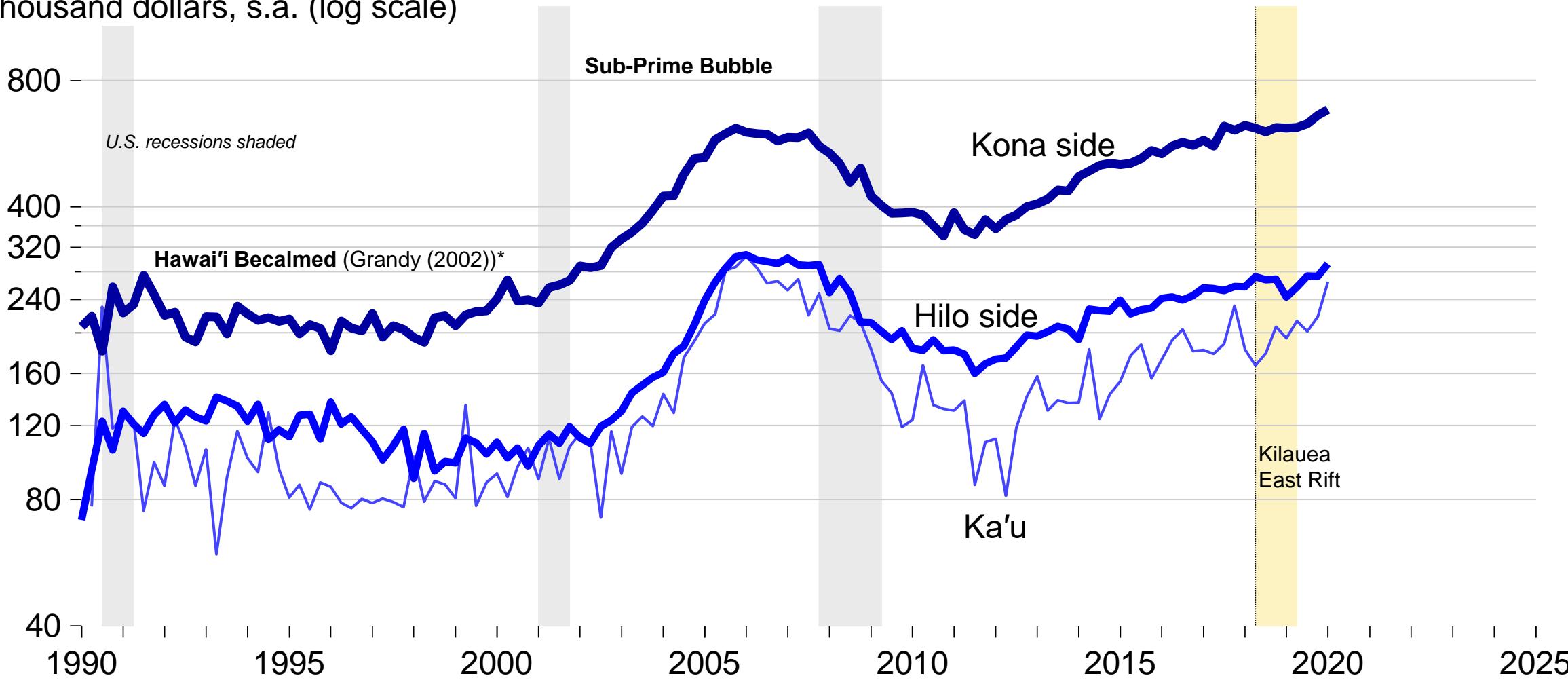


This section: calm before the storm

- Use single-family home prices as regional market barometer (sorry, condos)
- Distinguish four “islands:” Kauai, Hilo Side, Kona Side, and People’s Republic of K’au
- No offense K’au: “Onan Masuokoa Line of Demarcation” maxes signal-to-noise ratio; consider this—I do the same amount of work for you guys as the other three “islands”
(Segregating Big Isle TMKs 1-4, 5-8, and 9 cleans signal from the “data-generating process”)
- Variety of distinctions in the 2019 data:
 1. Hilo side of Big Island has lowest median prices, bested only by Ka’u
 2. Kauai is like Hilo in terms of sales; Kauai is like Kona in terms of median prices
 3. Underlying economic fundamentals in data solid up to (and through?) March 2020
 4. Housing was momentum play vulnerable to incipient recession or Black Swans

Big Island median single-family existing home prices had been reaccelerating prior to the coronavirus event—fundamentally solid

Thousands dollars, s.a. (log scale)



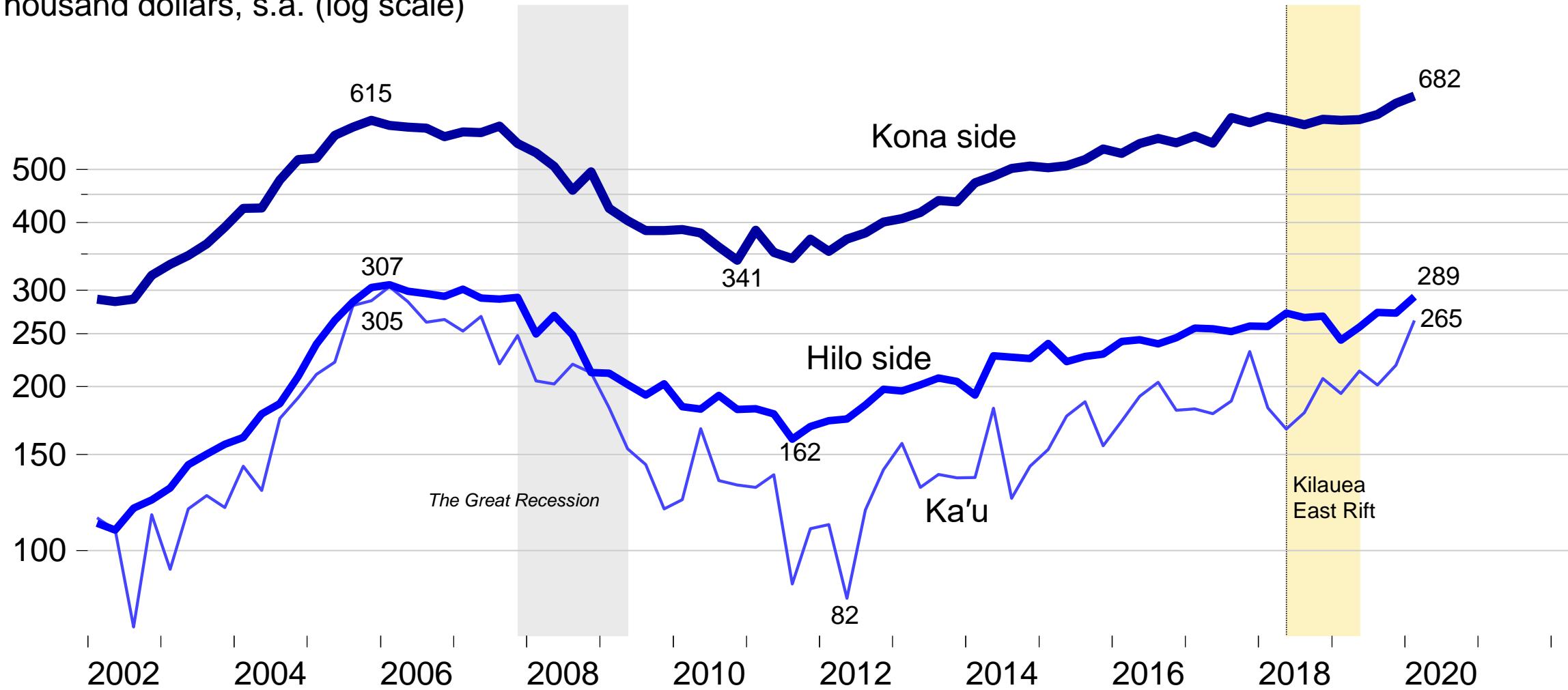
*Christopher Grandy (2002), *Hawai'i Beccalmed: Economic Lessons of the 1990s*, University of Hawaii Press

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Source: Hawaii Information Service, special tabulation; calculation of seasonally-adjusted quarterly moments by TZE, quarterly data through March 2020.

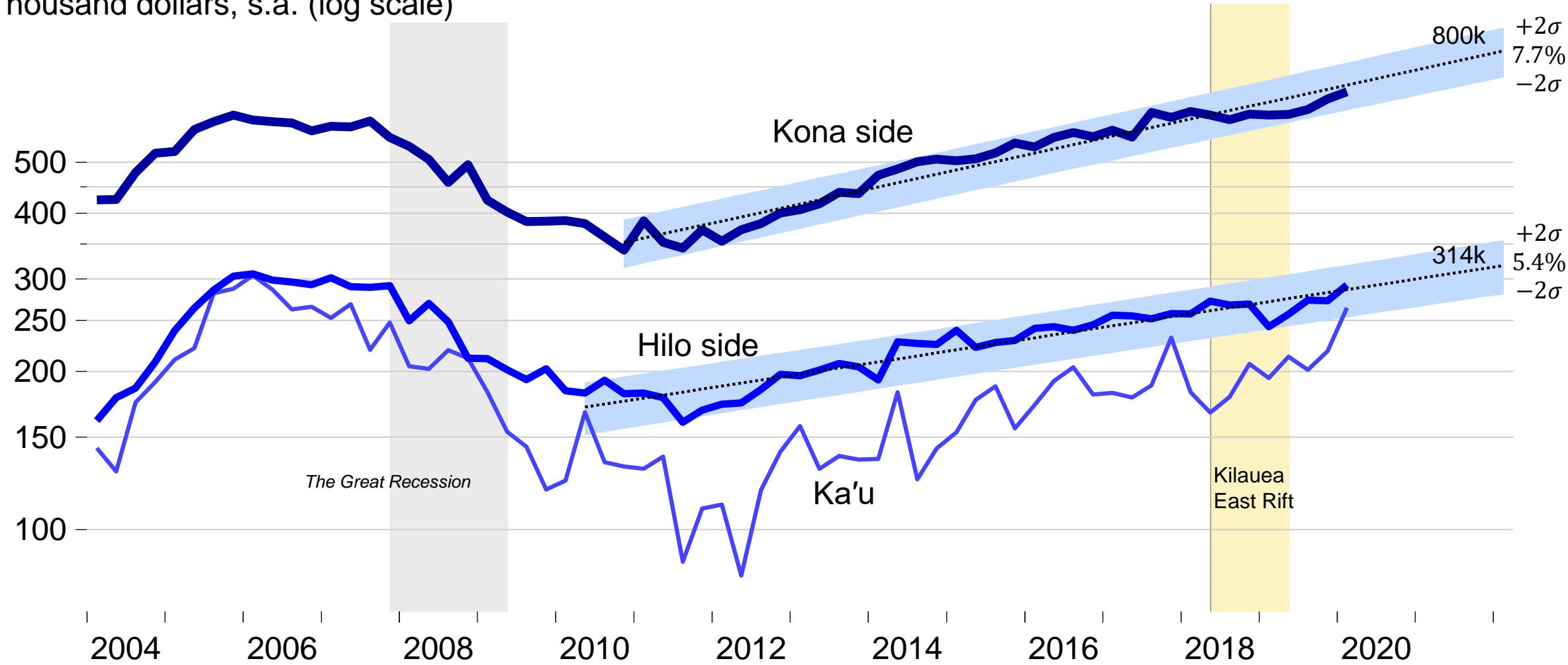
Big Island median single-family existing home prices had been reaccelerating prior to the coronavirus event—fundamentals OK

Thousand dollars, s.a. (log scale)



As with stock market valuations, after coronavirus herd immunity or vaccination, will Big Island housing valuations revert to prior trends?

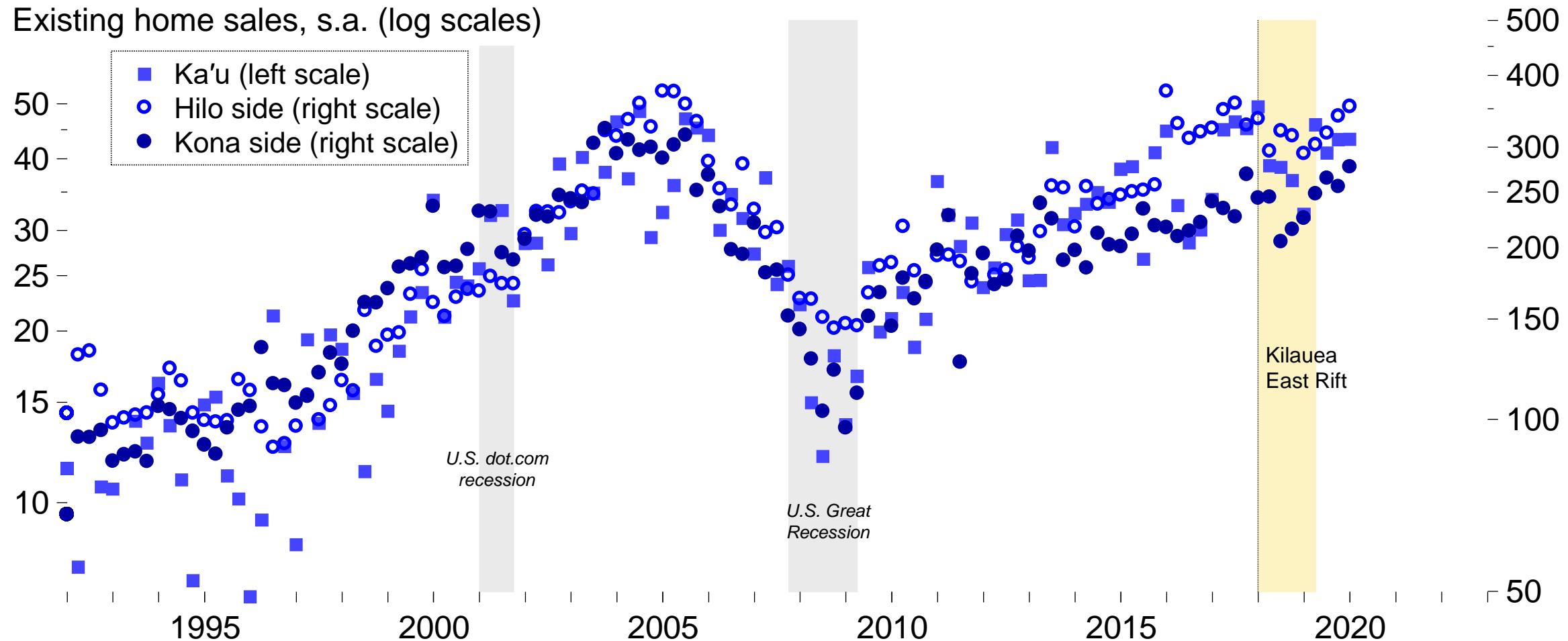
Thousand dollars, s.a. (log scale)



Source: Hawaii Information Service, special tabulation; calculation of seasonally-adjusted quarterly moments, trend regressions by TZE, quarterly data through March 2020.

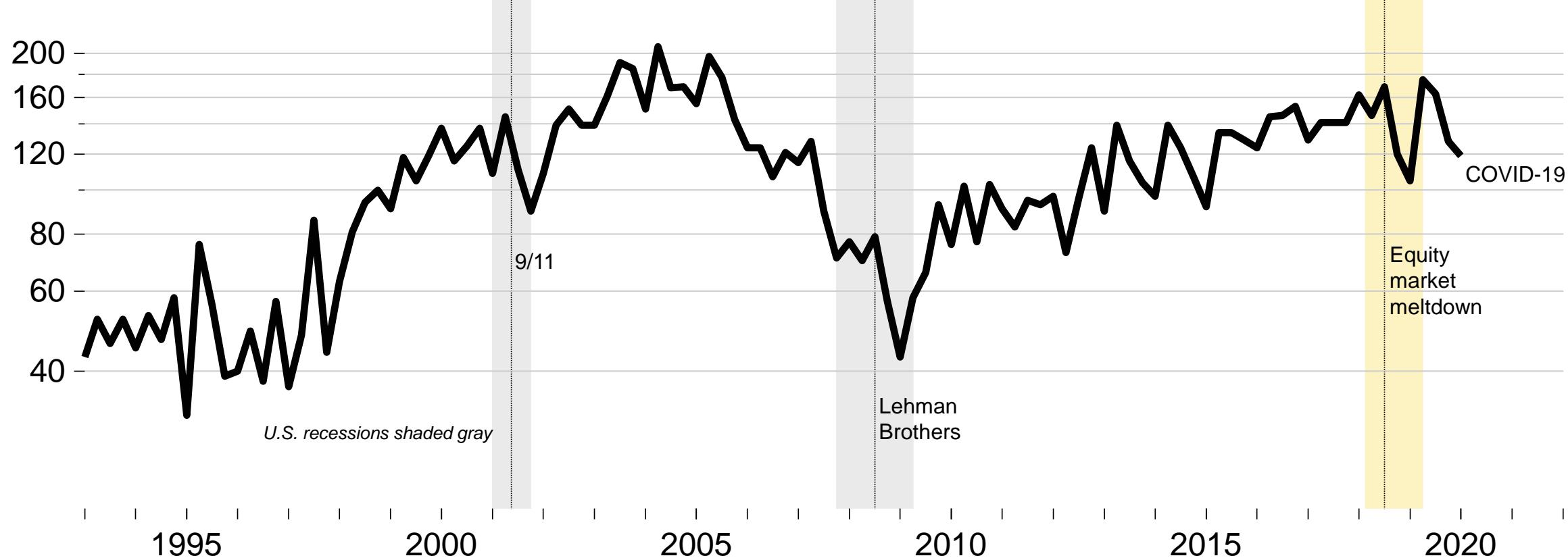
Recessions don't uniquely determine Big Island home sales trends but expect a sharp break this quarter, at least, before resuming growth

Existing home sales, s.a. (log scales)

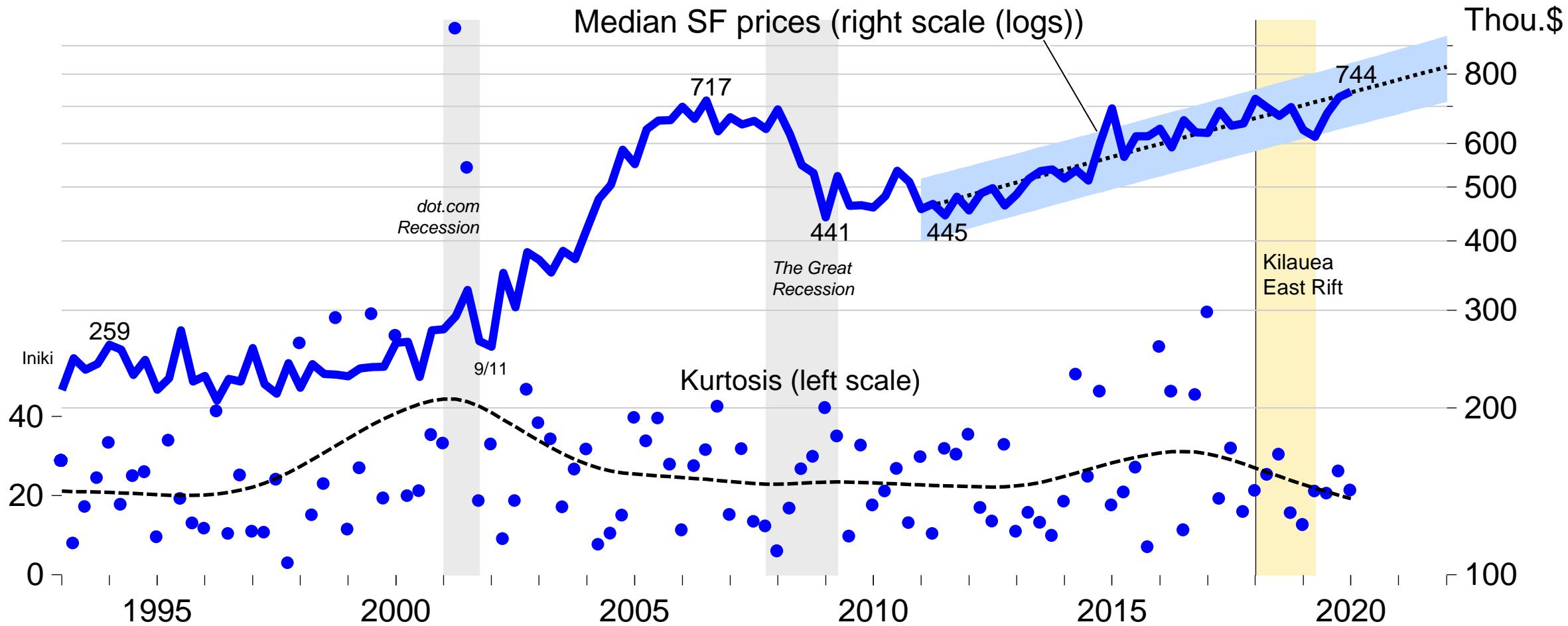


Kauai single-family existing home sales volumes exhibit a similar restoration of longer term growth after the bubble: note shocks

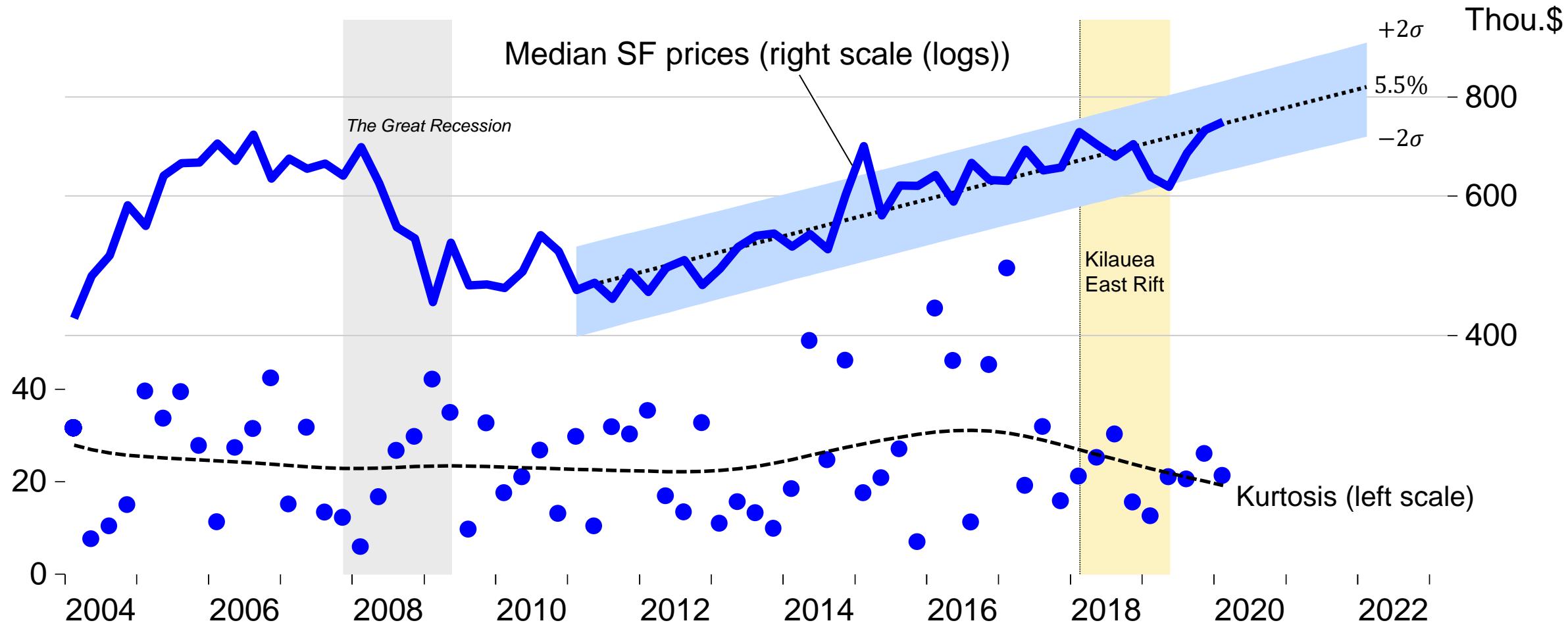
Quarterly closings, s.a. (log scale)



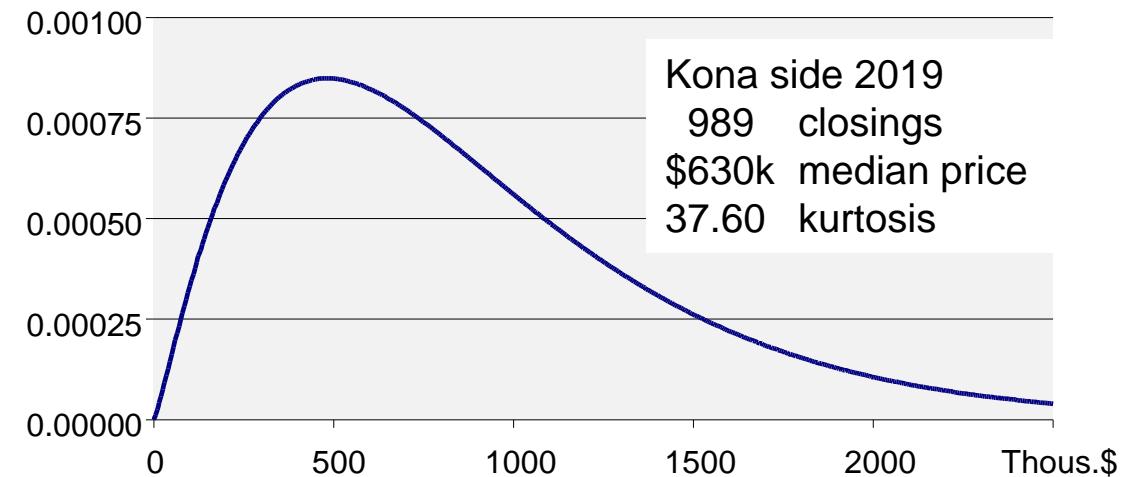
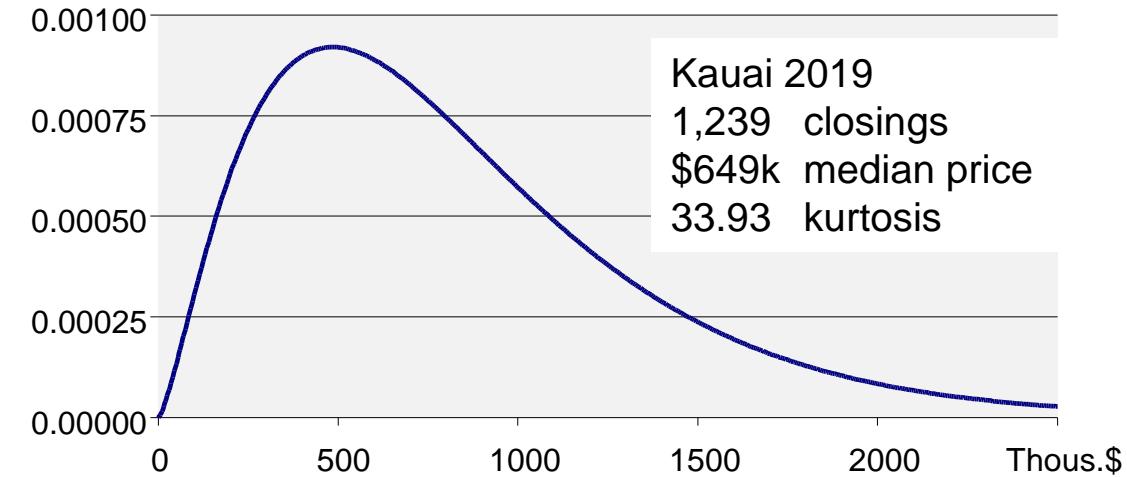
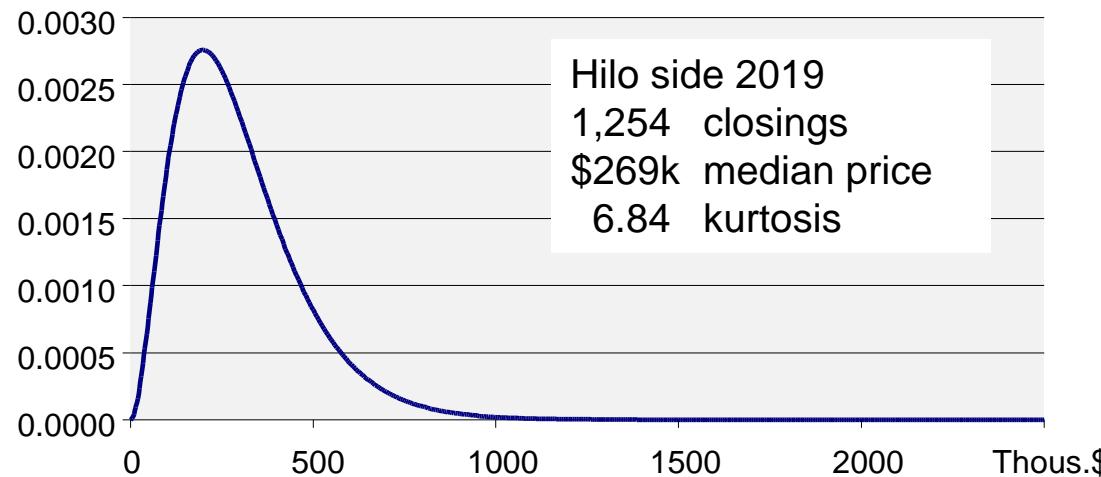
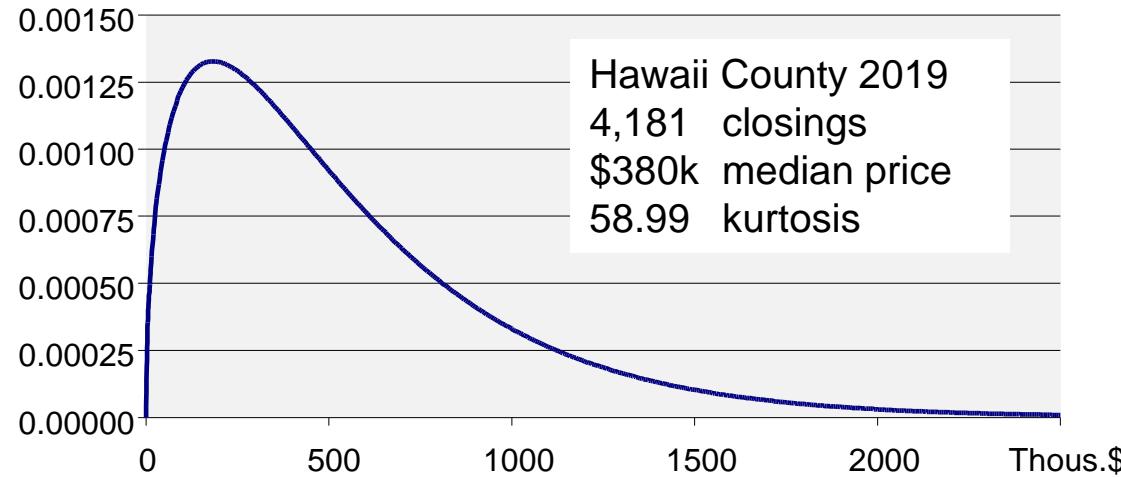
Kauai single-family existing home sales prices exhibit another investor-driven characteristic: surging prices in “tail” of distribution



As with Big Island housing valuations, Kauai single-family median existing home prices had been on a stable trajectory through 2020Q1



Empirical gamma distribution estimates, *all* closing prices (less 5 Kona)* show distinctions: Hilo most affordable; Kauai like Hilo sales, Kona prices



Source: Hawaii Information Service, special tabulation; calculation moments, empirical gamma distribution approximations calculated by TZE

*Excludes five transaction values in Kona ranging from \$12.7 million through \$25.0 million

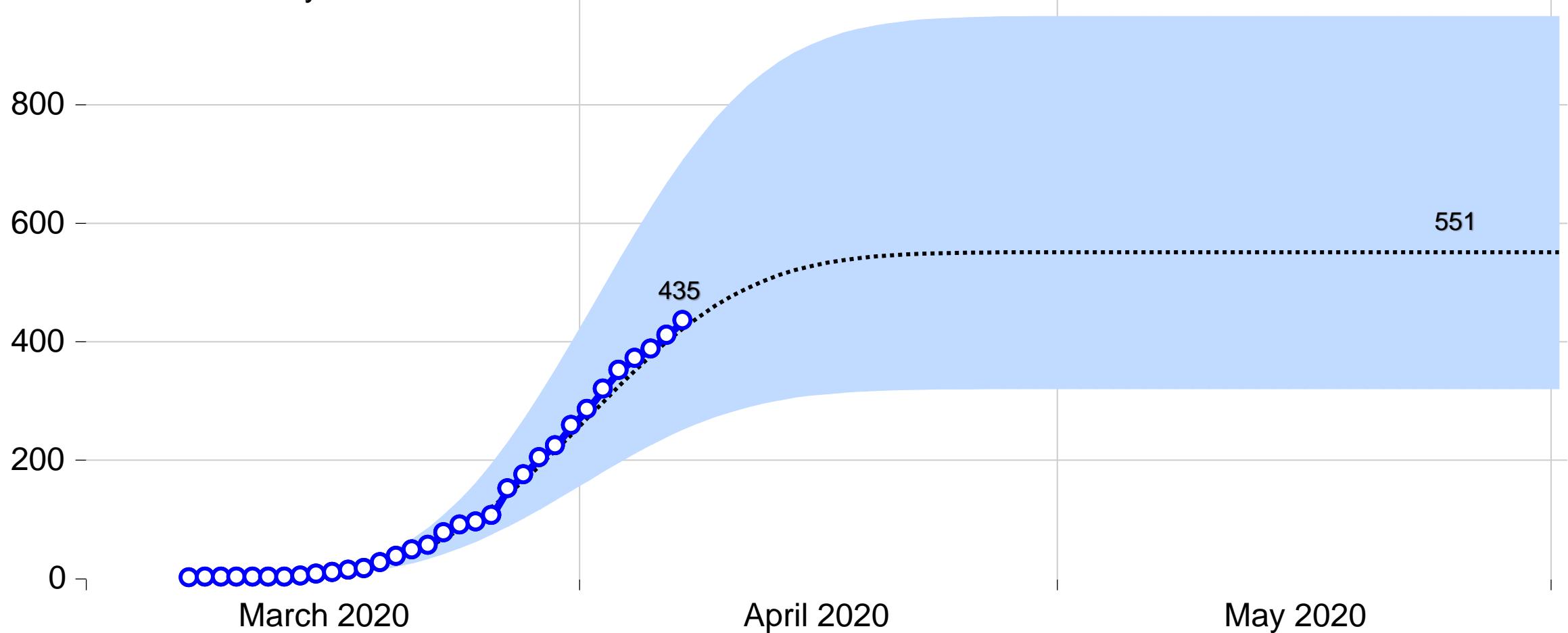


Murphy's Law meets a novel coronavirus and produces COVID-19

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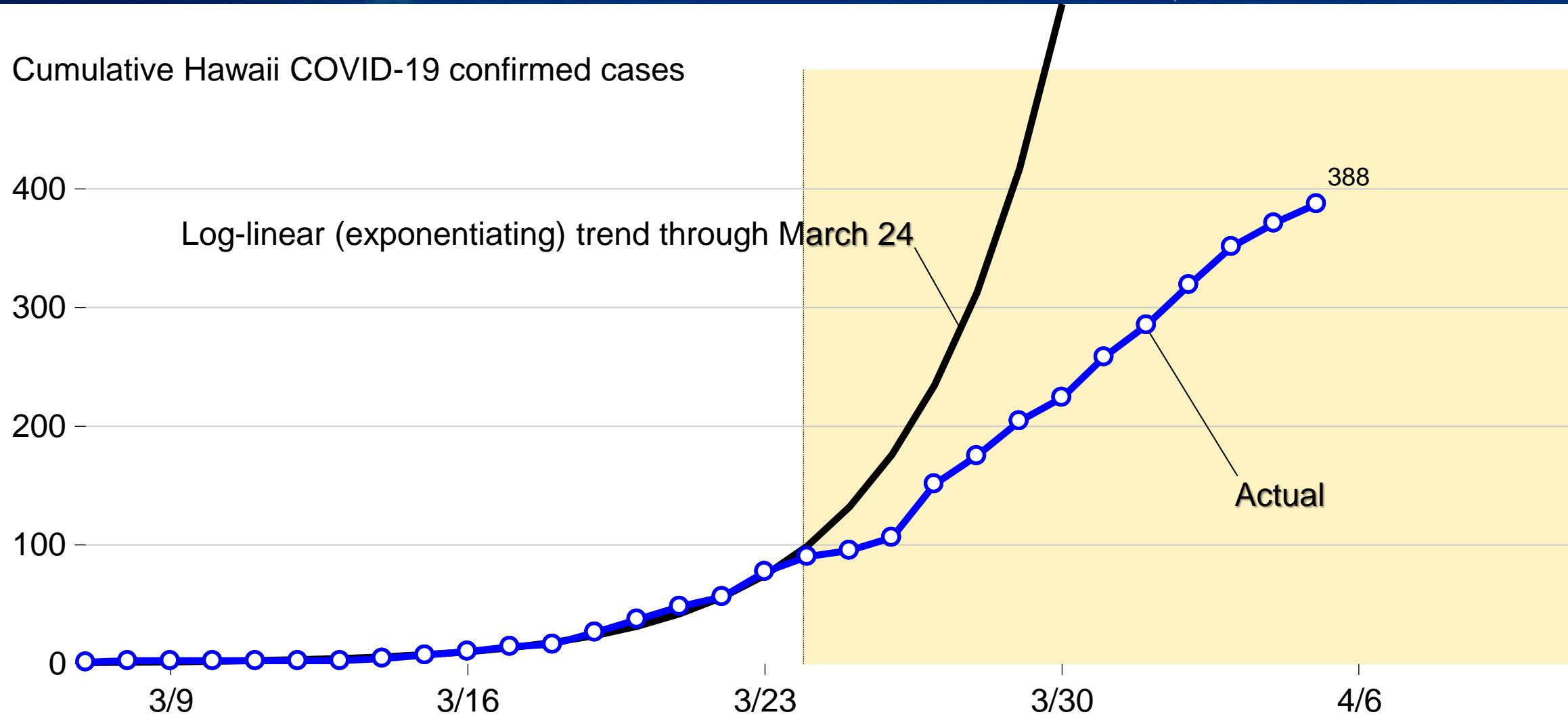
Assuming all existing mitigation (social distancing, shelter-in-place) continues, Hawaii's path should stabilize this month: what are odds?

Hawaii cumulative daily COVID-19 cases



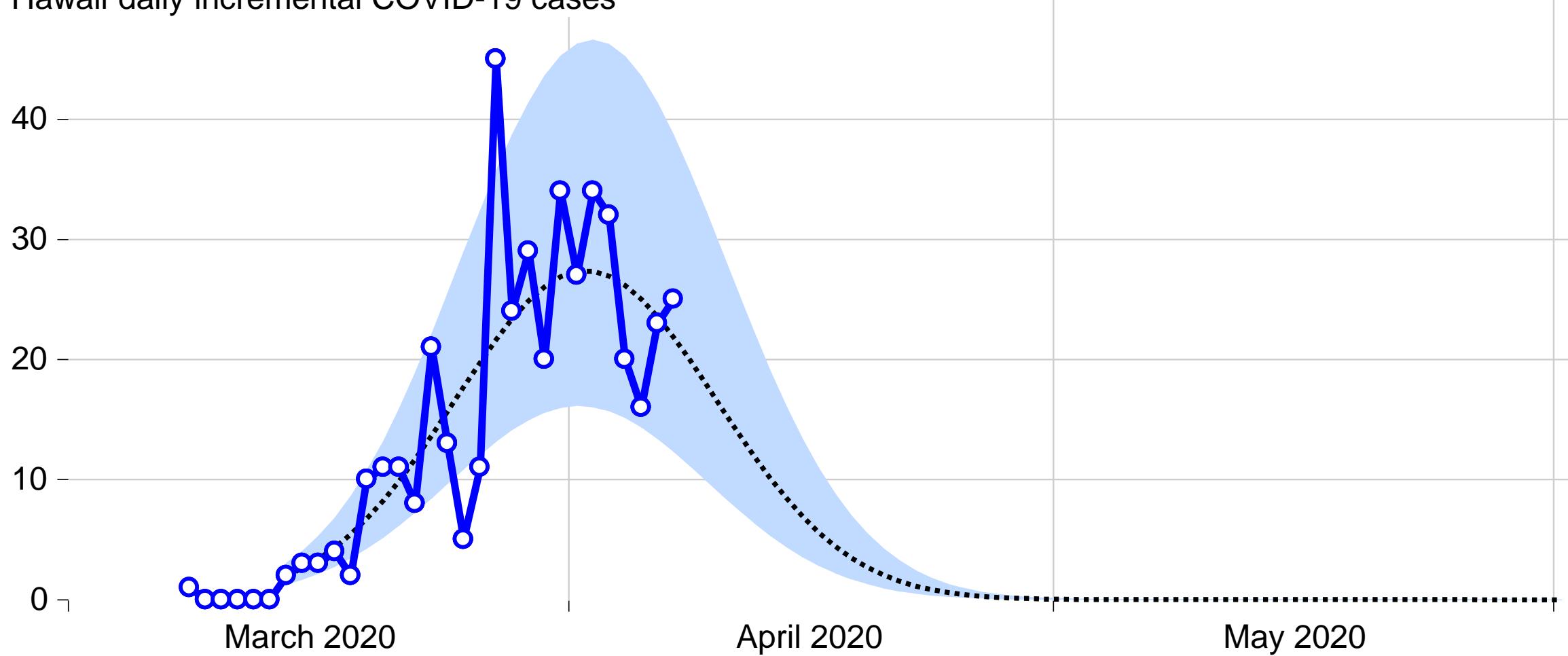
On Monday, it had been two weeks since Hawaii broke exponential growth of COVID-19 cases, doubling down on social distancing

Cumulative Hawaii COVID-19 confirmed cases



Daily Hawaii confirmed COVID-19 cases; one model of “the curve”: if social distancing succeeds in mitigation, what comes next?

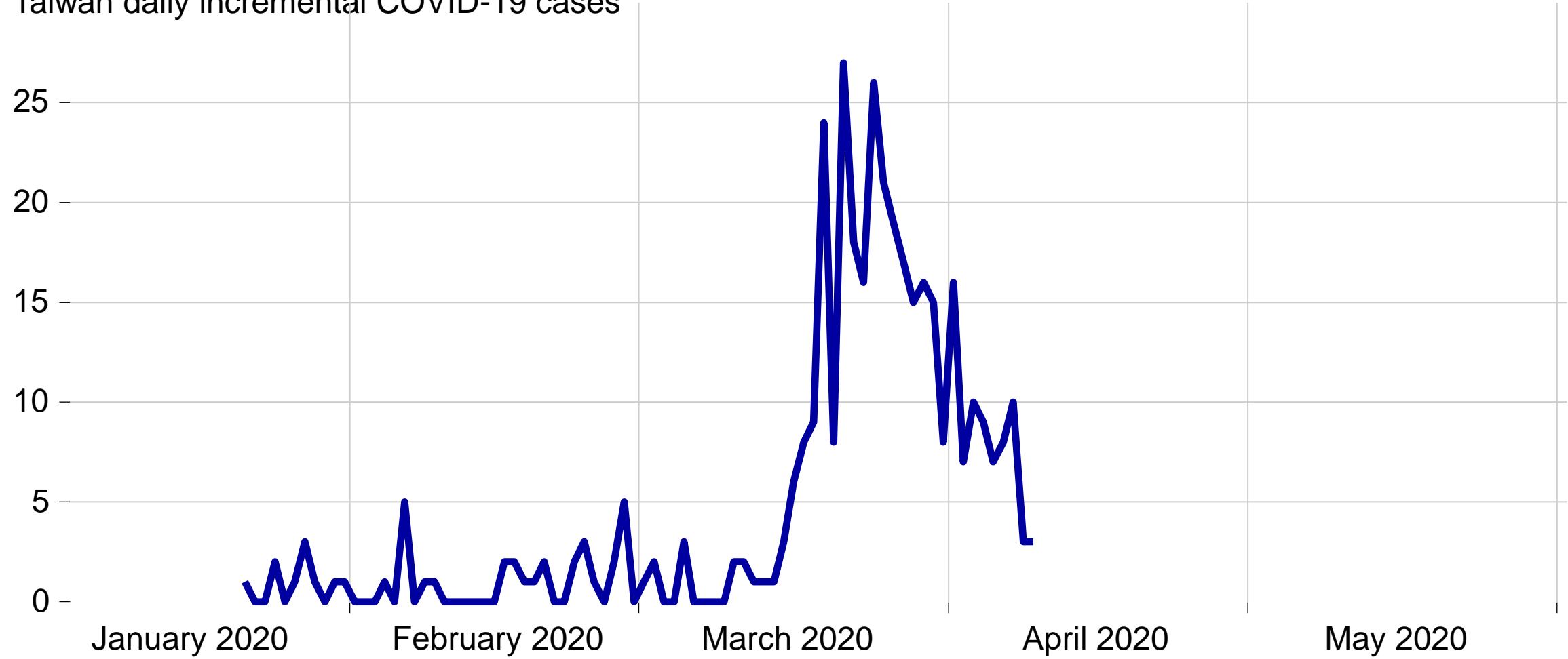
Hawaii daily incremental COVID-19 cases



Source: Hawaii Department of Health (<https://health.hawaii.gov/coronavirusdisease2019/>); actual and second-order polynomial GARCH estimates of the natural logarithm of Hawaii daily confirmed COVID-19 cases and two standard-error bandwidth through noon, April 8, 2020.

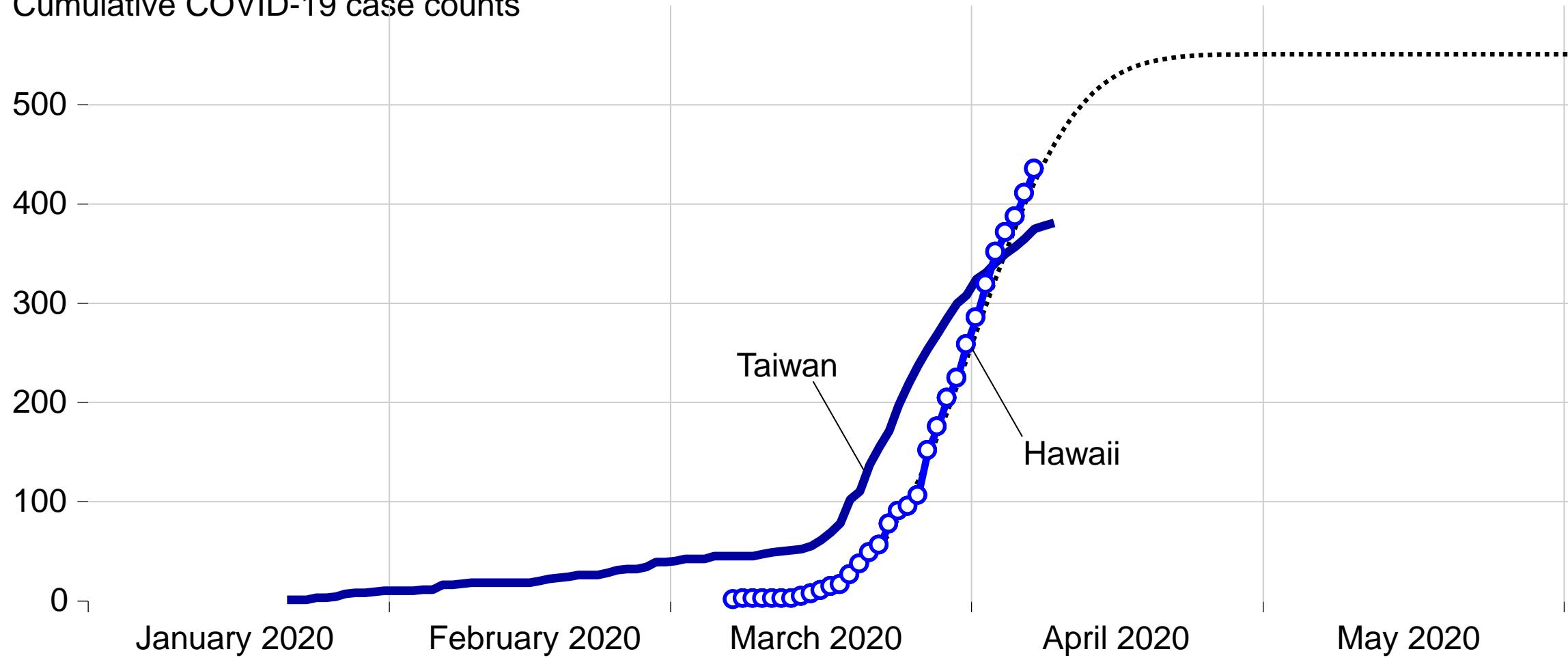
Challenge of successful containment: one crack in the edifice and you're on to mitigation; Taiwan daily COVID-19 cases

Taiwan daily incremental COVID-19 cases



Taiwan with 24 million persons beats Hawaii with 1.4 million persons in cumulative COVID-19 case count—learn from *Crazy Rich Asians*

Cumulative COVID-19 case counts

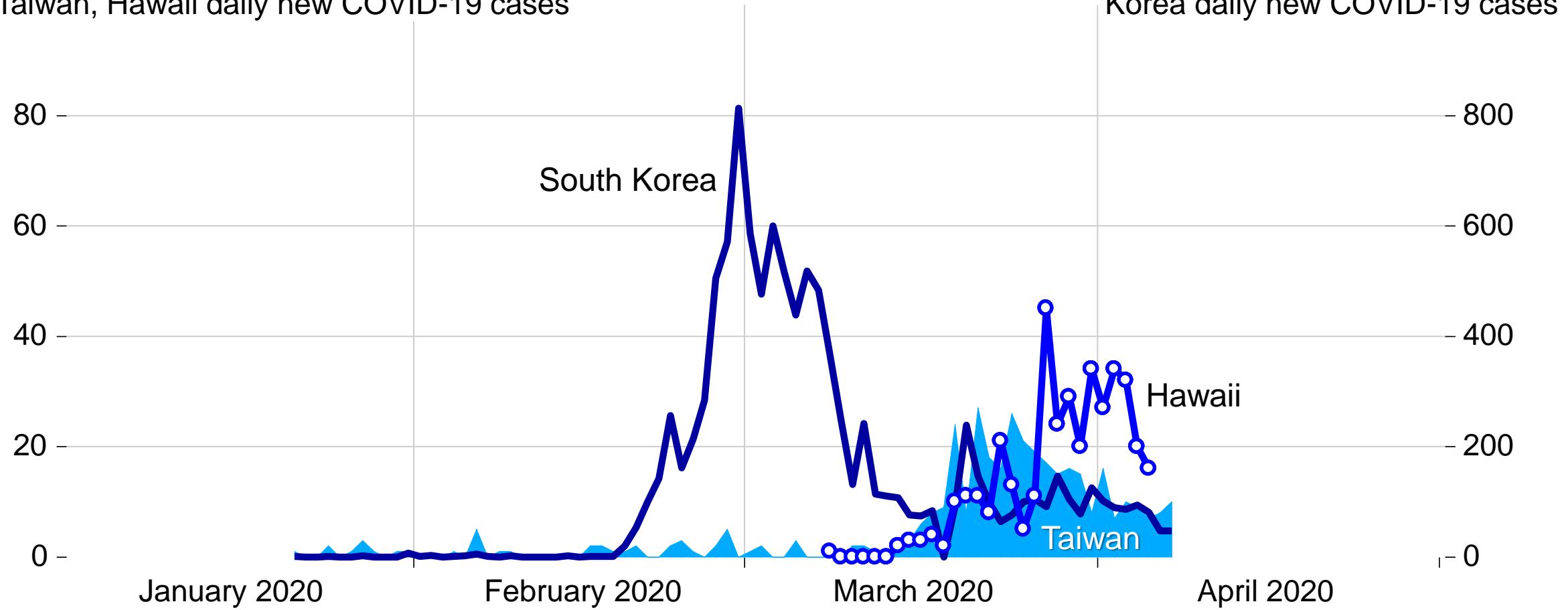




Both Korea and Taiwan managed containment for one month before shifting to mitigation as COVID-19 cases came from abroad

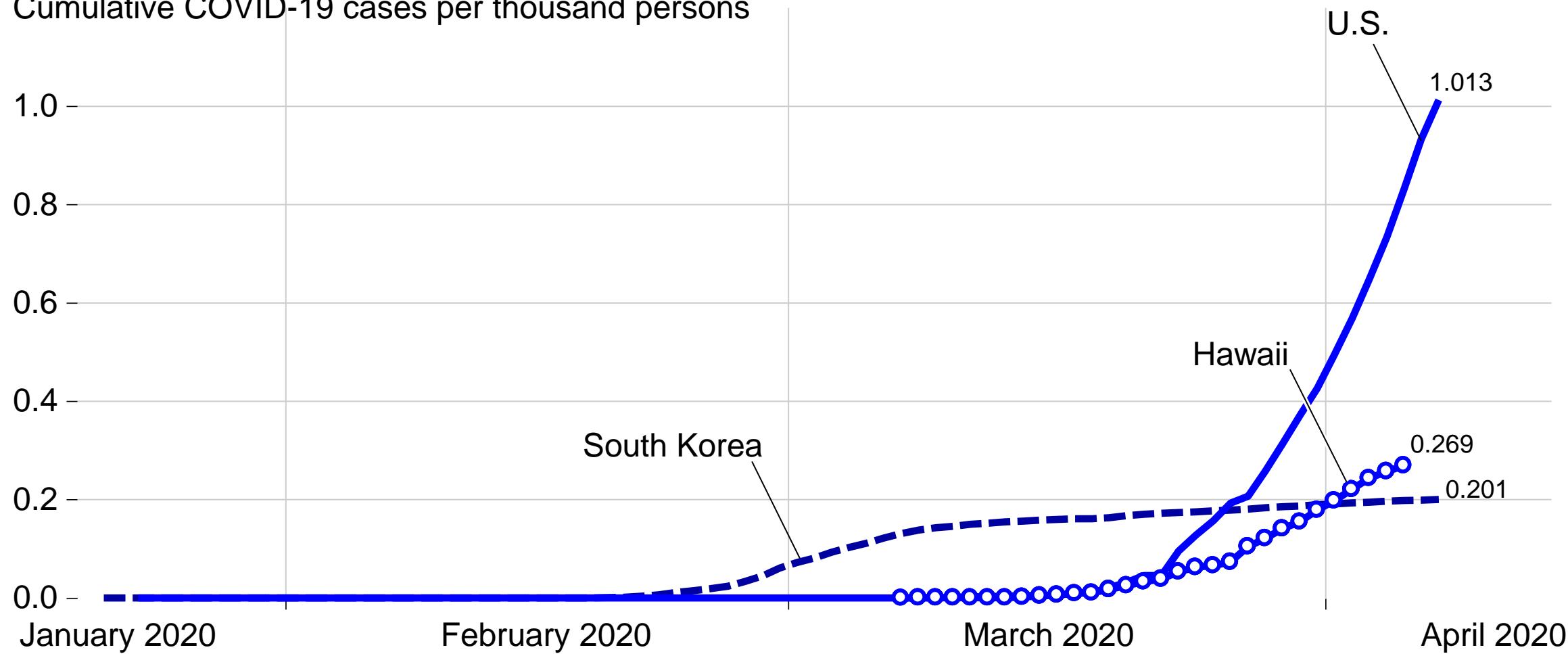
Taiwan, Hawaii daily new COVID-19 cases

Korea daily new COVID-19 cases

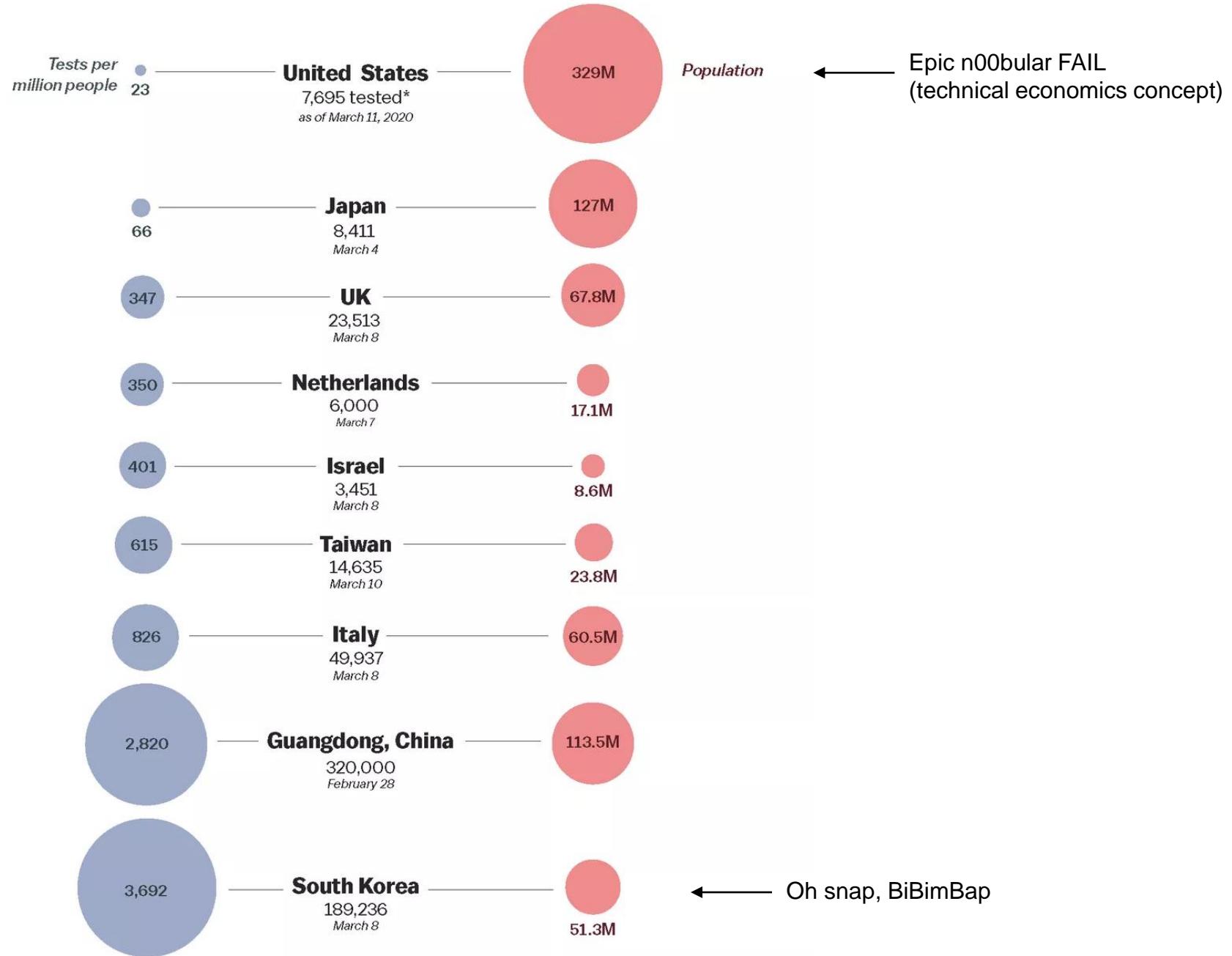


By successfully mitigating coronavirus spread through aggressive testing, tracking, tracing, South Korea continues to manage

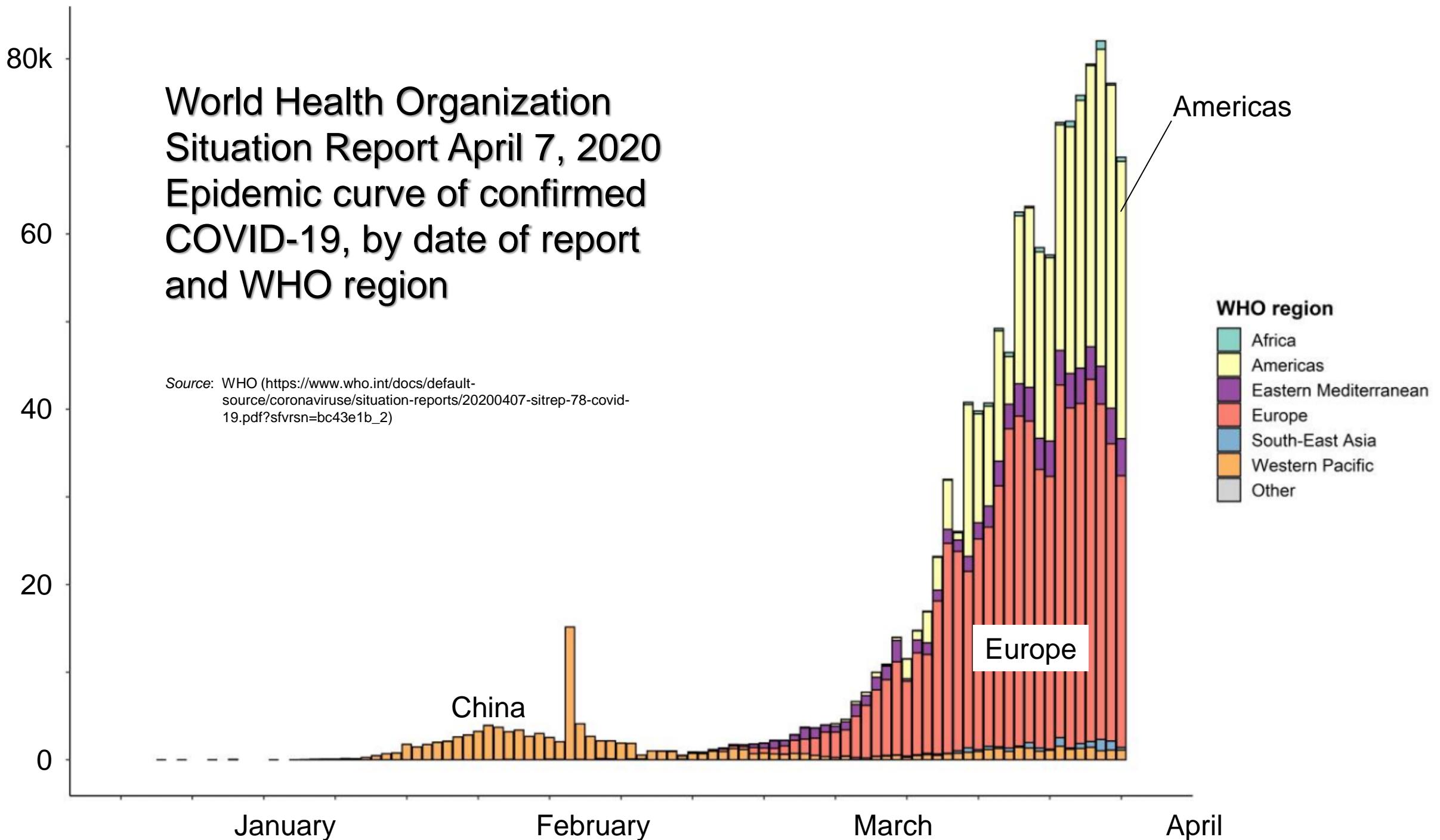
Cumulative COVID-19 cases per thousand persons



A snapshot of early Covid-19 testing per million persons (as of March 11, 2020)

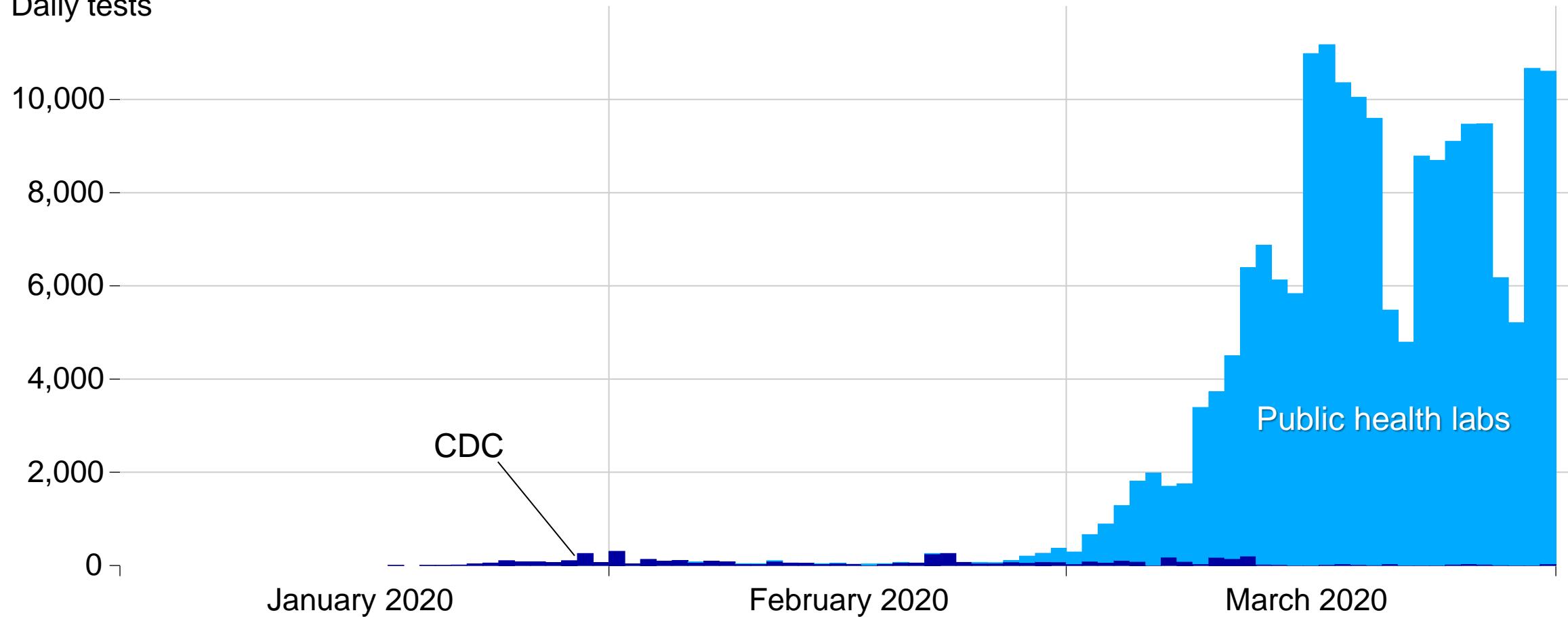


Source: Covid Tracking Project, *Business Insider*, *The Atlantic*, Taiwan CDC (<https://www.vox.com/policy-and-politics/2020/3/13/21178289/confirmed-coronavirus-cases-us-countries-italy-iran-singapore-hong-kong>)



Daily specimens tested for SARS CoV-2 by CDC labs ($n = 4,255$), and by U.S. public health laboratories ($n = 218,538$)[†]

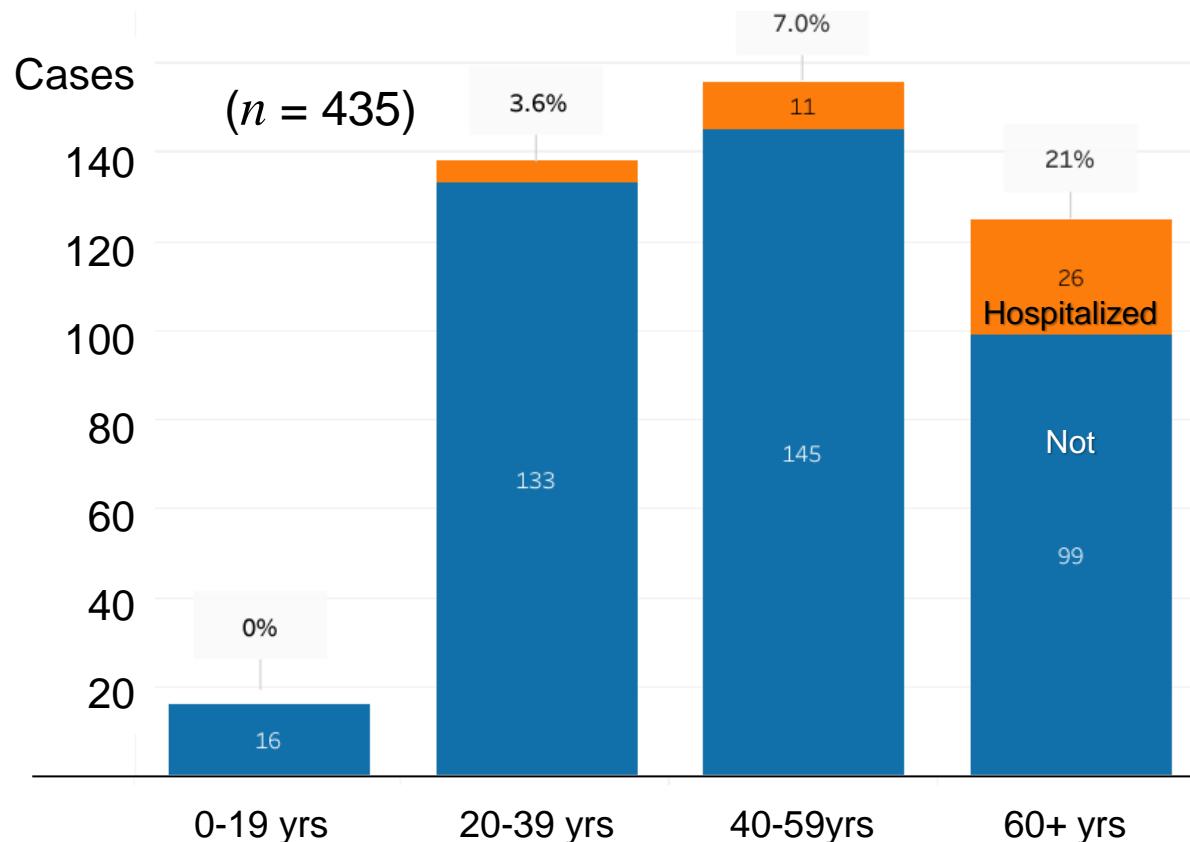
Daily tests



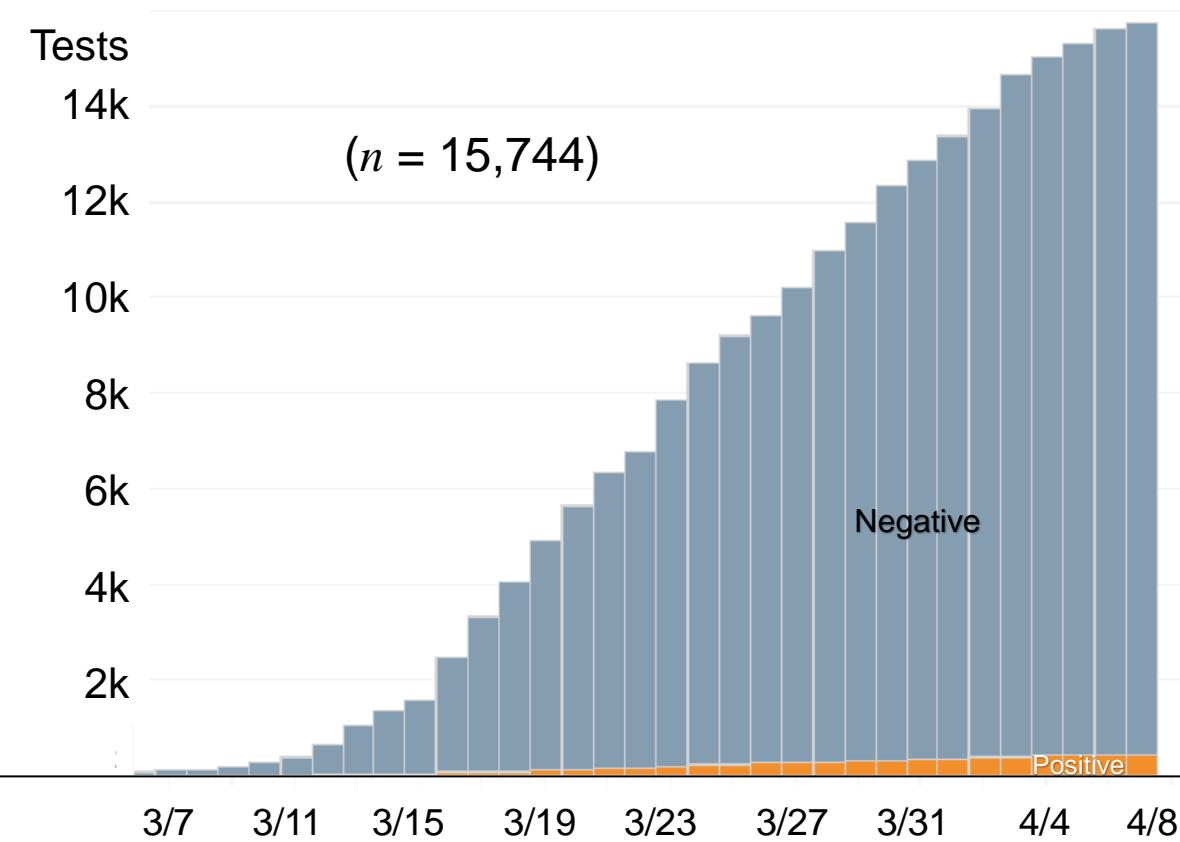
[†]Non-respiratory specimens were excluded. For state public health labs, the date represents the date of sample collection, if available, or the date tested. For CDC labs, the date represents the date specimen was received at CDC. Results reported as of 4:00 pm ET on April 6 were included less seven days because of the lag in time between when specimens are accessioned, testing is performed, and results are report. All data are preliminary and may change as more reports are received.

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On April 8 (noon), of confirmed Hawaii COVID-19 cases, “80% were residents returning from other areas;” known once testing ramped up



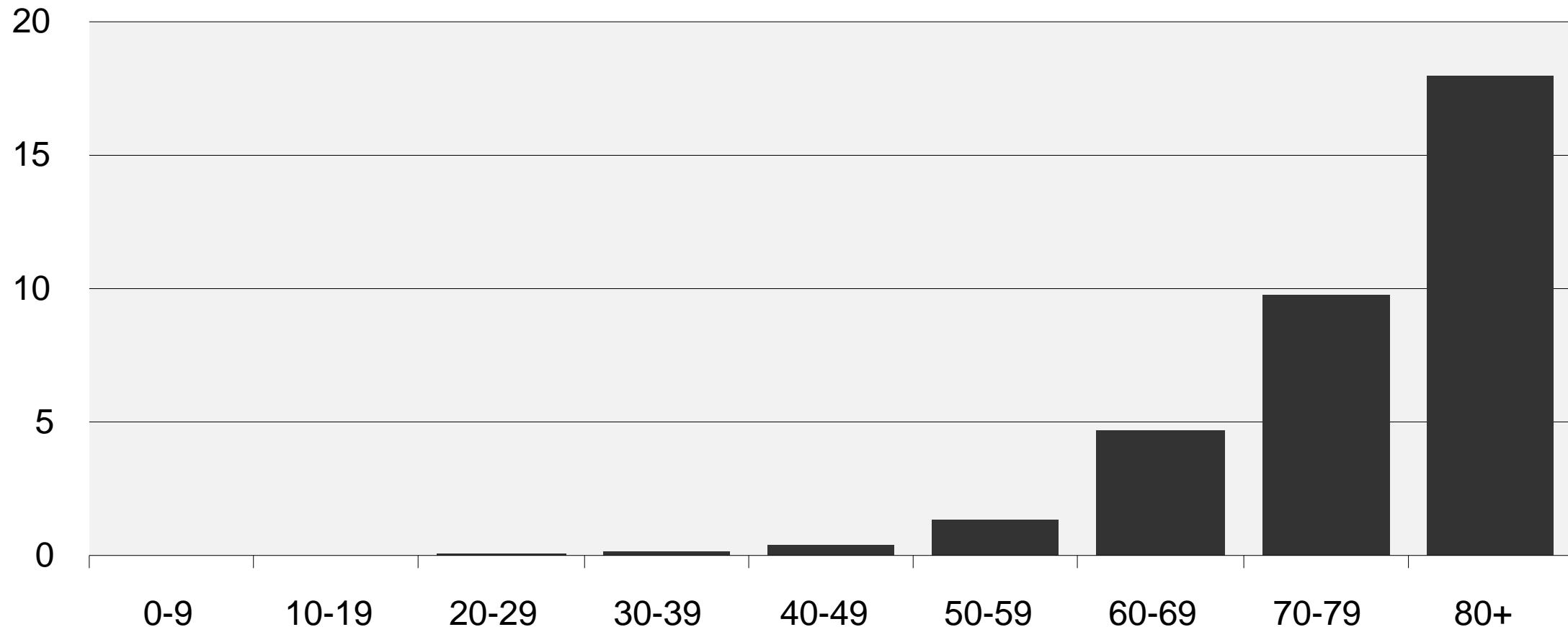
Confirmed cases of COVID-19 by age group and hospitalization status, Hawaii 2020



Cumulative number of persons with reported COVID-19 laboratory tests, Hawaii 2020

Adjusted age-specific case fatality ratio during COVID-19 epidemic Hubei, China, January and February 2020 (pre-publication data)

Percent of each age cohort

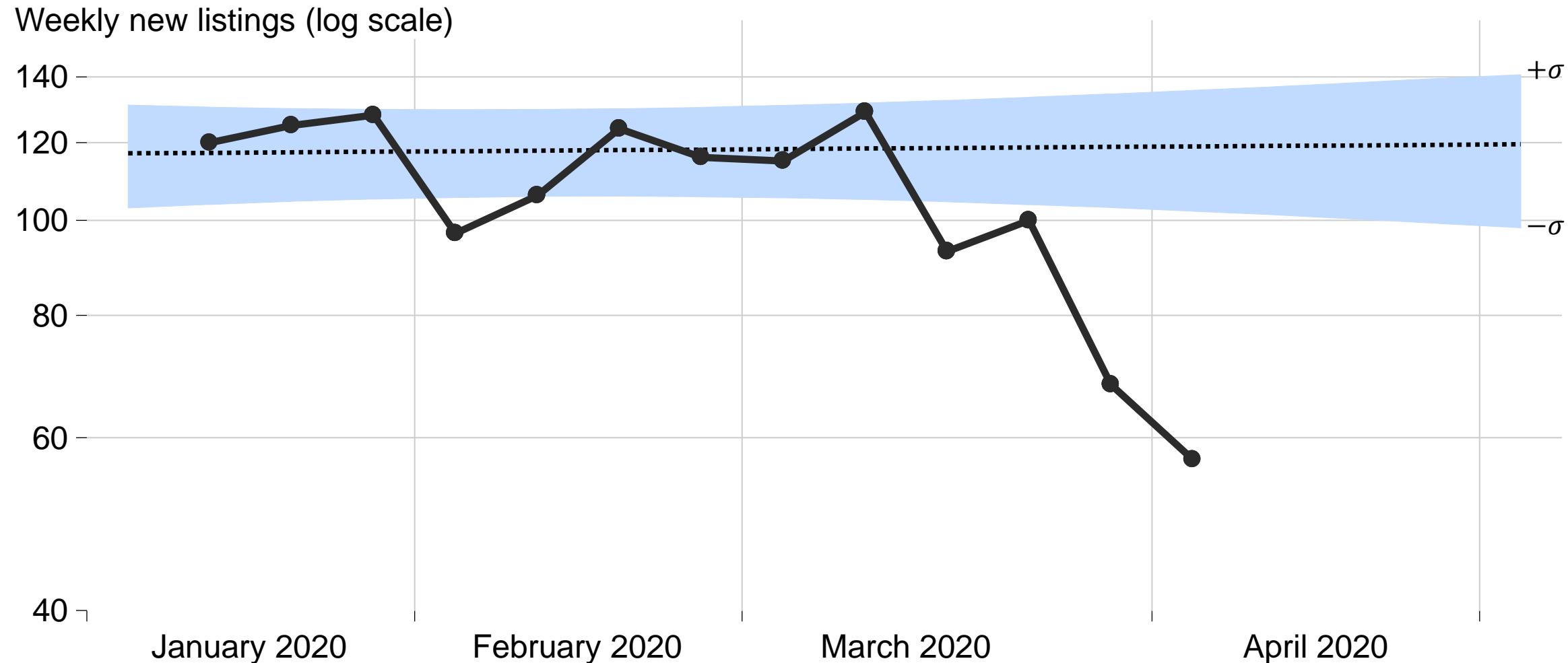




Some current economic impacts of the COVID-19 pandemic

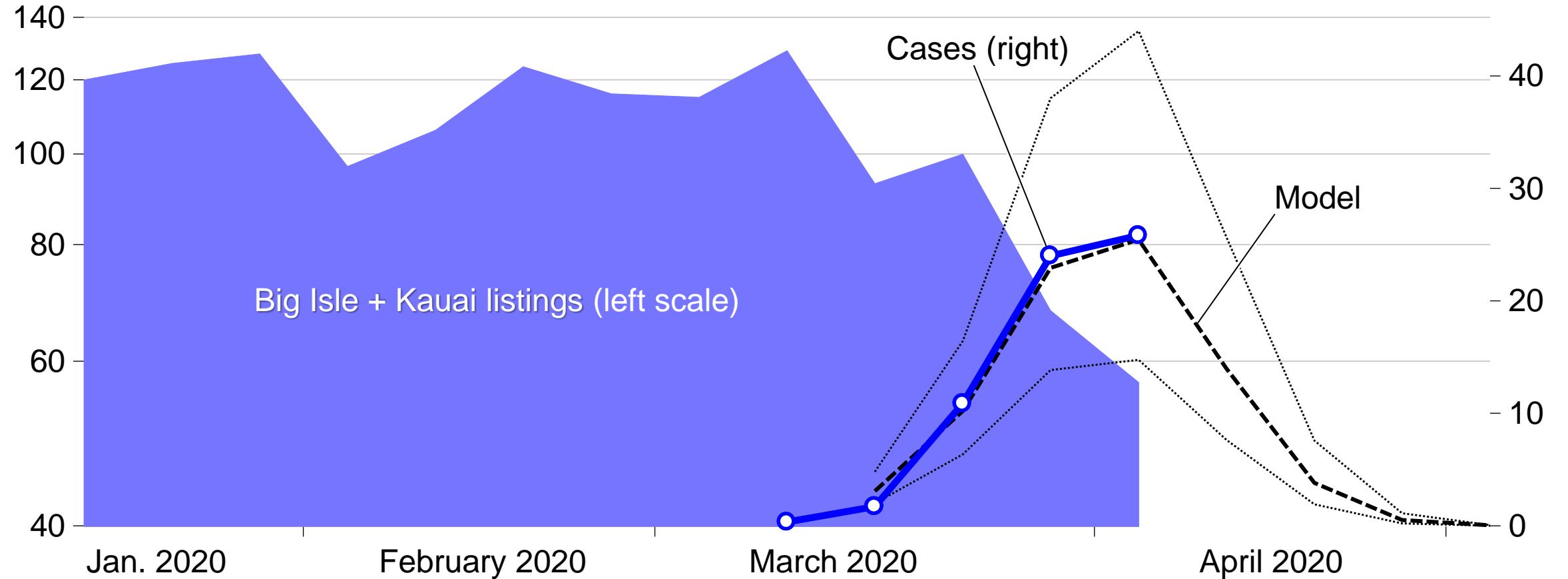
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Weekly new residential listings, Hawaii Island and Kauai combined: everything was good to go until one month ago, then Sudden Stop



Relationship between Big Island + Kauai listings and Hawaii COVID-19 cases: if we bend the curve do listings revive (low interest rates)?

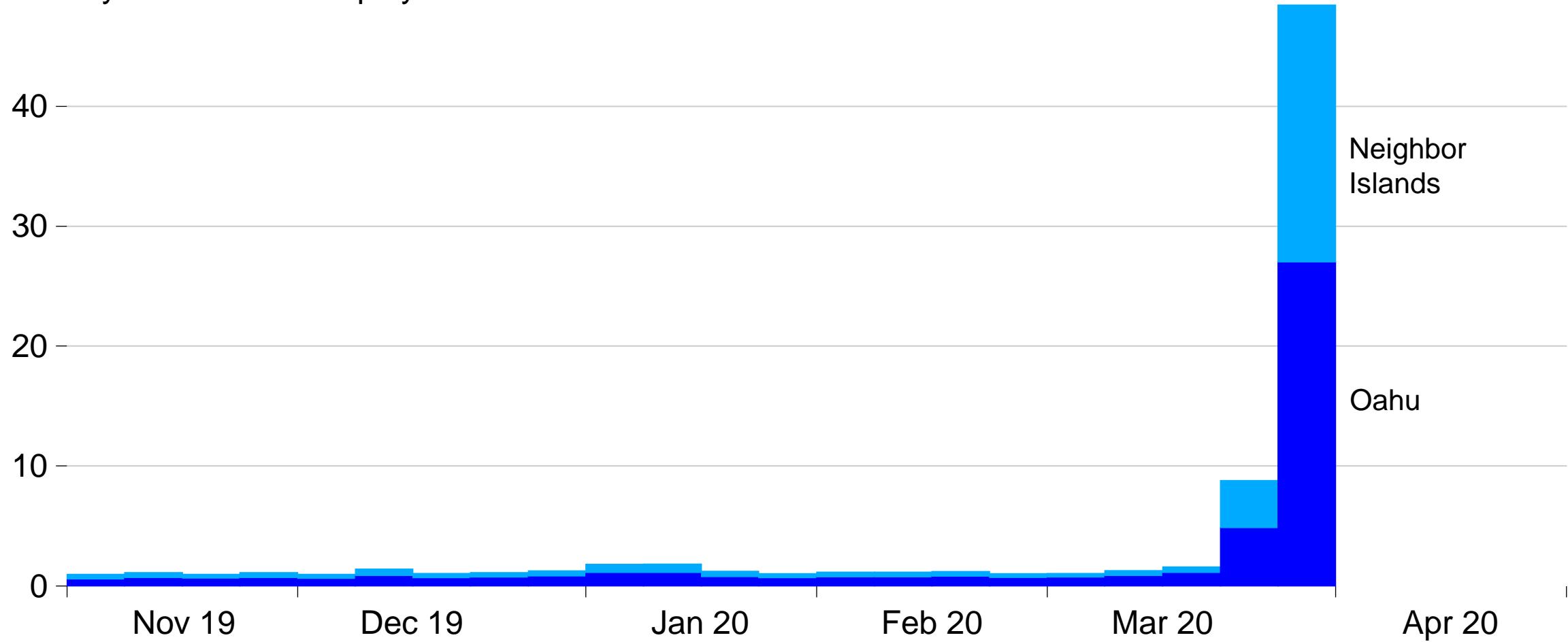
Listings, weekly (log scale)



Source: Hawaii Information Service (special tabulation; weeks ending Sunday); Hawaii Department of Health (<https://health.hawaii.gov/coronavirusdisease2019/>); weekly aggregations of actual and second-order polynomial estimates of the natural logarithm of Hawaii daily confirmed COVID-19 cases and two standard-error bandwidth through noon, April 6, 2020.

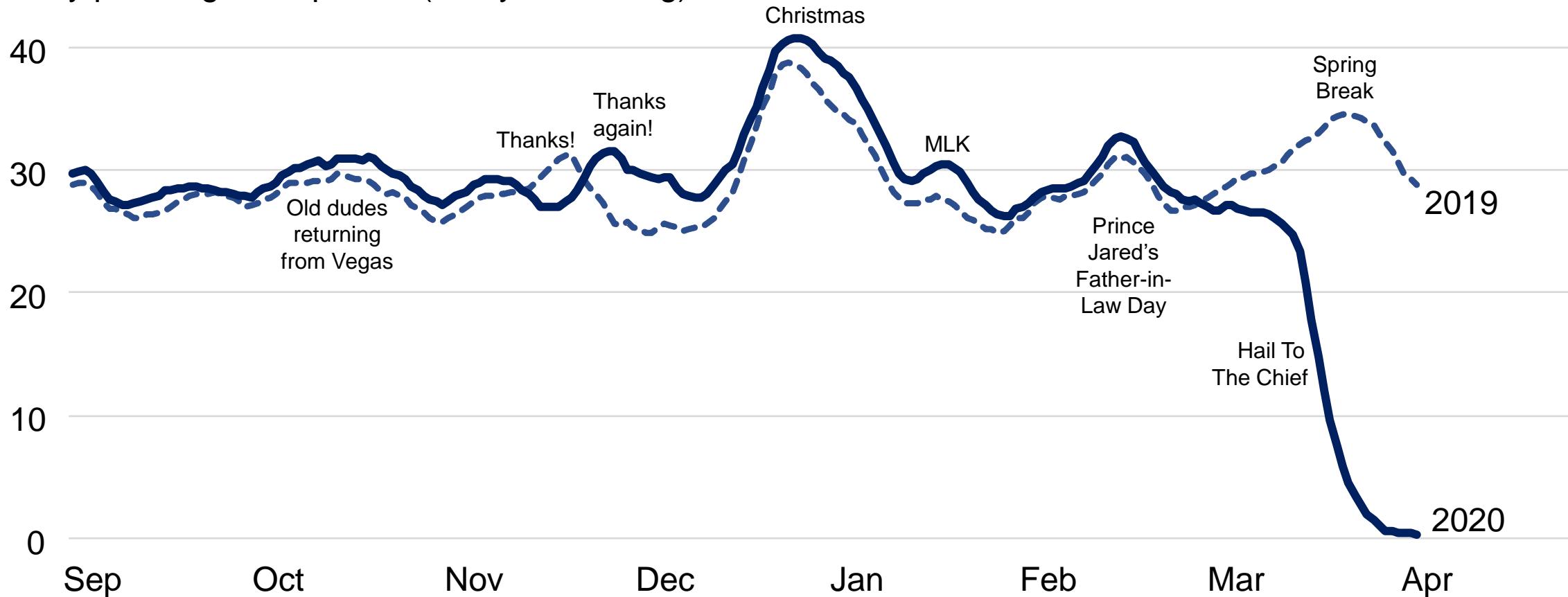
What's known as Sudden Stop: with COVID-19 Hawaii weekly claims for unemployment insurance jumped as shelter-in-place took hold

Weekly claims for unemployment insurance



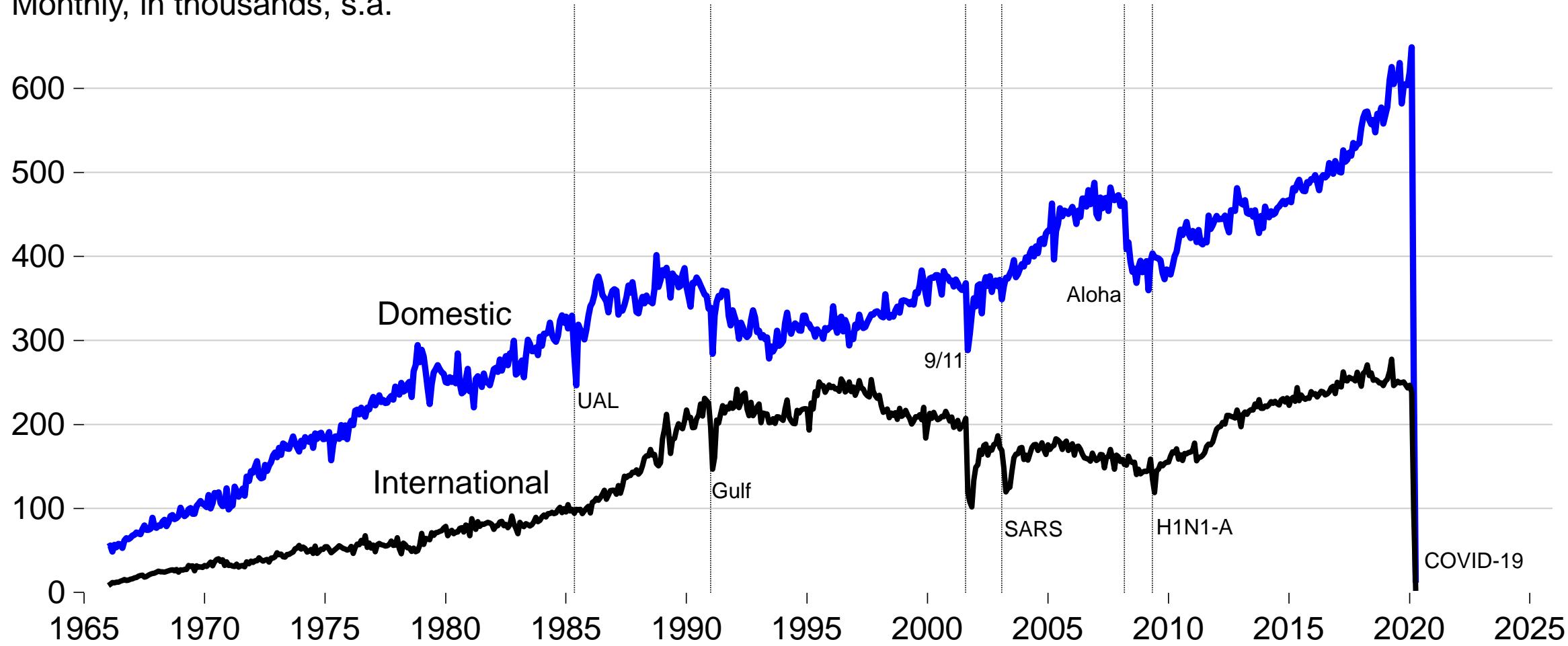
Out of the Blue, Into the Black: now you know what Neal Young meant; Hawaii daily passenger arrivals (smoothed) through April 6, 2020

Daily passengers deplaned (7-day smoothing)



Visitor arrivals estimates from daily passengers through April 7, 2020: when people say “like nothing that has ever happened” they mean it

Monthly, in thousands, s.a.

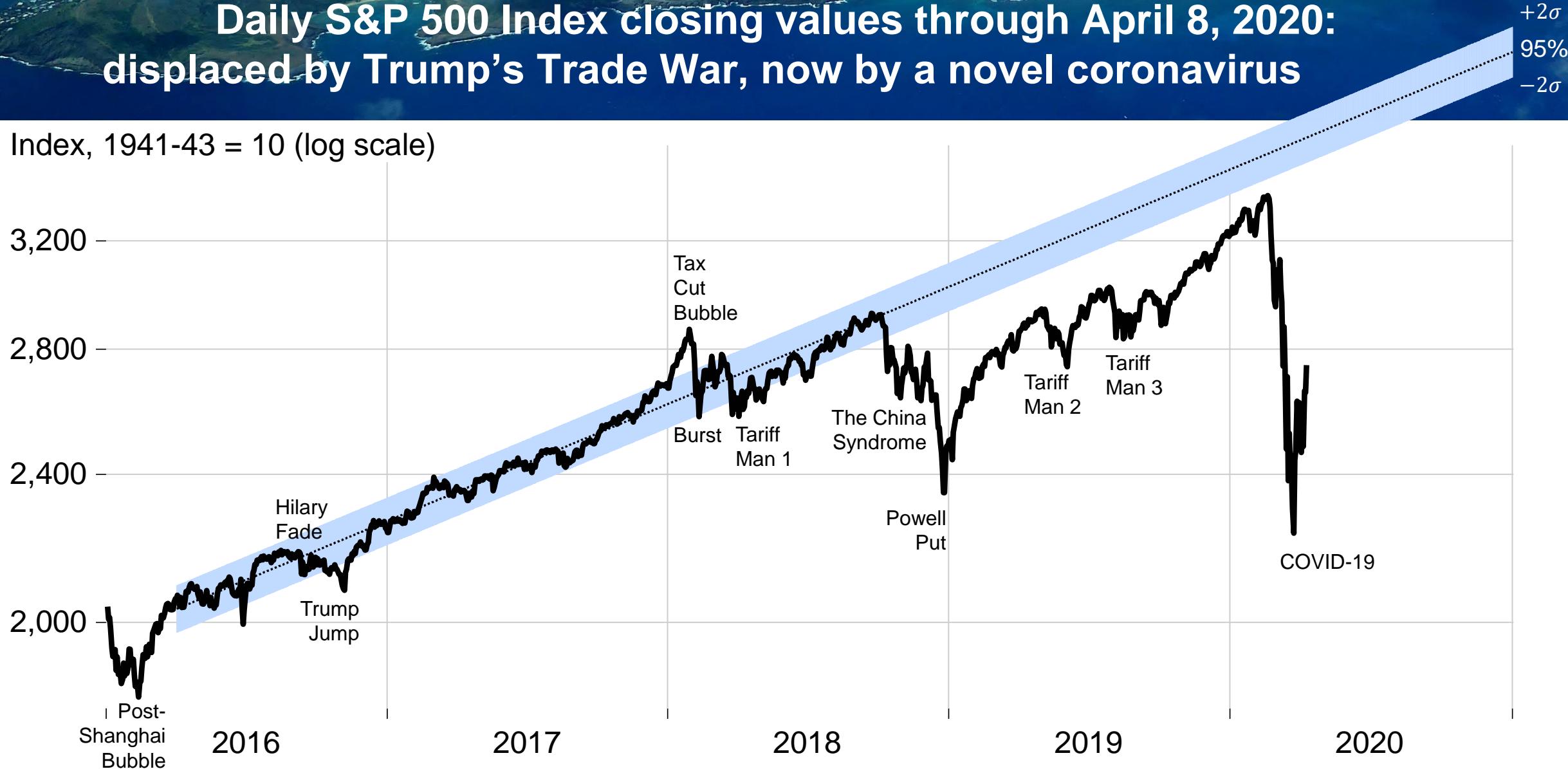


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Sources: Hawaii Tourism Authority (<https://www.hawaiitourismauthority.org/research/>), Hawaii DBEDT (<http://dbedt.hawaii.gov/economic/mei/>): monthly data estimated through April 2020 based on daily passenger counts through April 7, 2020; seasonal adjustment by TZ Economics

Daily S&P 500 Index closing values through April 8, 2020: displaced by Trump's Trade War, now by a novel coronavirus

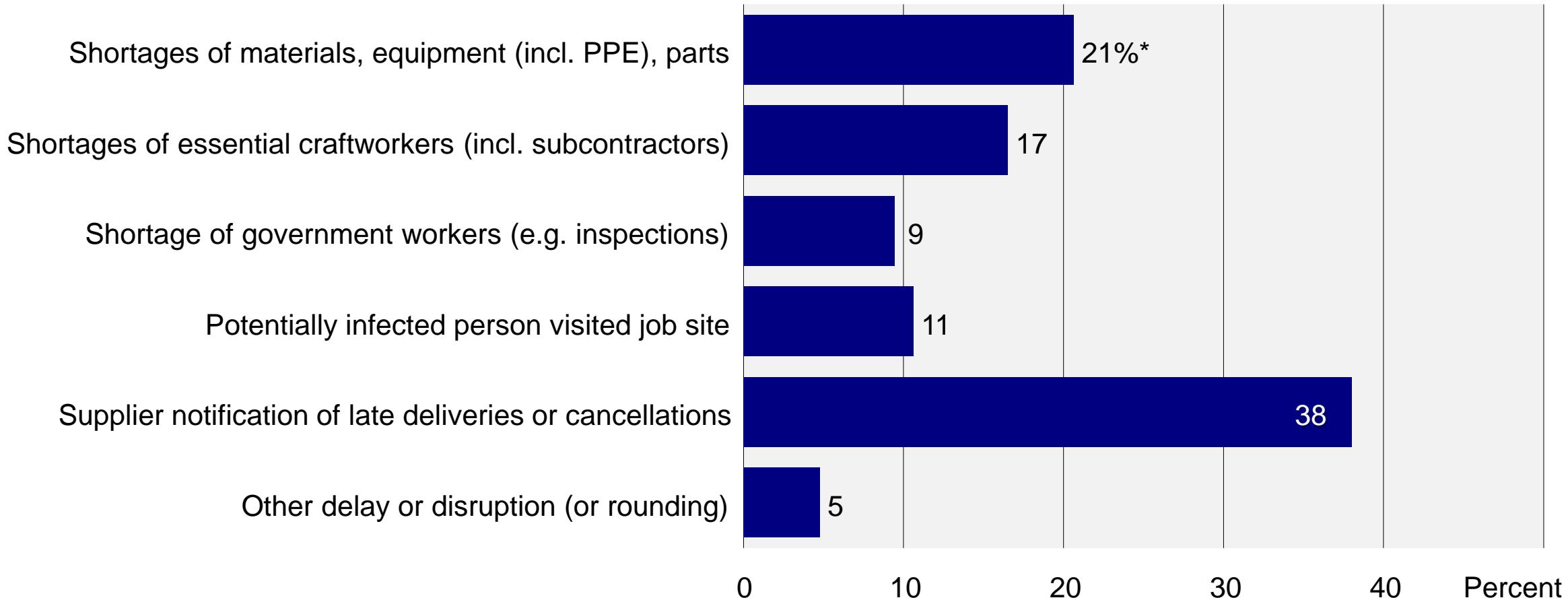
Index, 1941-43 = 10 (log scale)



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Sources: S&P Dow Jones Indices LLC, S&P 500 [SP500], from FRED, Federal Reserve Bank of St. Louis (<https://fred.stlouisfed.org/series/SP500>), daily closing values through April 8, 2020; trend regression on natural logarithm of daily closing values, April 1, 2016 – November 25, 2017, and two standard-error bandwidth by TZ Economics, projected forward through 2020 as if bad trade policy never happened after the tax cut.

Nationwide contractors reported widespread impacts of coronavirus: 55% owner 26% government delay or cancel; survey March 30-April 2



*Chart shows proportions who reported specific reasons for delays or cancellations

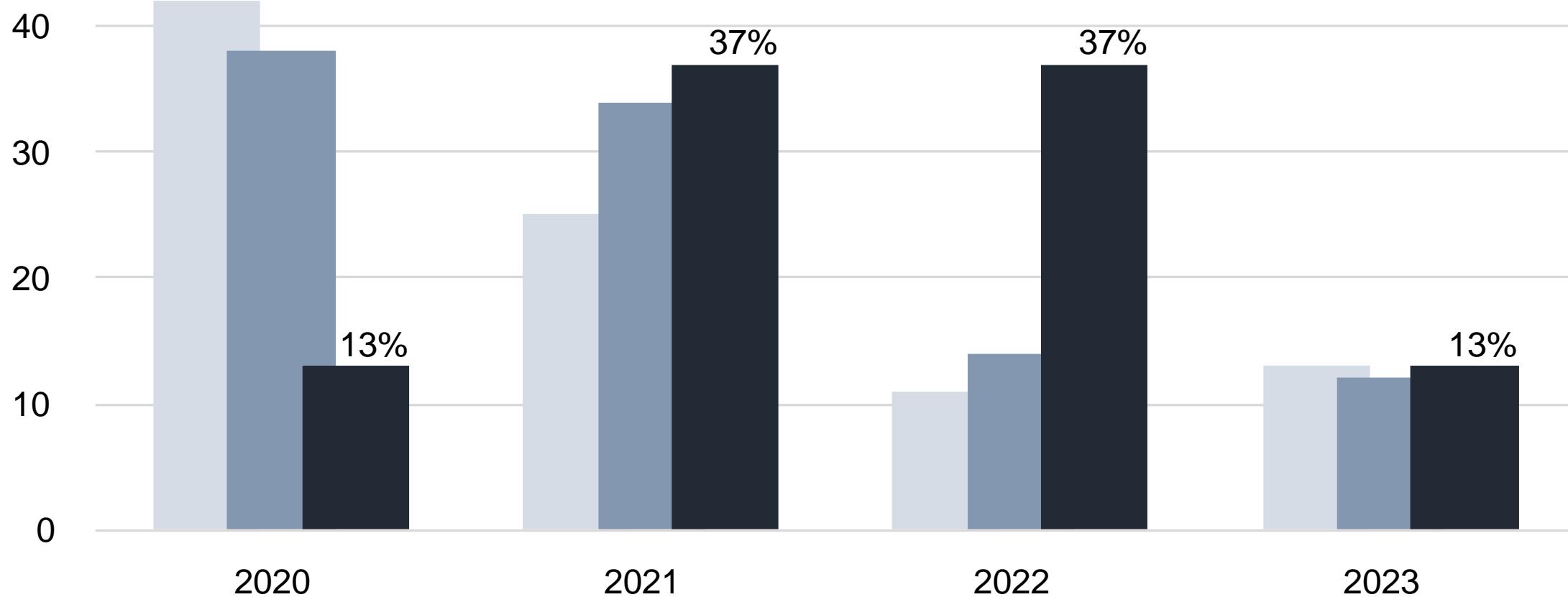
Economists' expectations for next recession better only six weeks ago; Q: "When will the U.S. economy enter the next recession?"

Percent of respondents

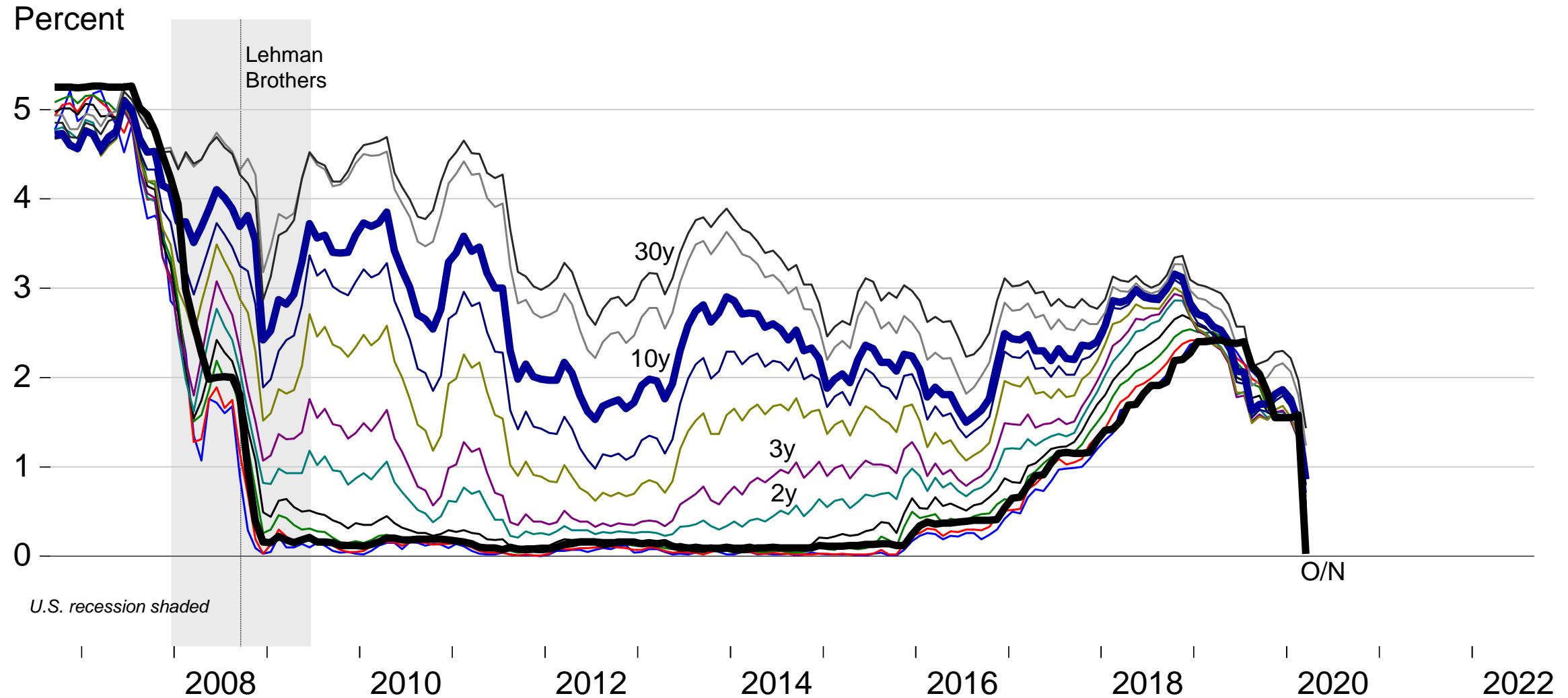
February 2019

August 2019

February 2020



Fed's actions: fed funds rate to zero, restore quantitative easing—at the zero bound for nominal interest rates, buy assets, create liquidity



U.S. average 30-year fixed rate mortgage rates (+0.7 fees/points) up only slightly from record low 3.29% (week ending April 2)

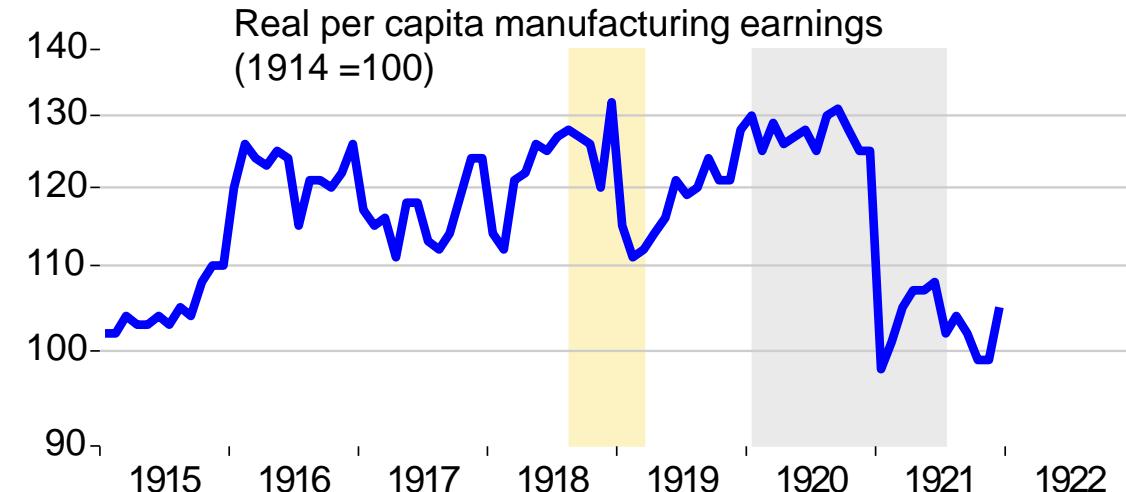
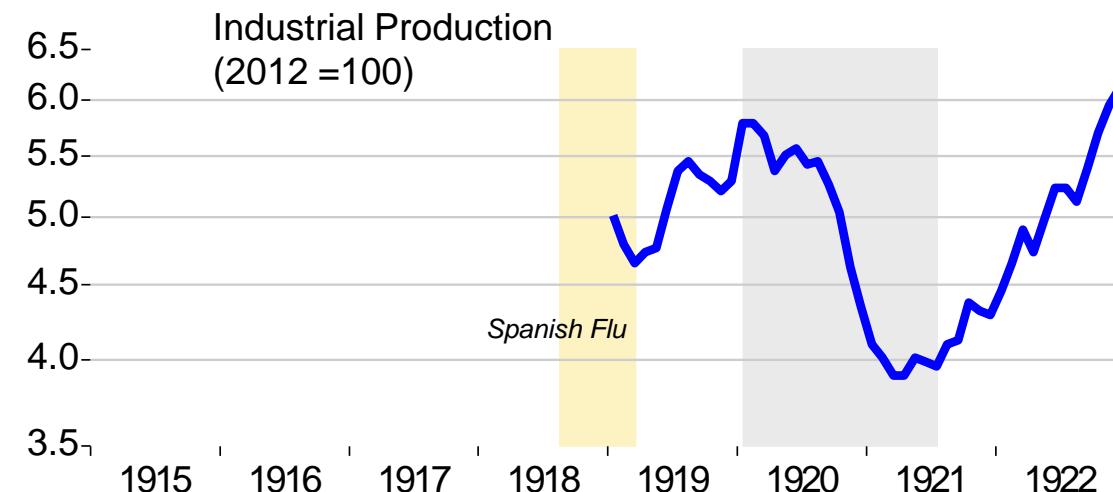
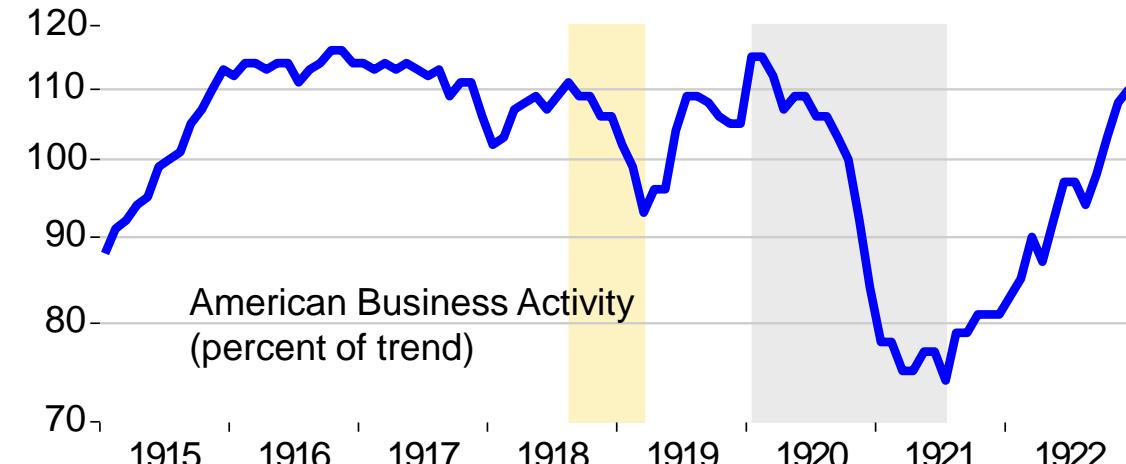
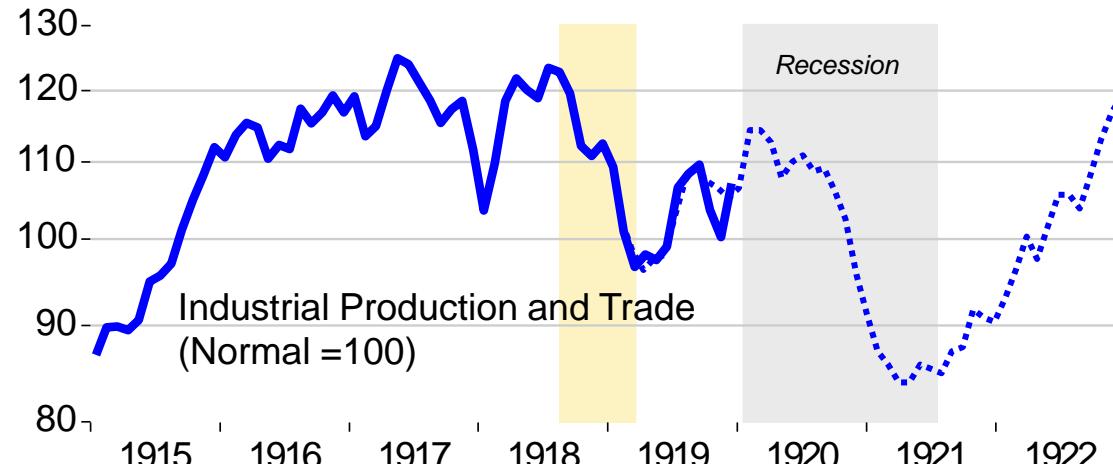




Same as it ever was? Life after the 1918-19 Spanish Flu pandemic, etc.

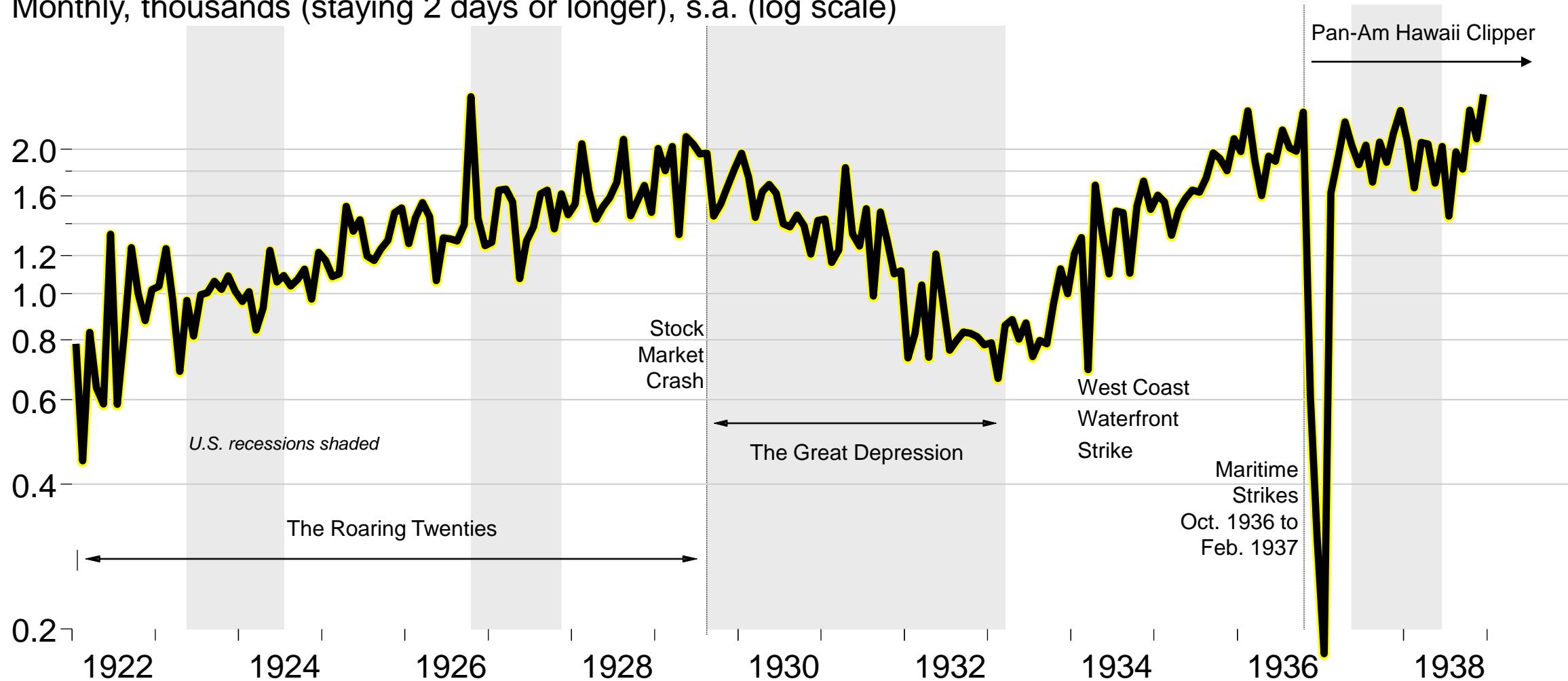
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A variety of industrial indicators a century ago illustrate the evolution of economic activity at the time of the Spanish Flu pandemic



Monthly Hawaii visitor arrivals in the 1920-30s—excluding passengers on ships in transit—exhibited business cycle, Black Swans, just as today

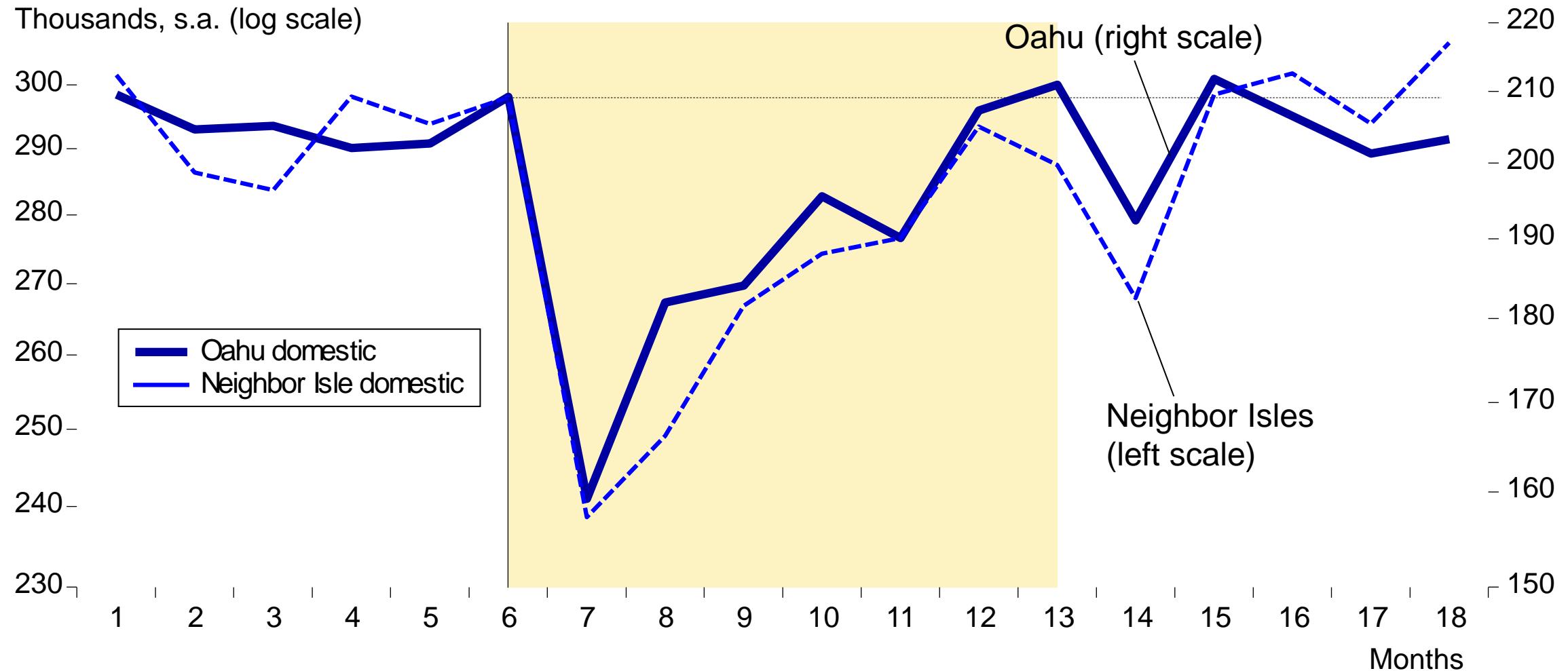
Monthly, thousands (staying 2 days or longer), s.a. (log scale)



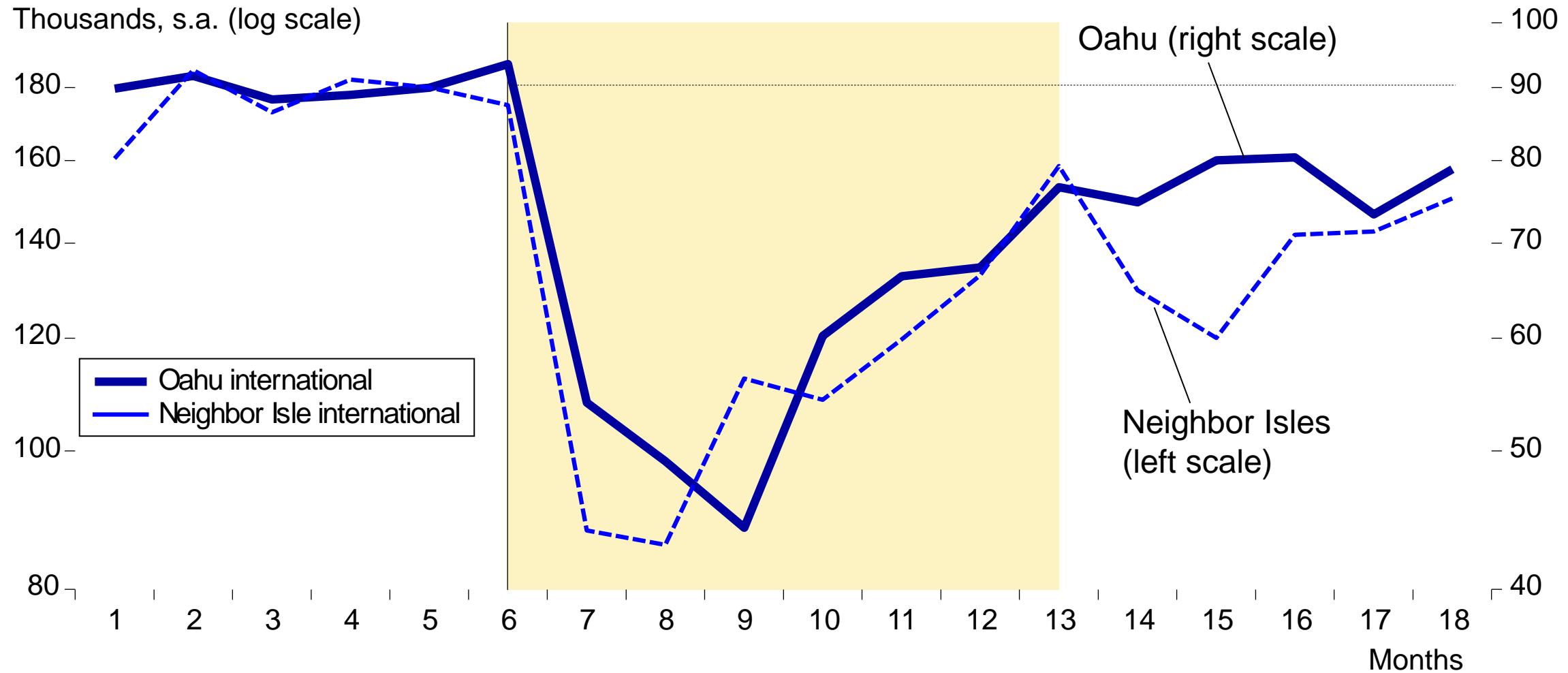
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Sources: George T. Armitage, Hawaii Tourist Bureau, "Hawaii's Tourist Business," Hawaii Territorial Planning Board *An Historic Inventory of the Physical, Social and Economic and Industrial Resources of the Territory of Hawaii* (February 8, 1939), p. 317; U.S. Bureau of Labor Statistics "The Maritime Strikes of 1936-37." *Monthly Labor Review* 44, no. 4 (1937): 813-27. Accessed January 29, 2020 (www.jstor.org/stable/41815101)

Domestic arrivals 6-months before and 6-months after the 9/11 event (“month 7”), and after that: “is it L-shaped, U-shaped, or V-shaped?”



International arrivals 6-months before and 6-months after the 9/11 event (“month 7”), and after that: “is it L-shaped, U-shaped, or V-shaped?”



Dependent Variable: Hawaii international visitor days (millions, s.a.)

Method: Least Squares

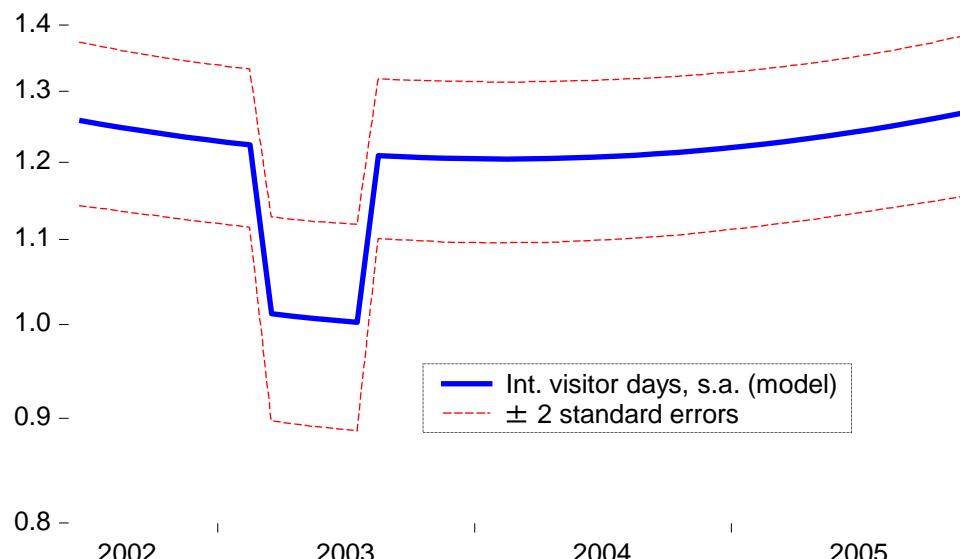
Date: 02/05/20 Time: 15:02

Sample: 2002M06 2005M12

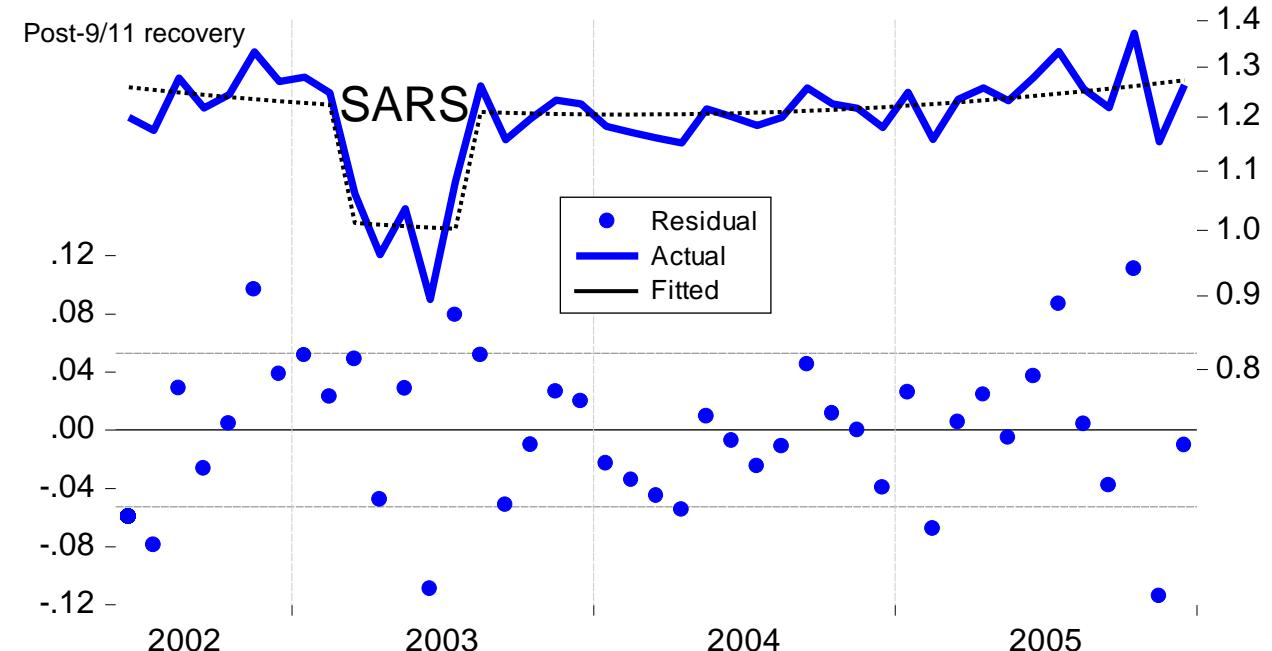
Included observations: 43

SARS episode, March through July 2003

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	71.04634	30.08115	2.361823	0.0233
@TREND	-0.092303	0.039725	-2.323561	0.0255
@TREND^4	2.25E-11	9.64E-12	2.330655	0.0250
DUMMYSARS	-0.208211	0.026497	-7.857914	0.0000
R-squared	0.678778	Mean dependent var	1.201553	
Adjusted R-squared	0.654069	S.D. dependent var	0.089668	
S.E. of regression	0.052739	Akaike info criterion	-2.958507	
Sum squared resid	0.108475	Schwarz criterion	-2.794675	
Log likelihood	67.60791	Hannan-Quinn criter.	-2.898091	
F-statistic	27.47049	Durbin-Watson stat	2.236366	
Prob(F-statistic)	0.000000			



Hawaii international visitor days (millions, s.a., log scale)



Forecast (model): Intl. visitor days	
Actual: International visitor days	
Forecast sample: 2002M06 2005M12	
Included observations: 43	
Root Mean Squared Error	0.050226
Mean Absolute Error	0.039894
Mean Abs. Percent Error	3.389676
Theil Inequality Coefficient	0.020853
Bias Proportion	0.000000
Variance Proportion	0.096563
Covariance Proportion	0.903437
Theil U2 Coefficient	0.569519
Symmetric MAPE	3.376099

The SARS math (the bottom line):

Foregone visitor days, March-July 2003: 1.0411 mil.
 Avg. daily intl. visitor expenditure (2003): \$228.22
 Foregone intl. tourism receipts (2003\$): \$237.60 mil.

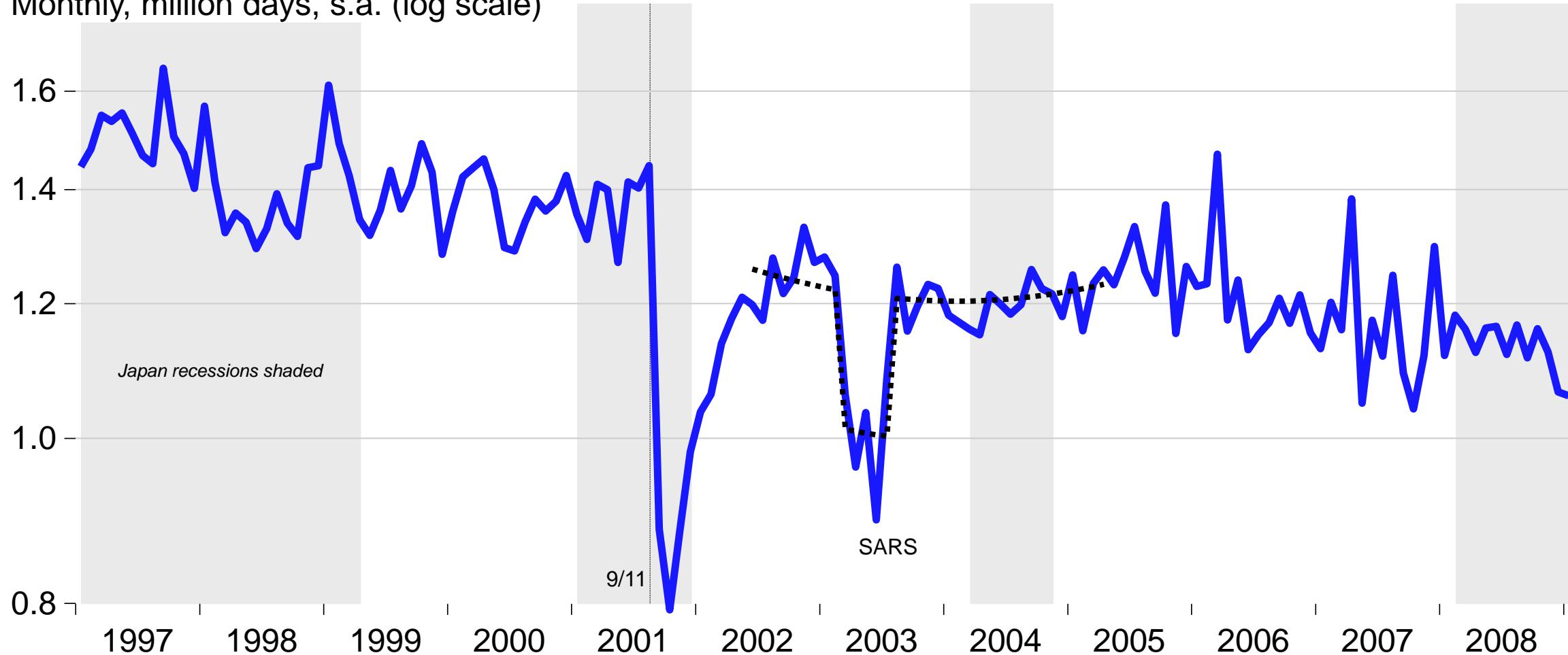
Ratio of Urban Hawaii CPI-U 2019/2003:
 $(281.585/184.5) = 1.526$ (inflation factor)

Foregone intl. tourism receipts (2019\$): \$362.58 mil.

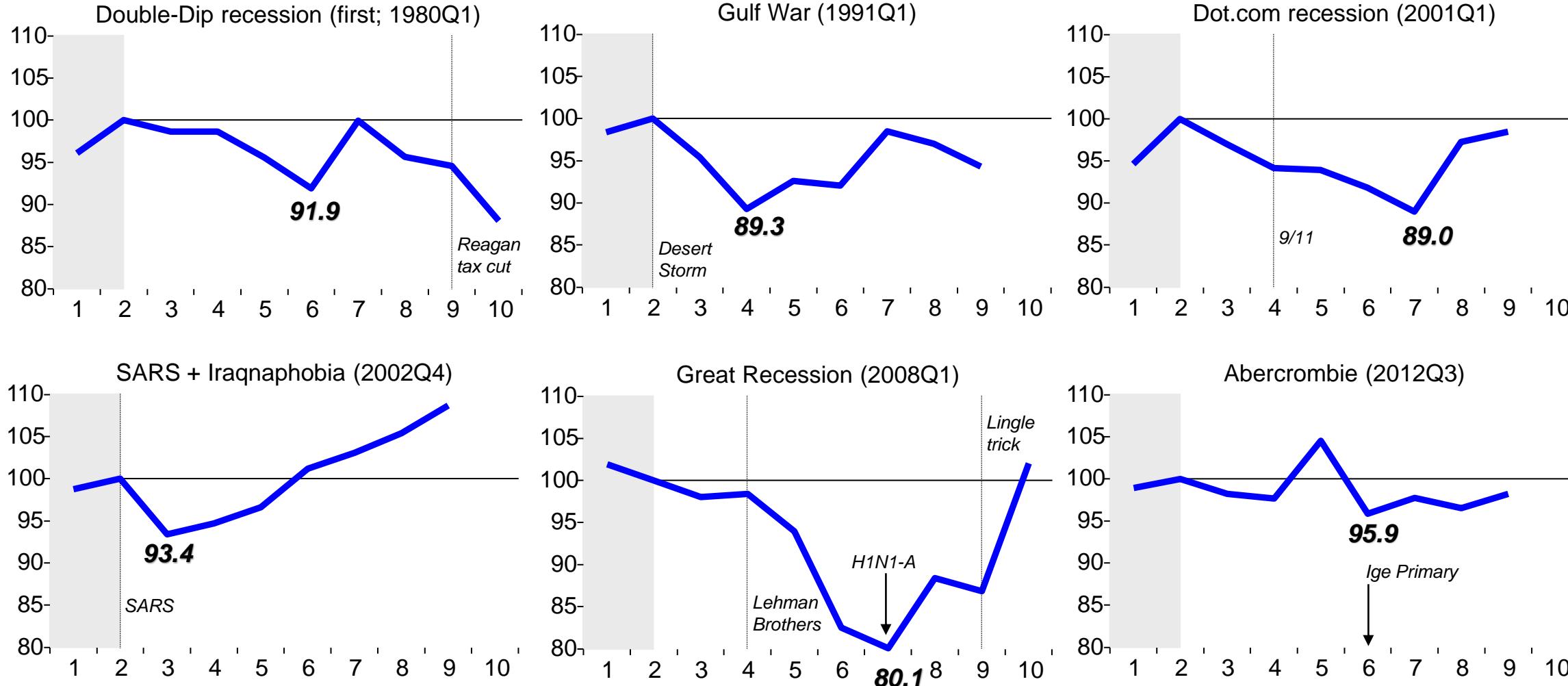
Assumption: zero Iraqophobia impacts, international impacts only to Japan, Asia, and Canada (half-weight)

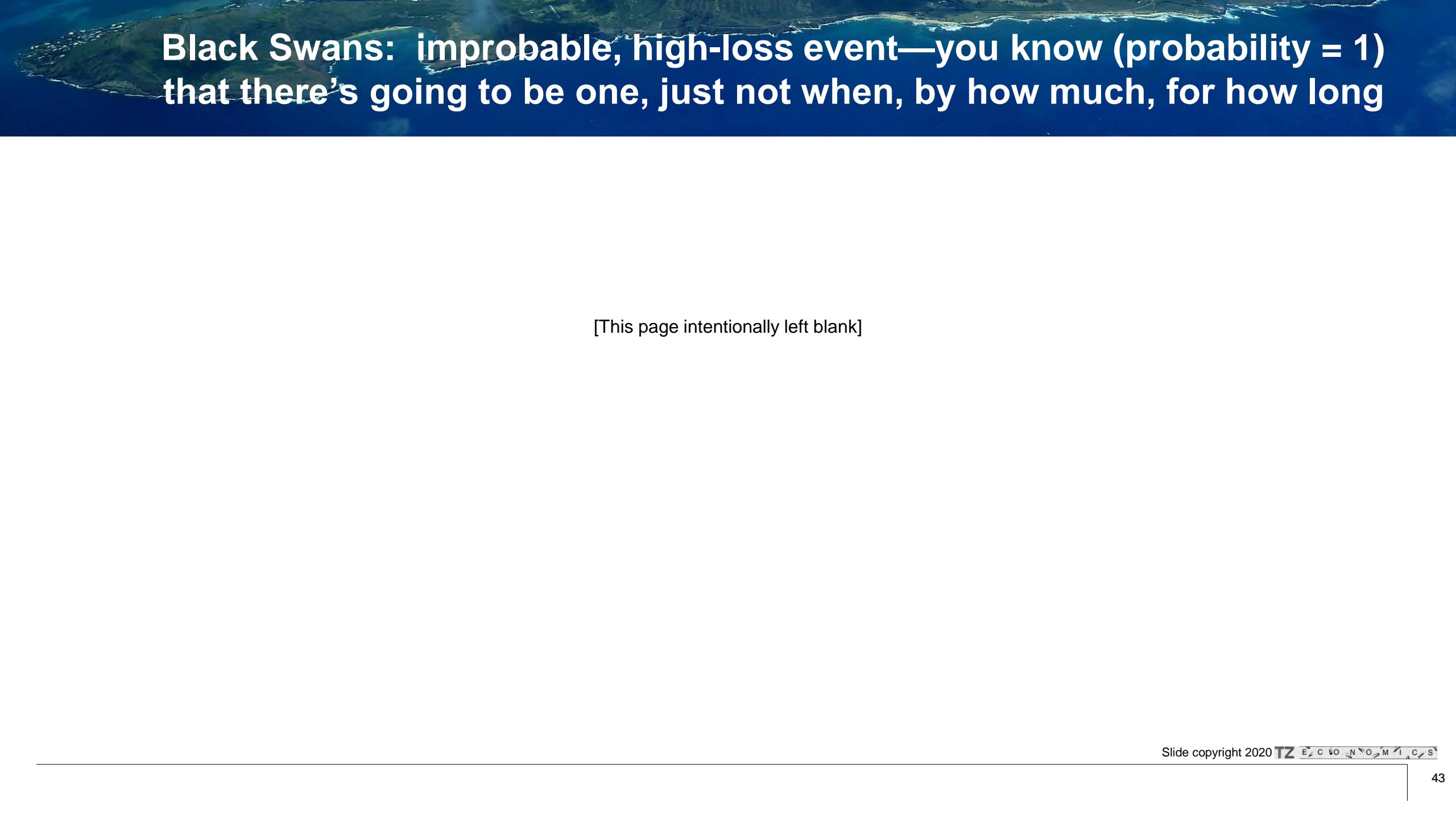
International visitor days before and after two famous Black Swans; SARS associated with \$360 million foregone tourism receipts (2019\$)

Monthly, million days, s.a. (log scale)



Hawaii real General Fund revenues, seasonally adjusted, indexed to “Quarter 2 = 100 (in parentheses)” and six episodes of “compression”

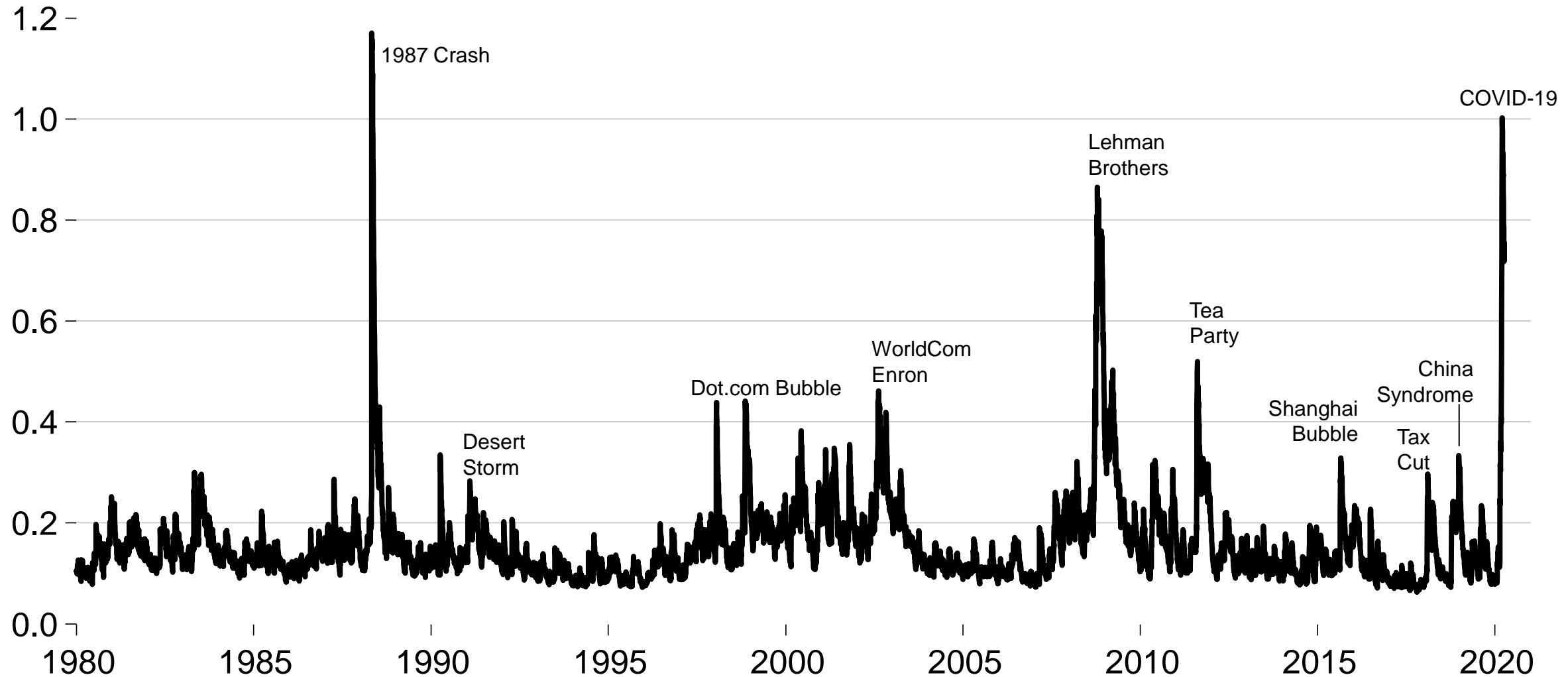




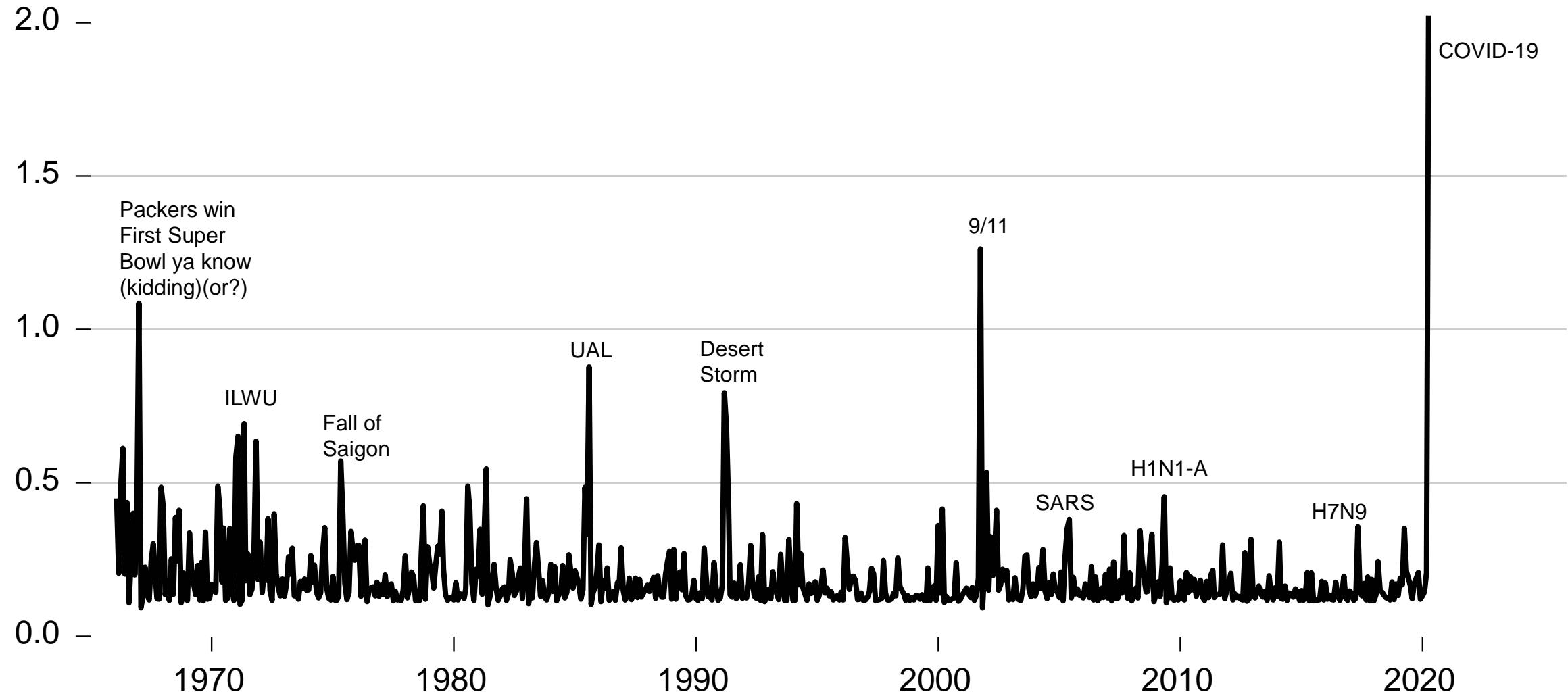
Black Swans: improbable, high-loss event—you know (probability = 1) that there's going to be one, just not when, by how much, for how long

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Conditional annualized daily volatility of the S&P 500 Index—so, you know it's going to happen again, right? Just not why, when, how hard



Conditional annualized monthly volatility of Hawaii visitor arrivals, let me guess: geophysical, geopolitical, or biological event?





Educate yourself: help build a bridge until vaccination, herd immunity

- Journalist Jon Cohen on COVID-19 research: https://www.youtube.com/watch?v=MPVG_n3w_vM
- Author Parag Khanna on Singapore lessons: <https://www.youtube.com/watch?v=pGg9T8QLArg>
- Johns Hopkins on Crazy Rich Asians: <https://www.youtube.com/watch?v=7Rt4odDNDNw>
- UHERO on rebooting Hawaii economy: <https://uhero.hawaii.edu/how-to-control-hawaiis-coronavirus-epidemic-and-bring-back-the-economy-the-next-steps/>
- UHERO on test and trace: <https://uhero.hawaii.edu/herd-immunity-or-containment-through-test-and-trace/>
- The Atlantic on contact tracing: <https://www.theatlantic.com/ideas/archive/2020/04/contact-tracing-could-free-america-from-its-quarantine-nightmare/609577/>
- China <https://www.businessinsider.com/coronavirus-china-health-software-color-coded-how-it-works-2020-4>
- Germany <https://www.scmp.com/tech/apps-social/article/3079035/germany-turns-fitness-tracking-app-help-monitor-coronavirus>
- France <https://www.reuters.com/article/us-health-coronavirus-france-apps/france-working-on-stopcovid-contact-tracing-app-ministers-say-idUSKBN21Q1D3>

Just like the good old days



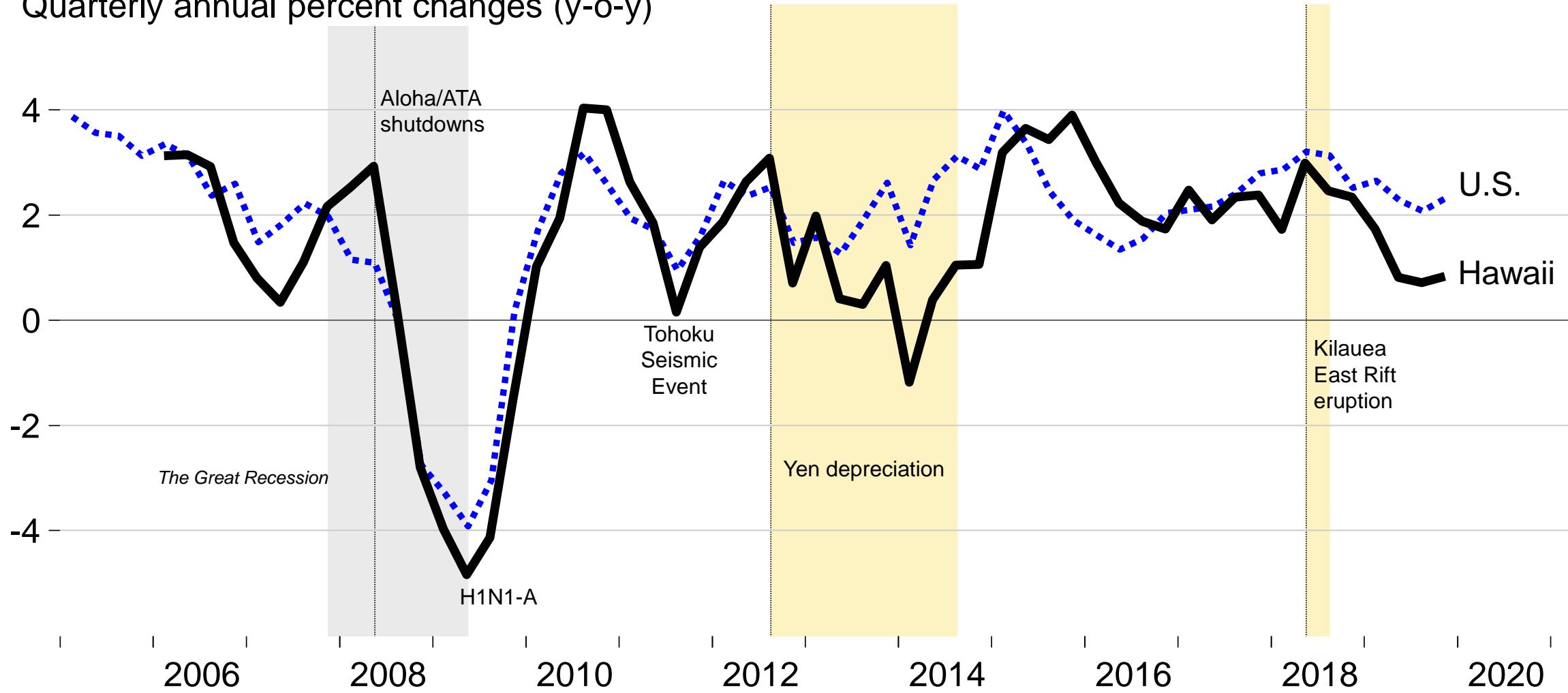


Appendix 1: Hawaii was set up like bowling pin for coronavirus

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Because Hawaii hit *idiosyncratic* headwinds, real GDP growth lagged U.S. average twice during 2010s, reaccelerated just before COVID-19

Quarterly annual percent changes (y-o-y)

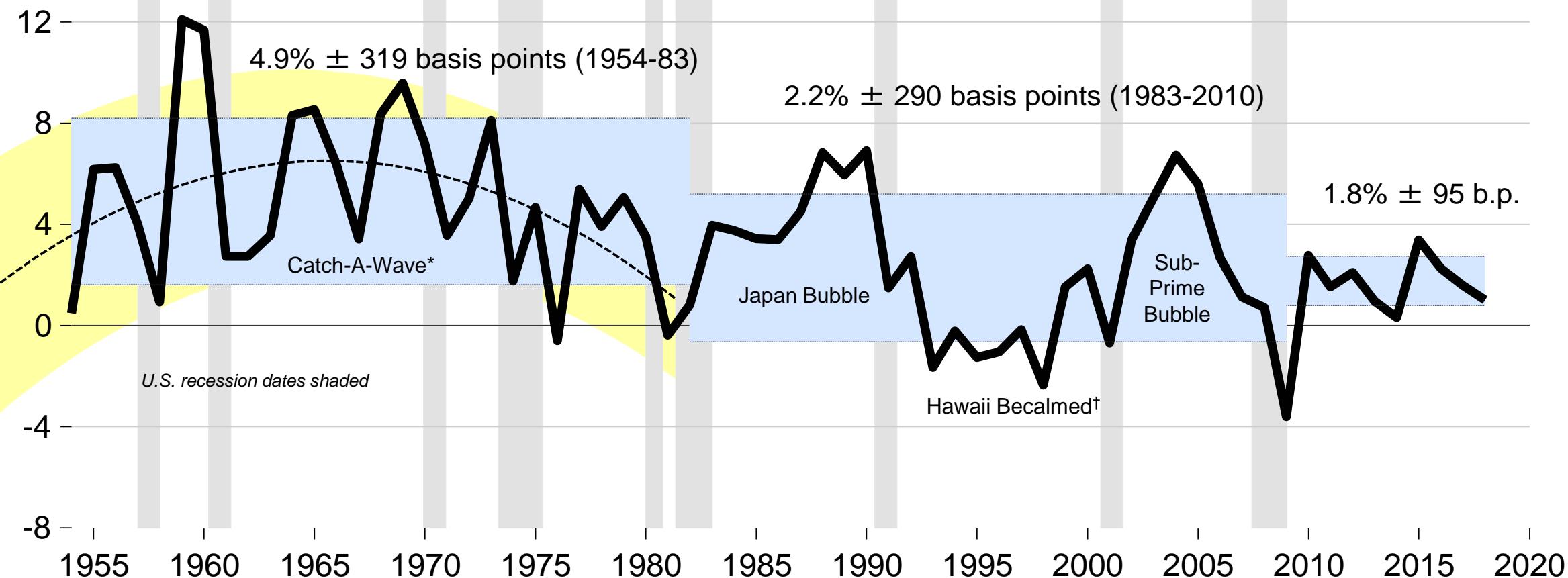


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Sources: Bureau of Economic Analysis, U.S. Department of Commerce (<https://www.bea.gov/data/gdp/gross-domestic-product>, <https://www.bea.gov/data/gdp/gdp-state>); quarterly data through 2019Q4, including revisions, year-over-year growth rate calculations by TZE

Estimated Hawaii annual real GDP growth rates: as elsewhere islands' growth has decelerated, with diminished volatility, settling to 1% (2019)

Percent change



*Mahalo, Tom Coffman

†Mahalo, Chris Grandy (note that "smooth pasting" issues complicate interpretation of data around 1997)

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Sources: Robert C. Schmitt, Table 6.1 (1976) *Historical Statistics of Hawaii*, based on UH Economic Research Center work by Harry Oshima, Mitsuo Ono, Bank of Hawaii (unpublished), Yung Shang, William Albrecht, Glenn Ifuku, Hawaii DPED (1988) *Hawaii's Income and Expenditure Accounts*, U.S. BEA (<https://www.bea.gov/data/economic-accounts/regional>), interval growth rates and 2 standard deviation bandwidths based on log changes of real GDP (or GSP, pre-1977) re-mapped to constant, 2018 dollars from NAICS data 1997-2018, SIC data 1977-1997, and prior estimates



Appendix 2: undocumented vacation rentals—the future?

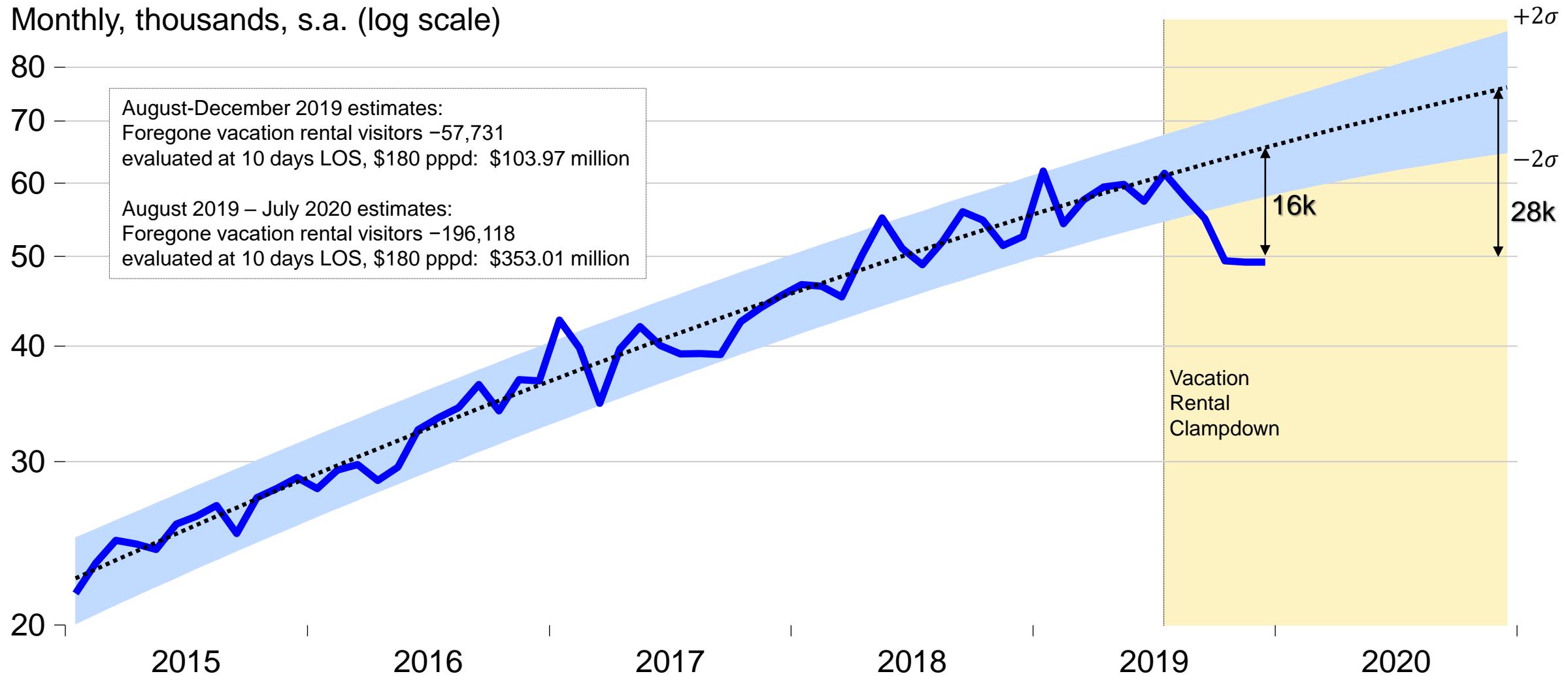
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Little bit of pile-up in Oahu condominium resale market: months of inventory remaining at current absorption broke link after Clampdown

Months remaining, seasonally-adjusted



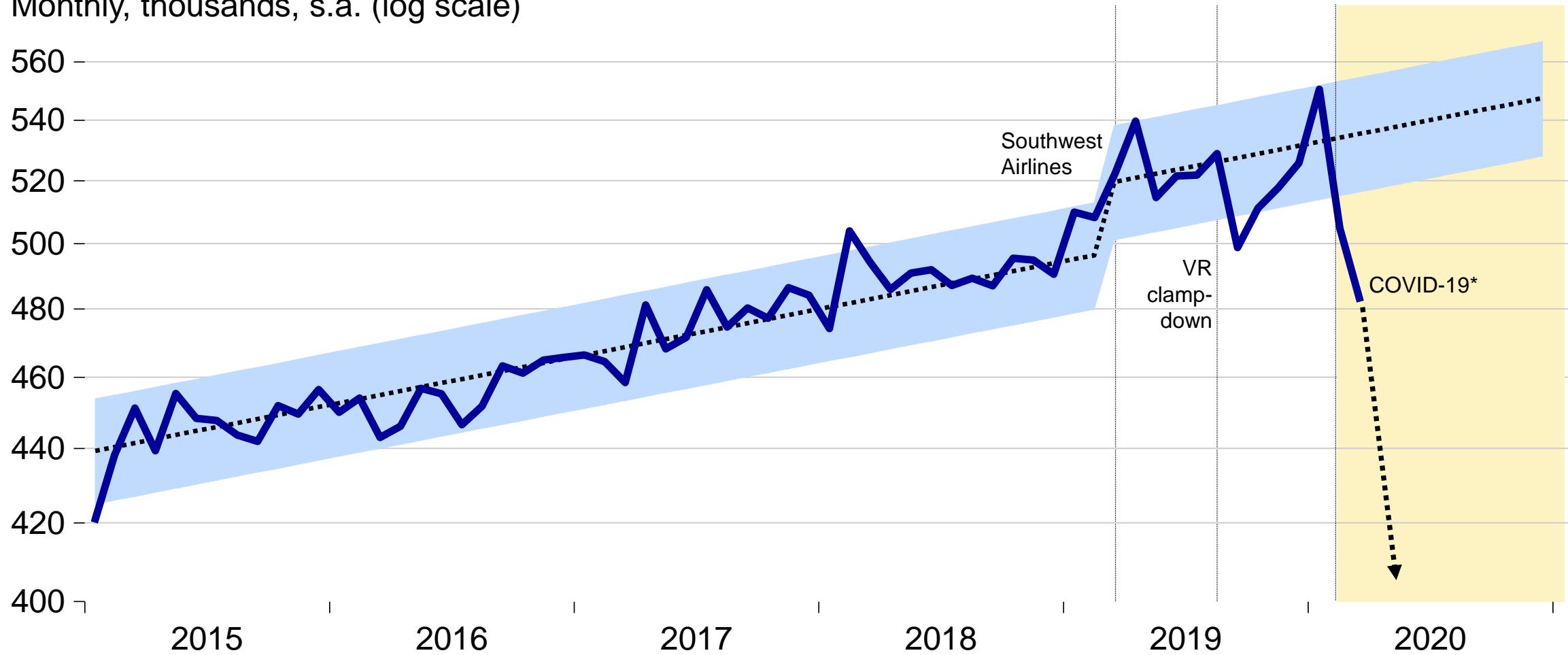
Through January 2020: monthly Oahu visitor arrivals (staying in a rental house, private room, or shared room in a private house)



Source: Hawaii Tourism Authority (<https://www.hawaiitourismauthority.org/research/monthly-visitor-statistics/>); monthly data through December 2019, seasonal adjustment using, nonlinear trend regression through July 2019 by TZE [$\ln(VREOVR3_D11) = -34.2837734267 + 0.0508333271106*t - 1.20633926677e-14*t^6$]; trend growth rate through July 2019 was 20.2 percent p.a. (2.2 percent p.a. for hotel-condo-timeshare visitors)

Oahu *total* visitor arrivals, on good run, were gifted Southwest Airlines entry, lump of coal by Honolulu City Council, *then* COVID-19

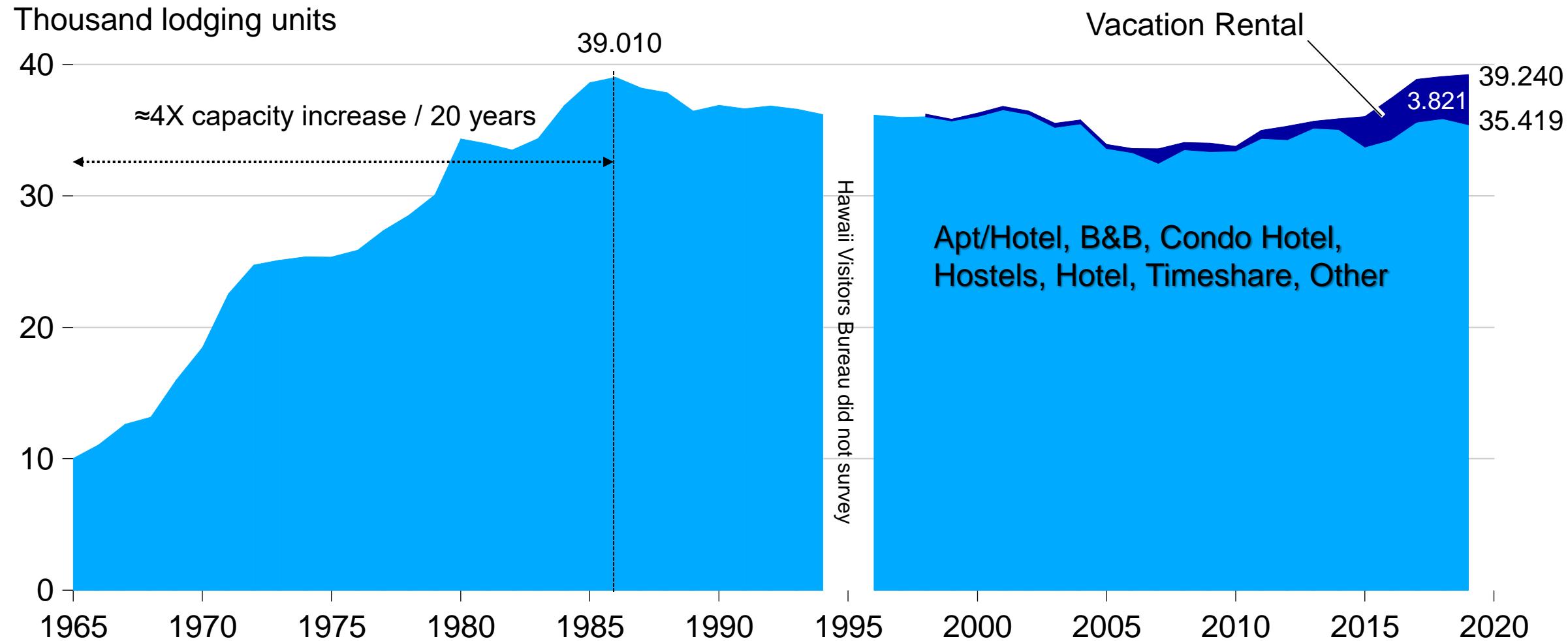
Monthly, thousands, s.a. (log scale)



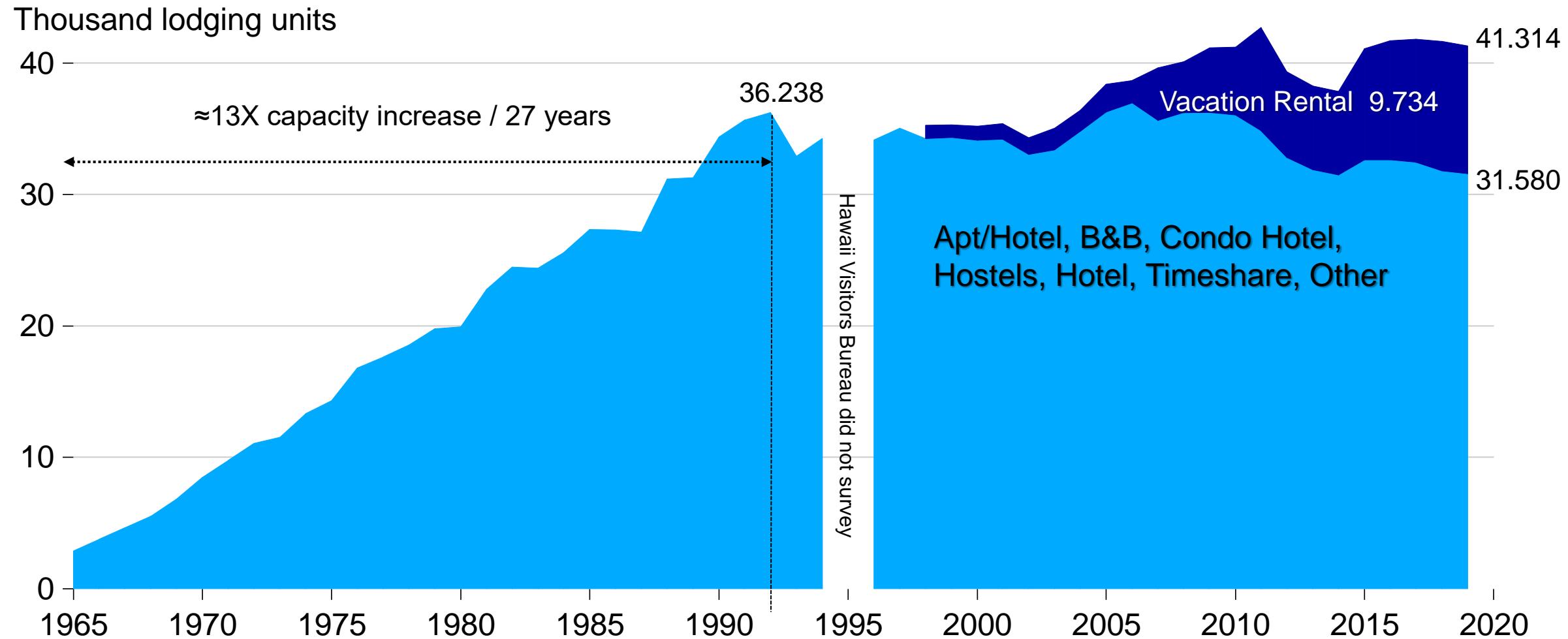
* Estimate based for Oahu visitor arrivals based on statewide *total* passenger arrivals through March 18, 2020 and likely a gross *underestimate* of the COVID-19 decline to date

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Oahu traditional lodging capacity growth ended 34 years ago; capacity growth since was in vacation rentals, subverting exclusionary zoning



Neighbor Isle traditional lodging capacity growth ended 28 years ago; one-quarter now vacation rentals contesting global brands' oligopoly



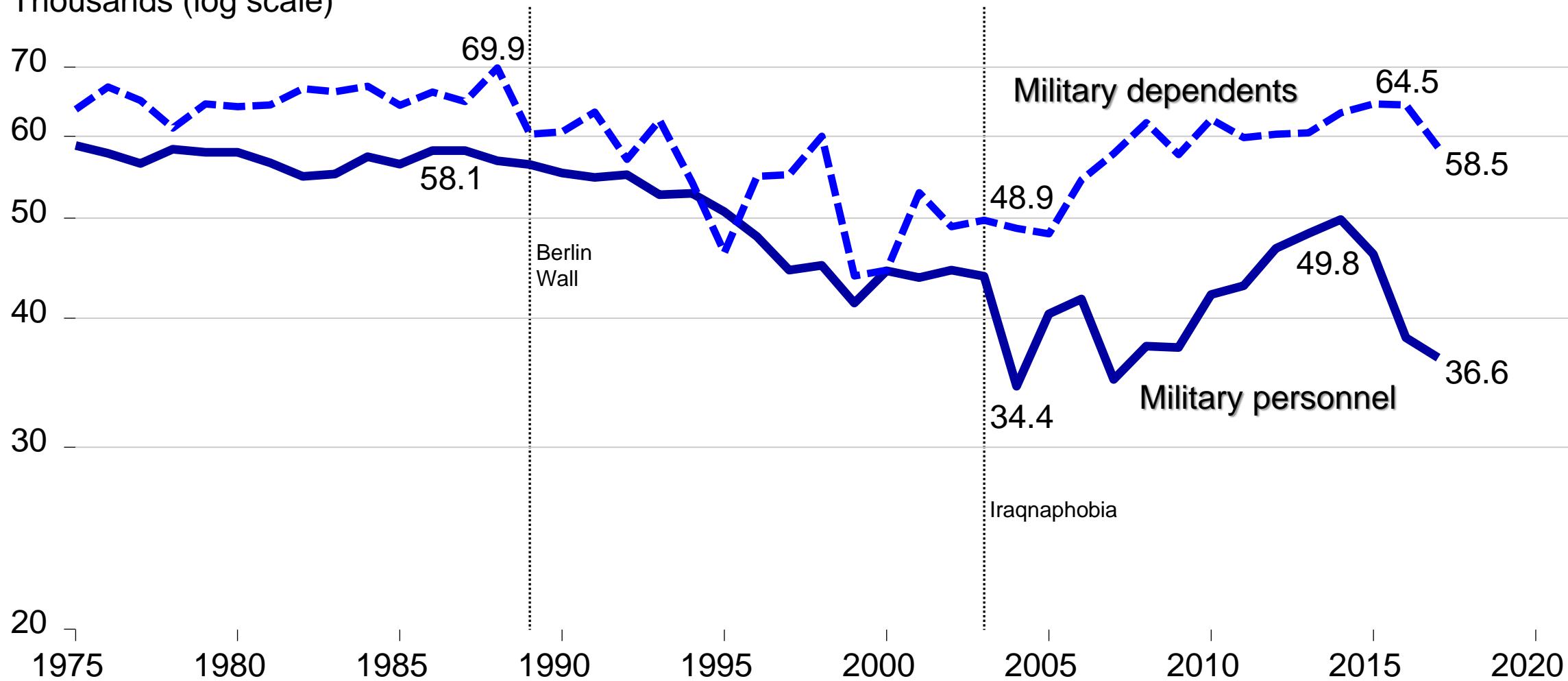


Appendix 3: population and demographic trends, muted 21st century

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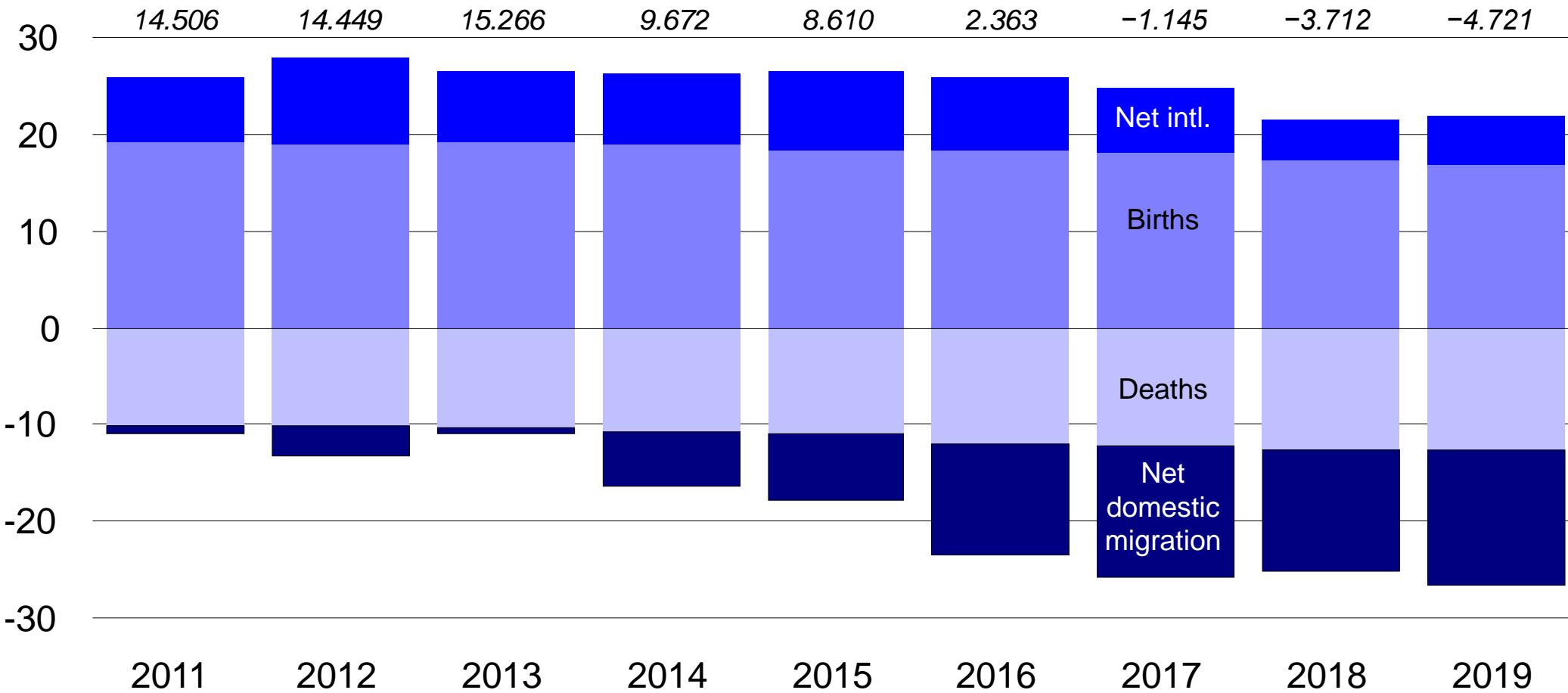
Post-Vietnam Era military personnel and dependent counts in Hawaii: post-Cold War downsizing (1990s); post-Iraq, Afghanistan (2010s)

Thousands (log scale)

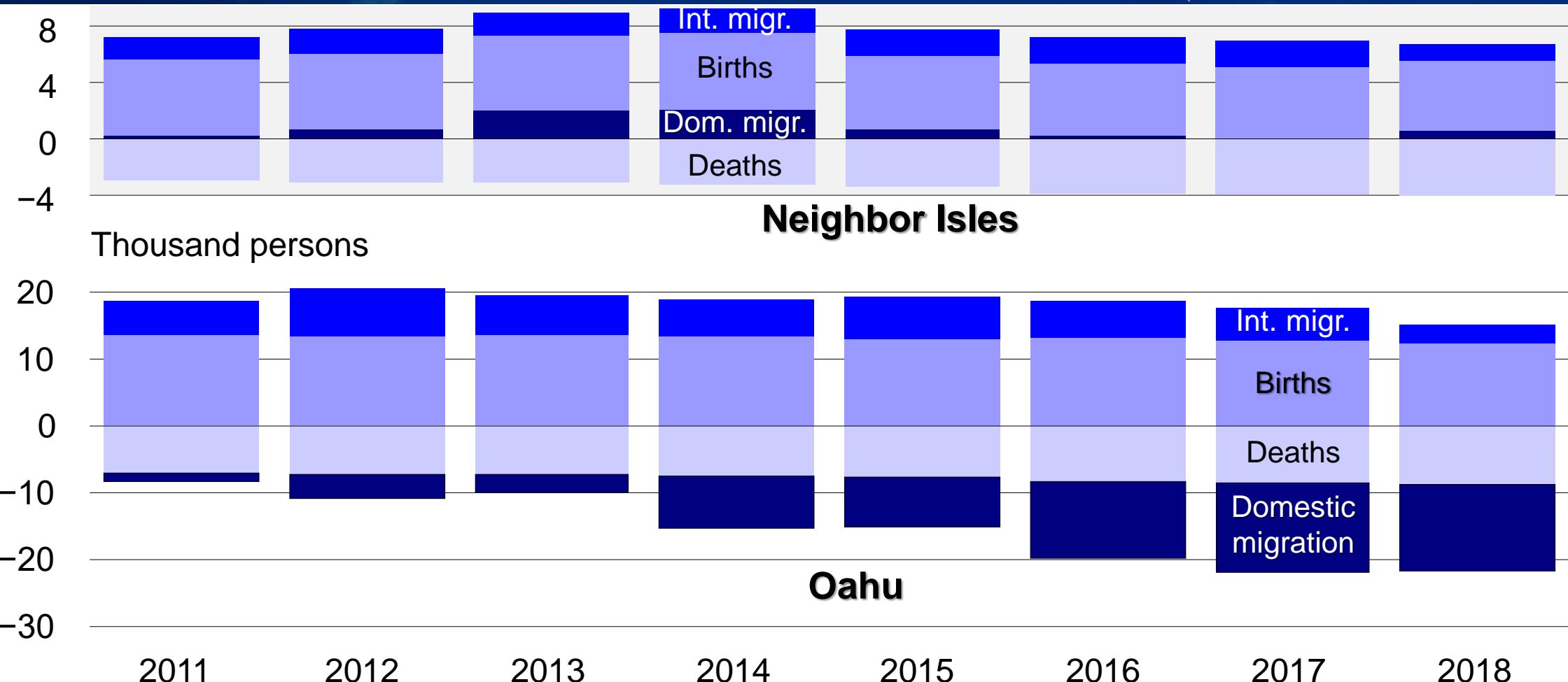


Estimates of the components of population change for Hawaii: 2010-2019 (Julys); net domestic outmigration swamping others

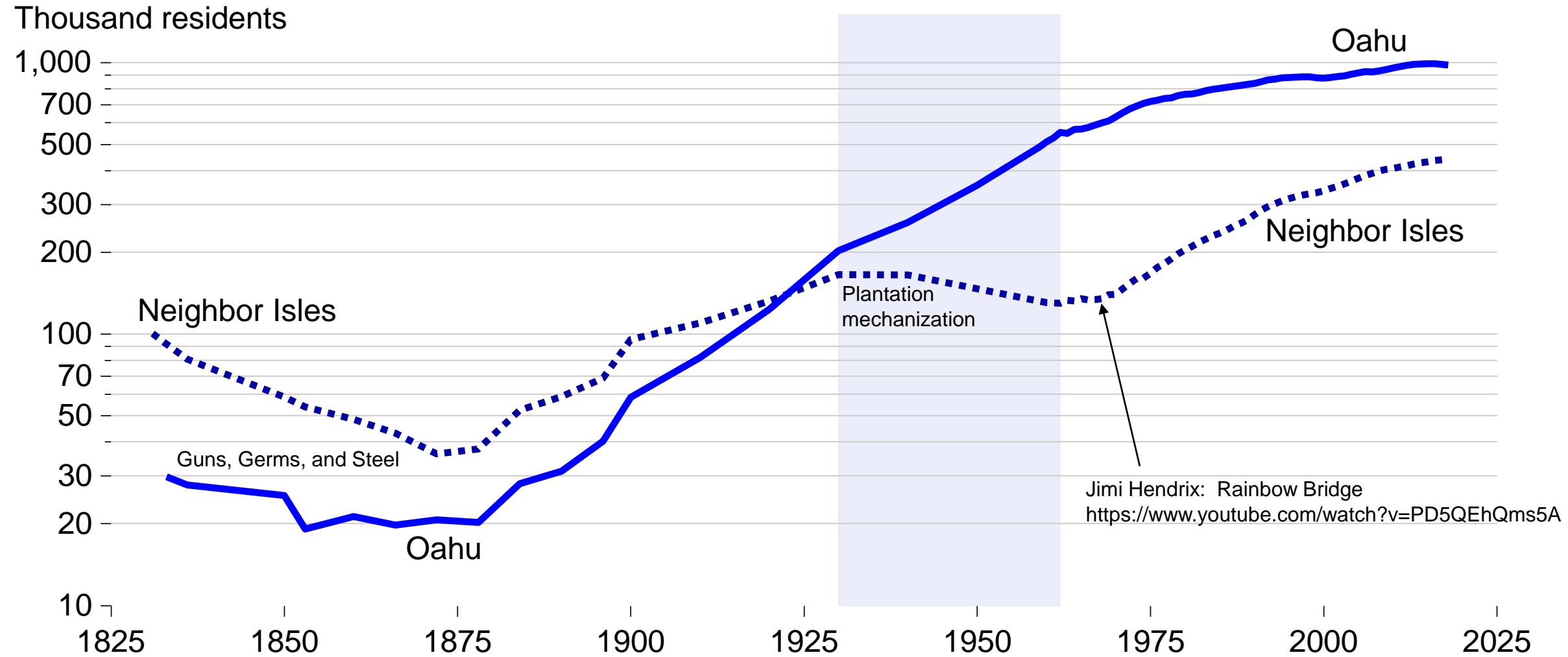
Thousand persons



Components of 2010s population change: declining natural increase and international in-migration, growing net domestic out-migration

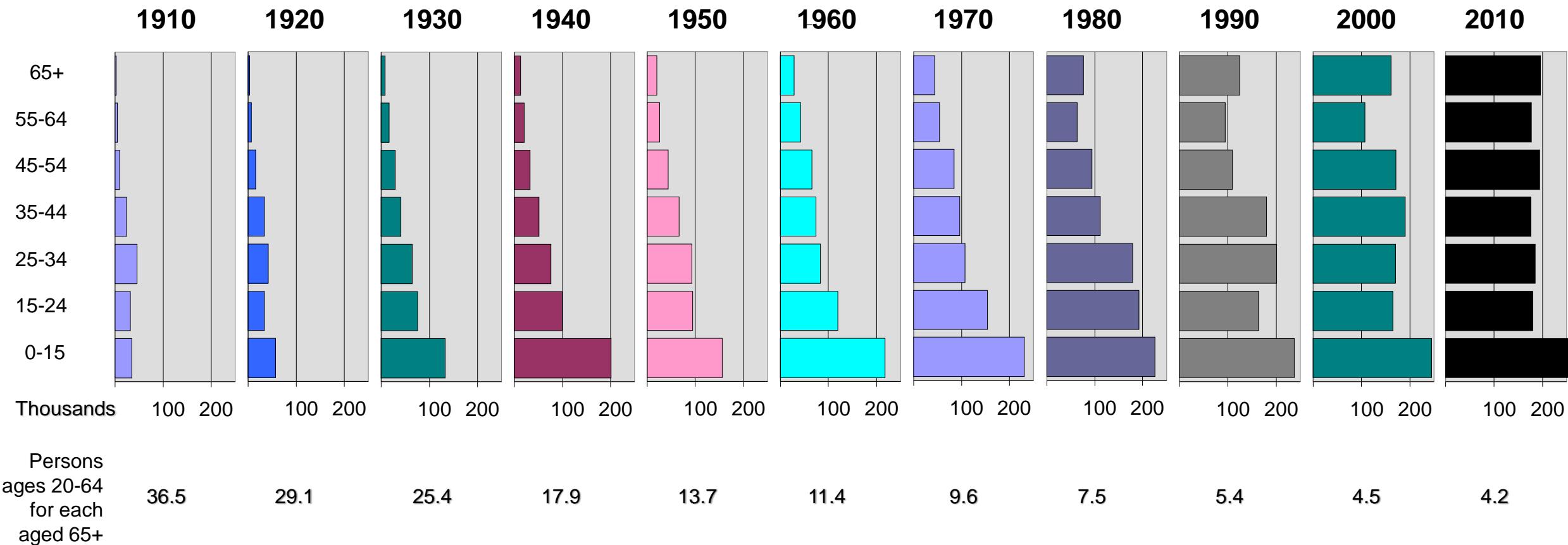


Neighbor Island population only grew in modern era since 1960s—for more than three decades, people moved to Oahu; now they're leaving



20th century mortality reduction, fertility reduction, increased longevity ⇒ population aging—what happens to houses if Boomers die after 2030s?

Hawaii population by age cohort—decennial census data



Pau

