



FEDERAL RESERVE BANK *of* NEW YORK

Puerto Rico and the U.S. Virgin Islands After Hurricanes Irma and Maria

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The views expressed here are those of the presenter and do not necessarily represent those of the Federal Reserve Bank of New York or the Federal Reserve System.

Overview

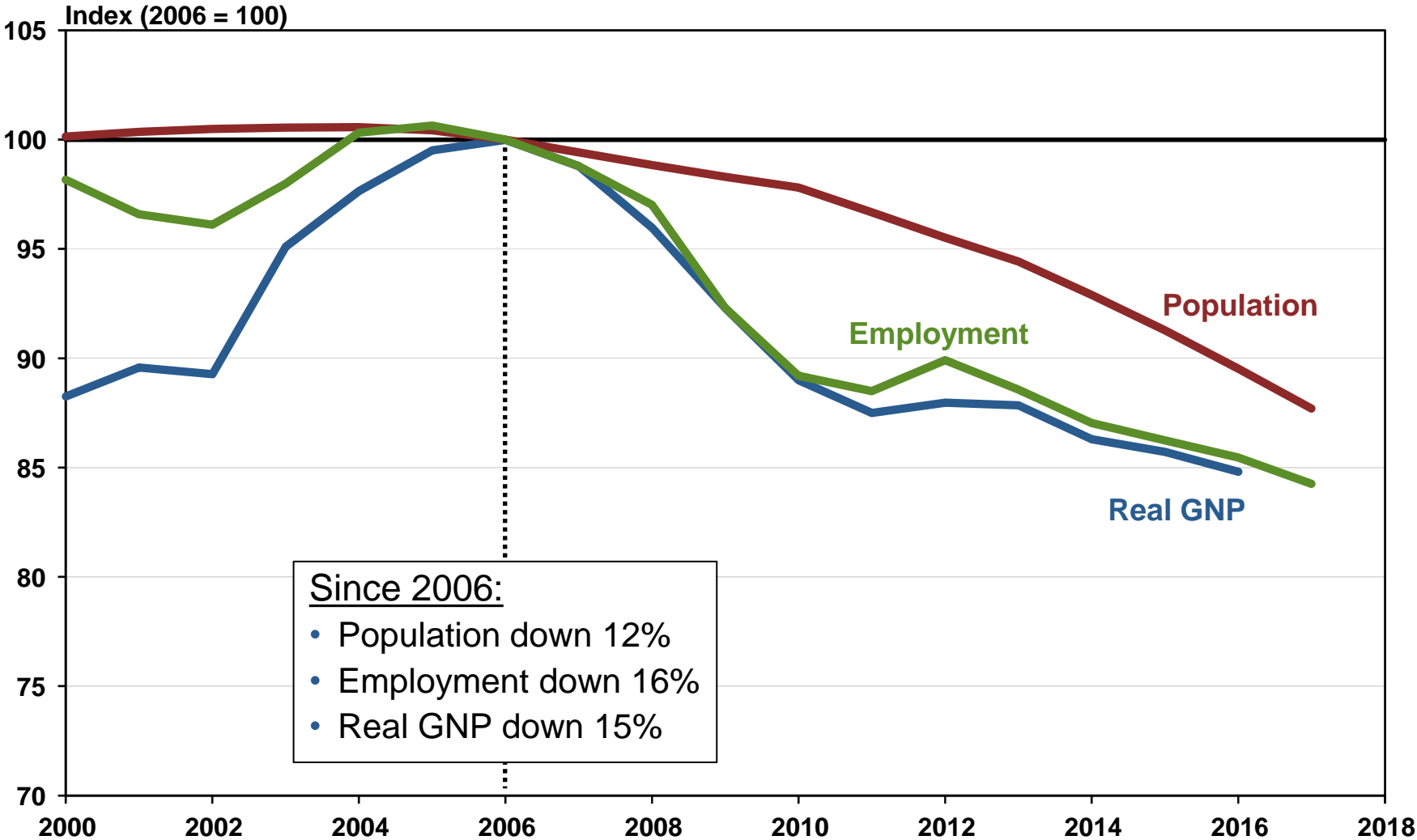
- Economic and fiscal conditions in Puerto Rico and the U.S. Virgin Islands (USVI) were dire even before hurricanes Irma and Maria.
- We look at a variety of indicators to help gauge the hurricanes' effects on these U.S. territories and their economies.
- Despite widespread devastation, the Puerto Rico economy has shown some signs of resilience, whereas the USVI economy has stabilized but has yet to show signs of a rebound.
- While the main focus here is on economic effects, it's important to note that the storms took a great toll in terms of loss of life, physical destruction, health issues, and widespread suffering.



Economic & Fiscal Situation Leading Up to the Storms

Puerto Rico Economy Weak Well Before Maria

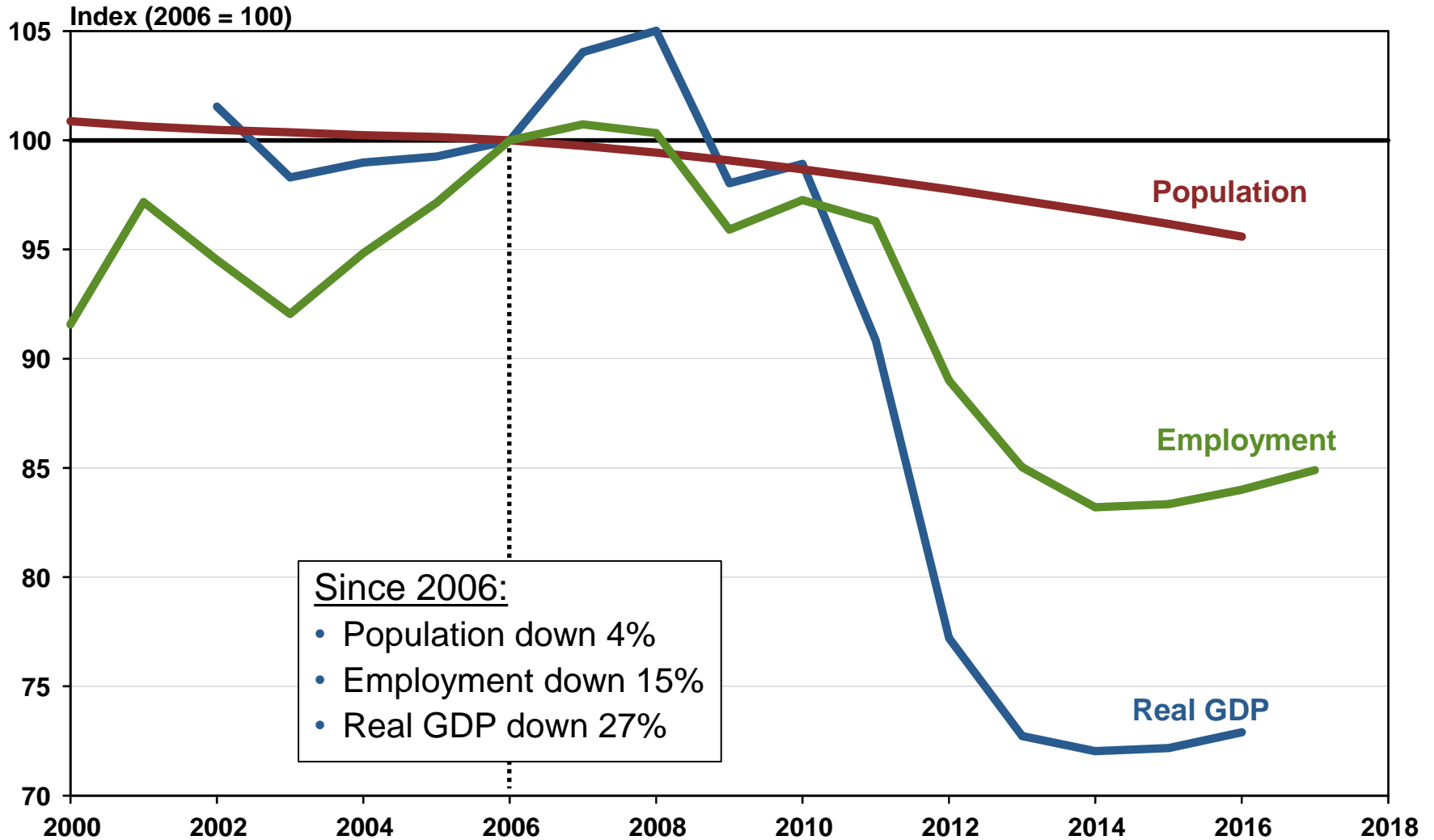
Indexes of Economic Activity, Employment, and Population



Source: U.S. Bureau of Labor Statistics, U.S. Census Bureau, Planning Board of Puerto Rico, and Moody's Economy.com.

USVI Also Weak Well Before Irma & Maria

Indexes of Economic Activity, Employment, and Population



Economic & Fiscal Conditions Before the Storms

- Puerto Rico
 - The economy had already been in decline for over a decade.
 - Public debt in 2016 was roughly 100% of GNP.
 - The Island had defaulted on debt payments and could no longer borrow.
 - In 2016, the U.S. Congress implemented PROMESA to restore long-term economic growth and fiscal balance, creating a fiscal oversight board and a bankruptcy-like process.
- U.S. Virgin Islands
 - This economy had been depressed, largely due to the Great Recession and the closure of the major Hovensa oil refinery in 2012.
 - USVI were also under fiscal stress; while they have not defaulted on debt payments, public debt in 2016 was roughly 72% of GDP, and they have limited market access.
- These conditions exacerbate the already-difficult challenge of recovering and rebuilding after Irma and Maria.



Initial Impacts of the Storms

Fallout on Puerto Rico and the USVI

- Physical damage and loss of life
 - More than 1,000 deaths have been attributed to the hurricane in Puerto Rico.¹
 - Many homes and businesses were severely damaged.
 - Major damage to water, telecom, transportation, and power infrastructure.
 - Widespread agricultural devastation—80% of crops destroyed in Puerto Rico.²
- Population loss
 - There was a large outflow of residents to the mainland after the storm, exacerbating the islands' ongoing population decline of the past decade.
 - It remains to be seen how many of these migrants have returned or will return.
- Economic disruption
 - In the first few weeks, there were widespread power and telecommunications outages, fuel shortages, and transportation blockages.
 - Many areas have gone without electricity and running water for months.
 - Economic activity declined sharply in September and October.

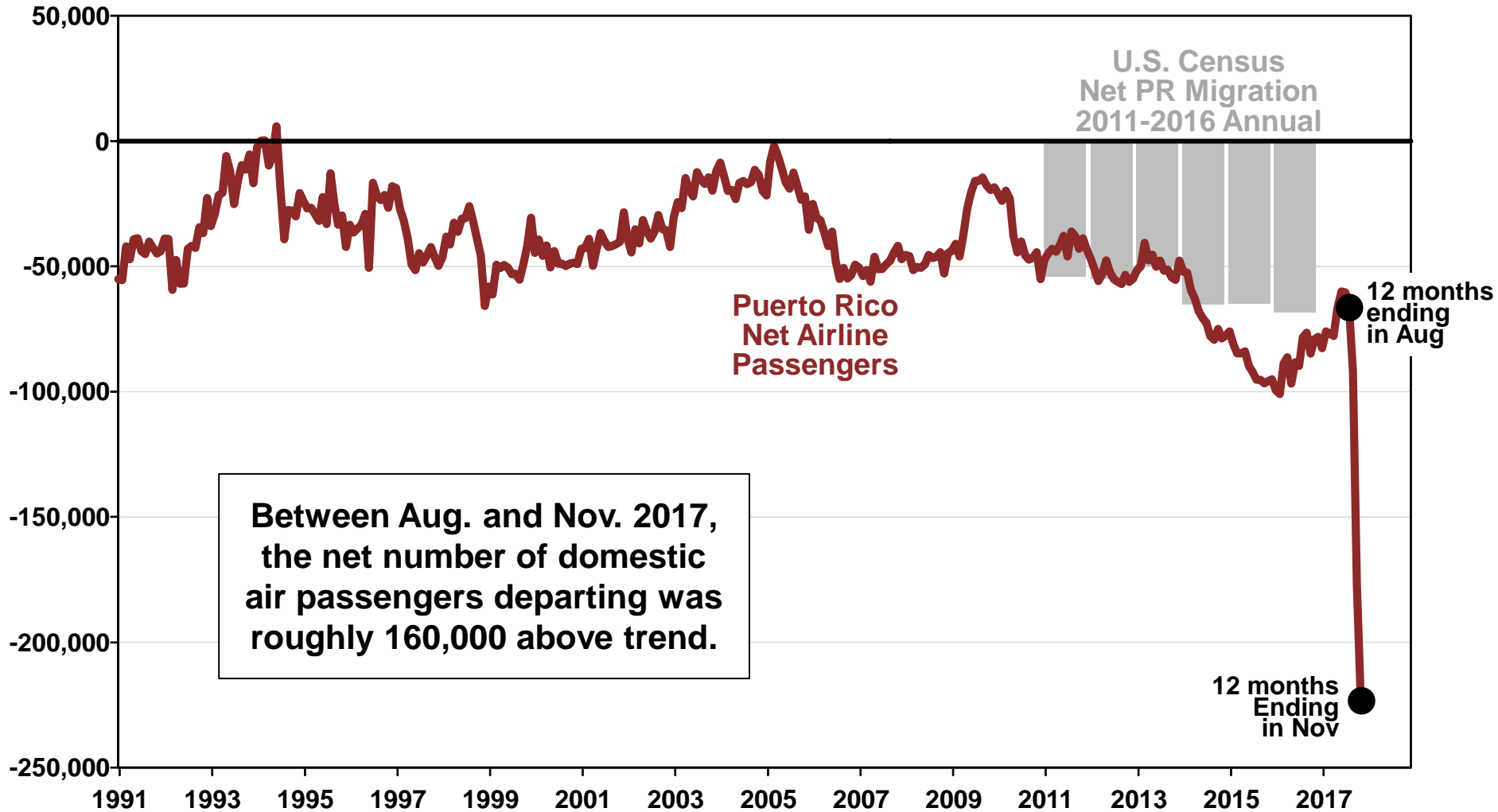
1) "Estimates of excess deaths in Puerto Rico following Hurricane Maria" Alexis Santos & Jeffrey T. Howard (Dec. 2017)
<https://osf.io/preprints/socarxiv/s7dmu>

2) Attributed to Carlos Flores Ortega, Secretary of Agriculture for Puerto Rico



Population Loss After the Storms

Net Domestic Passengers to Puerto Rico, 12-Month Rolling Sum



Note: Airports are Luis Munoz Marin Intl Airport in San Juan, Mercedita Intl Airport in Ponce, and Rafael Hernandez Intl Airport in Aguadilla. Source: U.S. Bureau of Transportation Statistics and FRBNY staff calculations.

Assessing Damage and Recovery: Nighttime Lights

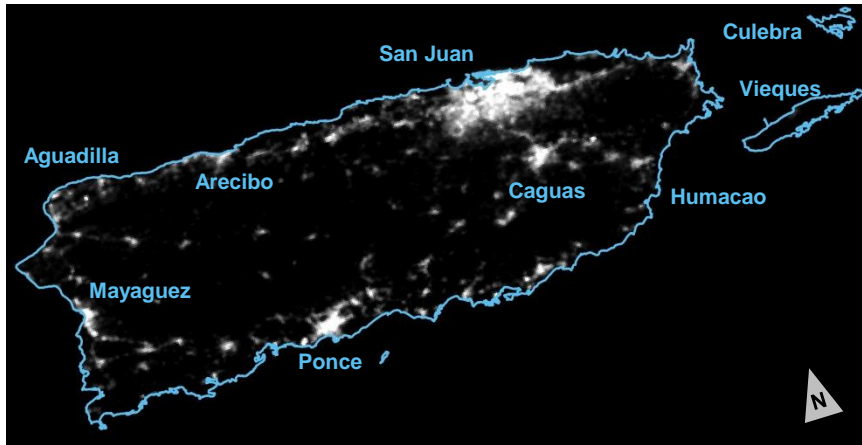
- Research¹ shows that nighttime lights can serve as a proxy for economic activity, though the relationship is not one-to-one—particularly during a power outage.
- Nighttime light images can be used to gauge the loss and subsequent restoration of power after the storms.
- Nighttime lights can provide some indication of which localities were most affected, and how quickly they are recovering.

1) “Newer Need Not be Better: Evaluating the Penn World Tables and the World Development Indicators Using Nighttime Lights” (Maxim Pinkovskiy and Xavier Sala-i-Martin, 2016) <http://www.nber.org/papers/w22216>

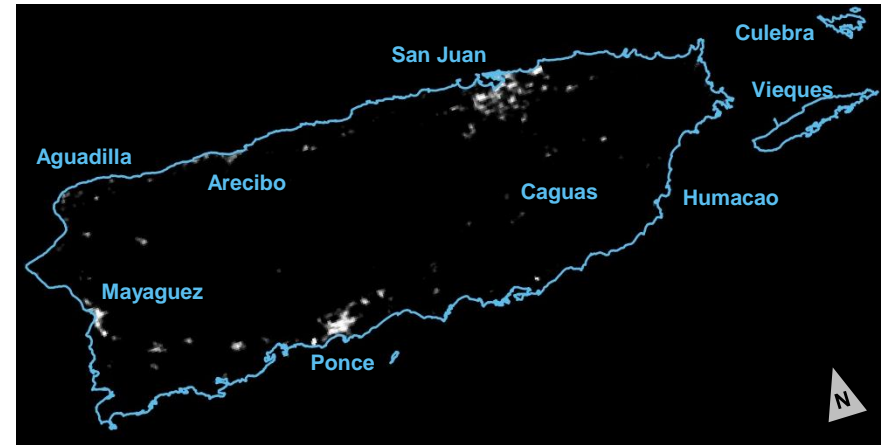


Nighttime Lights in Puerto Rico

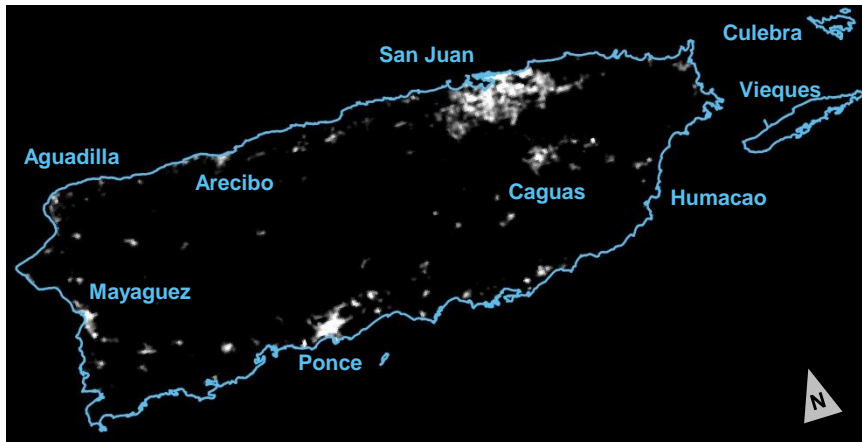
August



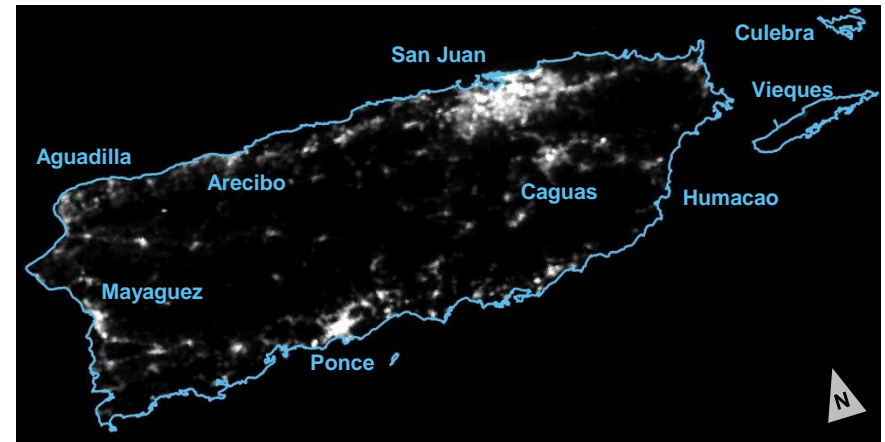
October



December



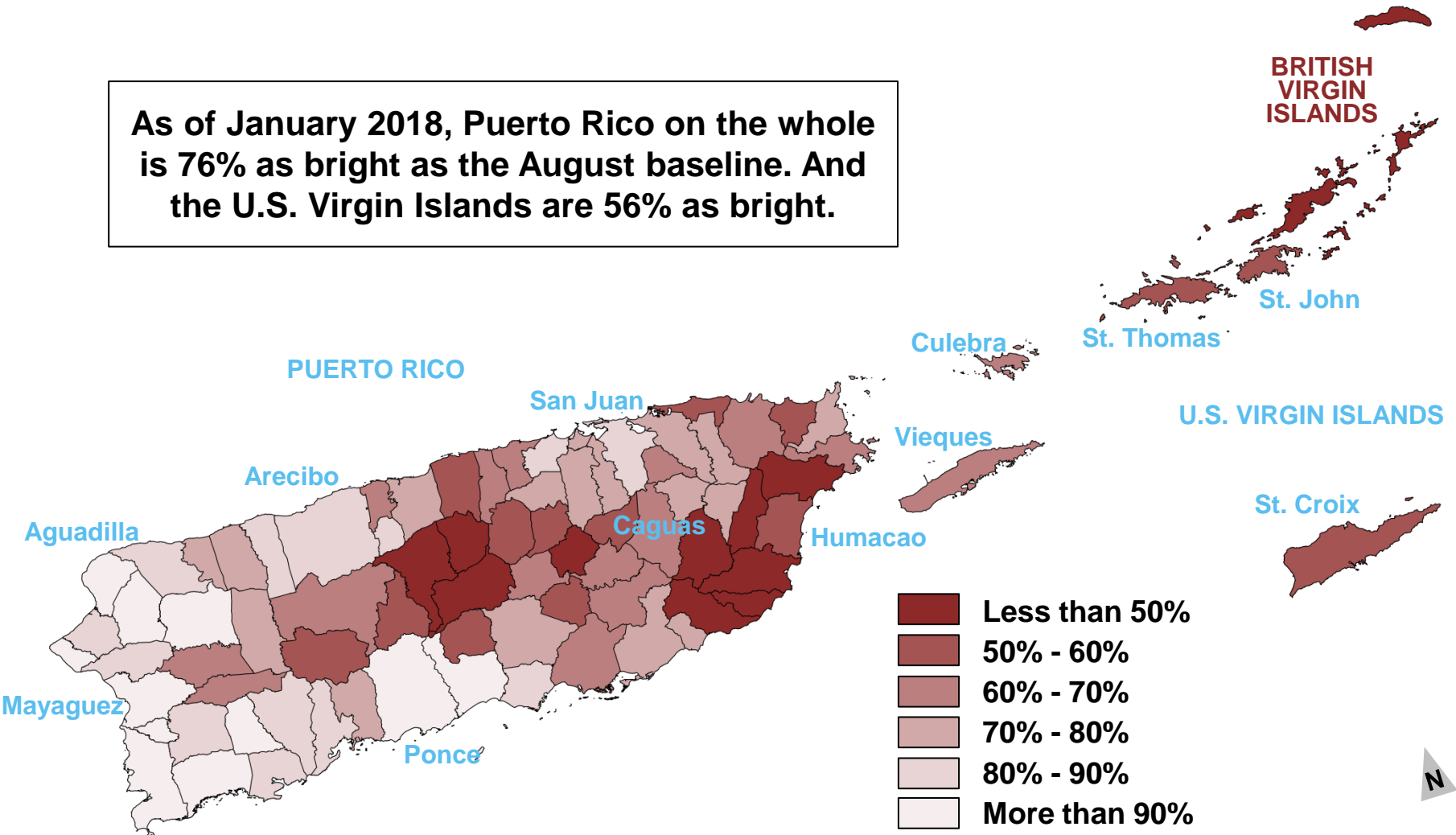
January



January Nighttime Lights

Brightness as a Percentage of August Baseline

As of January 2018, Puerto Rico on the whole is 76% as bright as the August baseline. And the U.S. Virgin Islands are 56% as bright.



Economic Outlook After the Storms

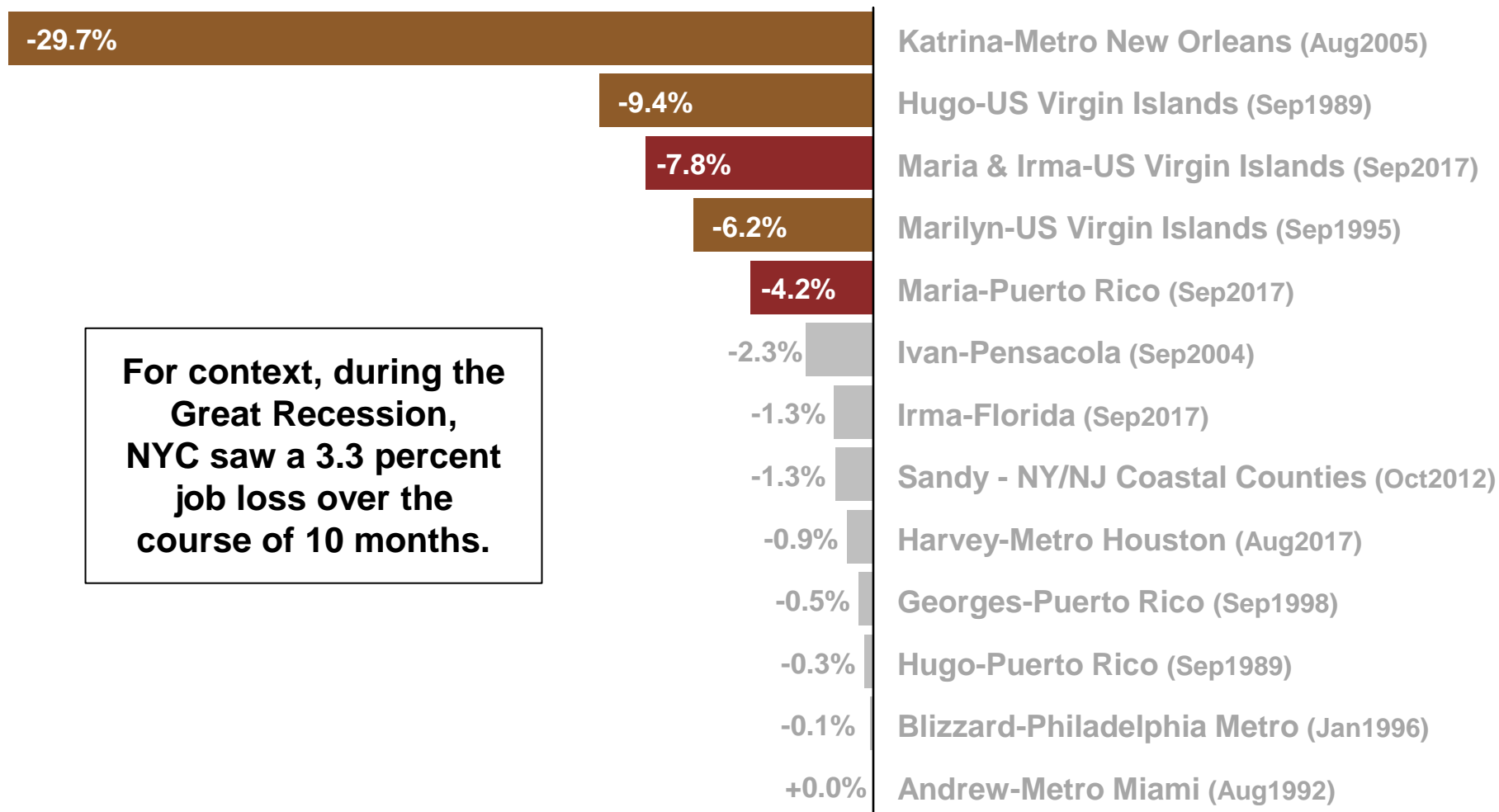
How Does This Compare to Other Disasters?

- Economic effects of natural disasters share some common elements:
 - Economic disruptions tend to be severe for 1-2 months but then dissipate.
 - Subsequently, economic activity is boosted by clean-up, restoration, and reconstruction efforts.
 - Insurance payouts and federal aid further buoy spending and investment.
 - In considering how Puerto Rico's economy might be affected in the longer run, this history can be a useful guide.
- Still, this disaster has unique features that complicate comparisons with other natural disasters.
 - The power outage has been by far the most severe in U.S. history, in terms of total customer-hours lost.
 - The dire fiscal situation in both territories before the storms is unprecedented.
 - These and other issues make it harder to predict economic prospects.



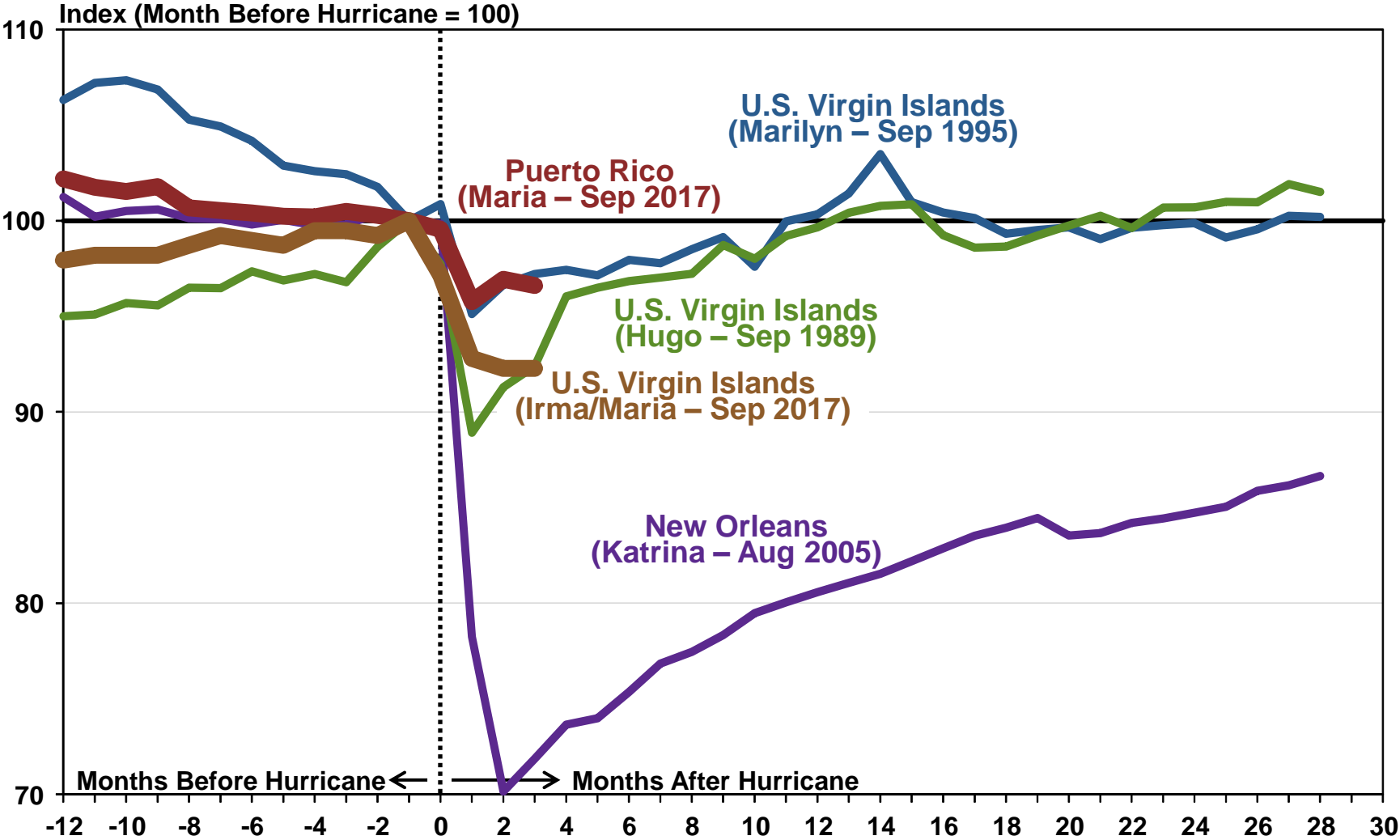
How Does This Compare to Other Disasters?

Local Job Loss Following Natural Disasters, from Onset to Trough



Employment Paths Post Hurricanes

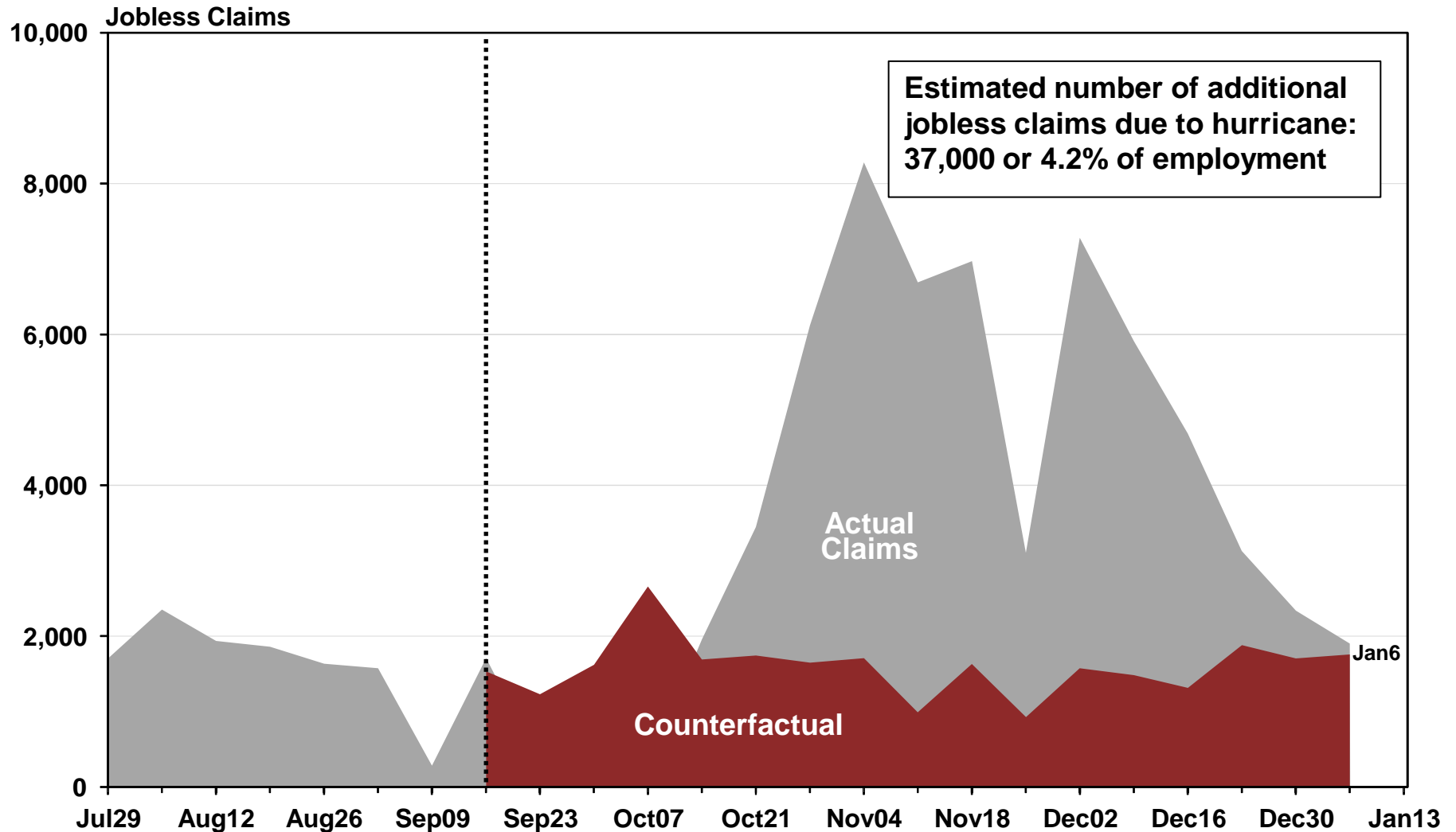
Index (Month Before Hurricane = 100)



Source: U.S. Bureau of Labor Statistics, Moody's Economy.com, and FRBNY staff calculations.

Jobless Claims Confirm Payroll Data

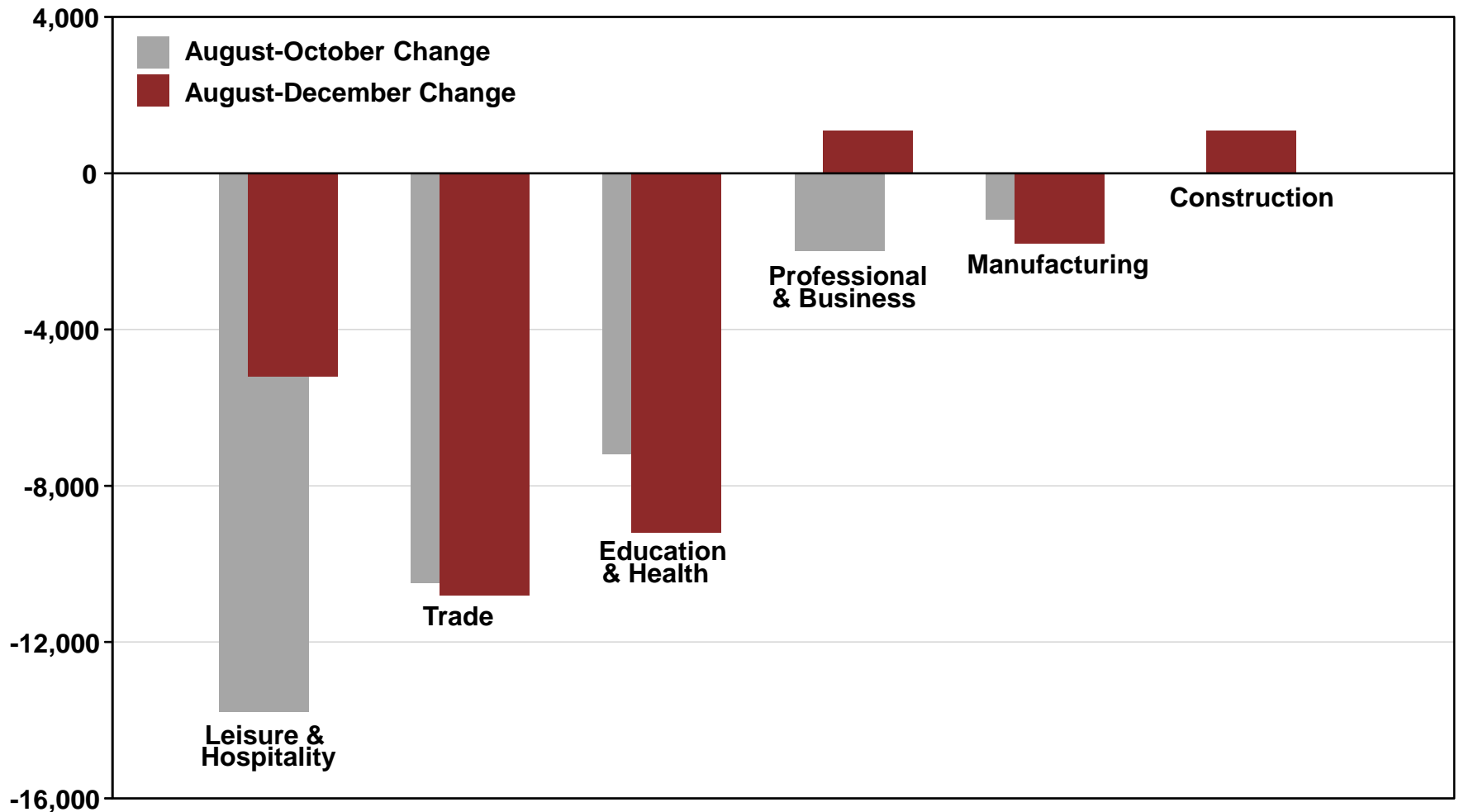
Weekly Initial Jobless Claims in Puerto Rico Before and After Maria



Note: Since there was no significant time trend pre-storm, the counterfactual is set to the level from the same week of the prior year.
Source: U.S. Department of Labor. Employment and Training Administration; Haver Analytics; Staff calculations.

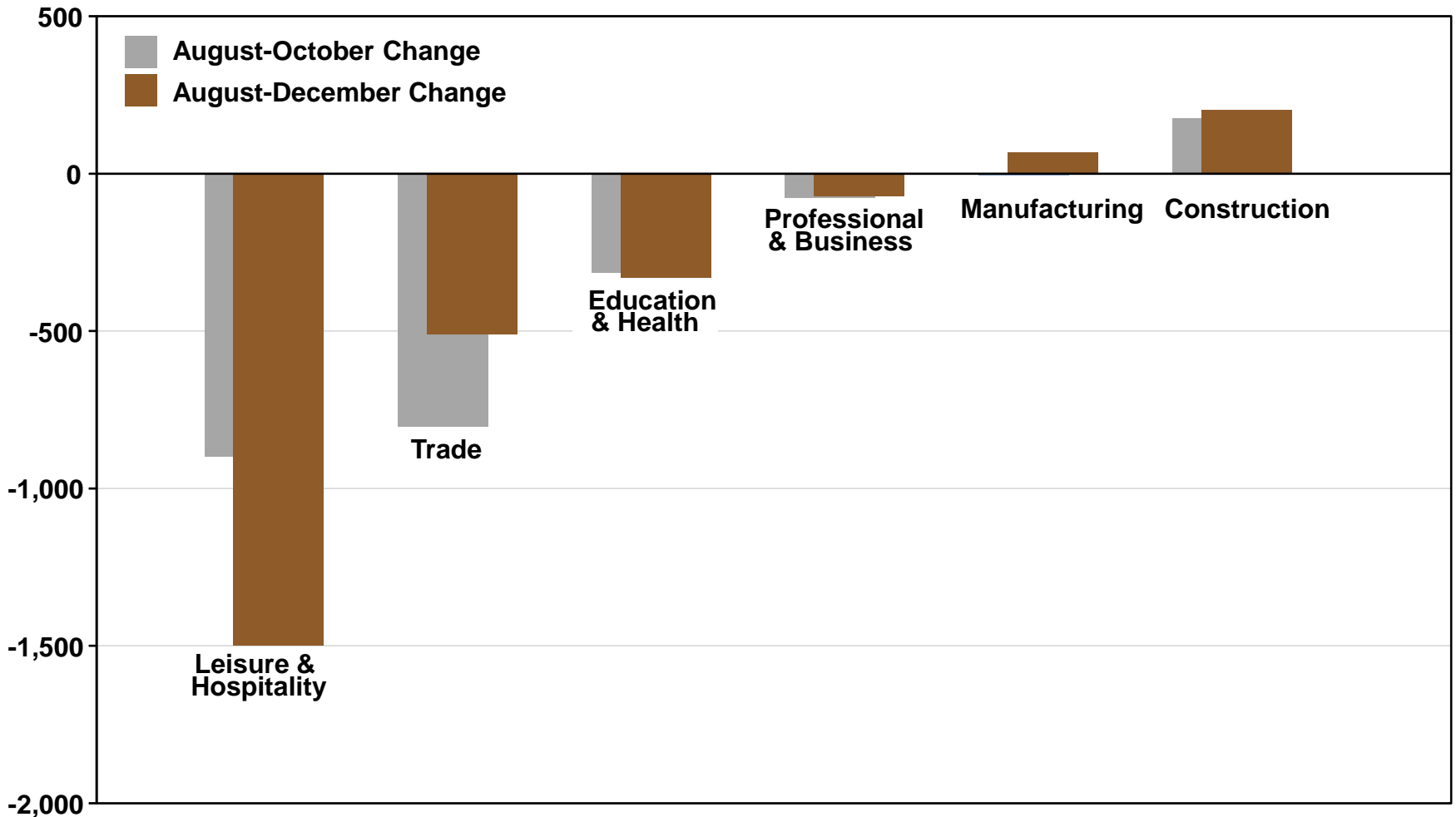
Jobs Lost by Sector in Puerto Rico

Aug-Oct Job Change vs. Aug-Dec Job Change



Jobs Lost by Sector in USVI

Aug-Oct Job Change vs. Aug-Dec Job Change



Assessing the Economic Fallout

- Job losses in Puerto Rico (4%) and the USVI (8%), though far less severe than after Katrina, are still substantial.
- Some businesses and homes had backup power, which may have helped mitigate the economic effect somewhat.
- The job loss may understate the true economic cost because:
 - At least some of those still employed likely suffered a drop-off in income.
 - There may be additional unmeasured effects on the informal economy.
 - We do not account for the value people place on quality-of-life issues.



Conclusions

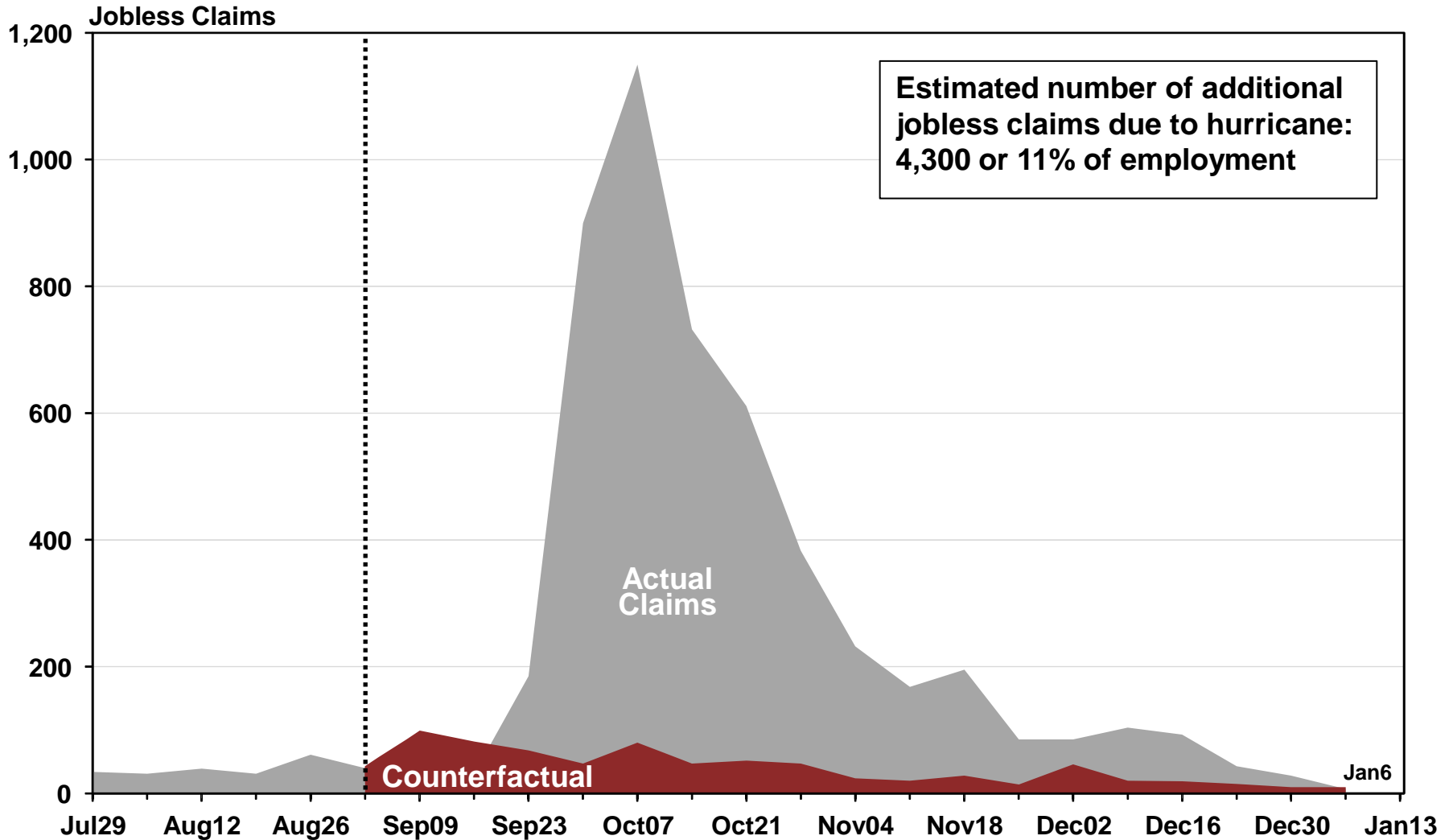
- Hurricanes Maria and Irma were overlaid onto already weak economies, raising concerns about longer-term prospects for the Puerto Rico and the USVI economies.
- Despite widespread devastation and the dire situation before the storms, Puerto Rico's economy has shown some signs of resilience, while the USVI appears to be taking longer to recover.
- Looking ahead, the recovery will be affected by the degree of out-migration, external aid, fiscal and other reforms.



Appendix

U.S. Virgin Islands Jobless Claims

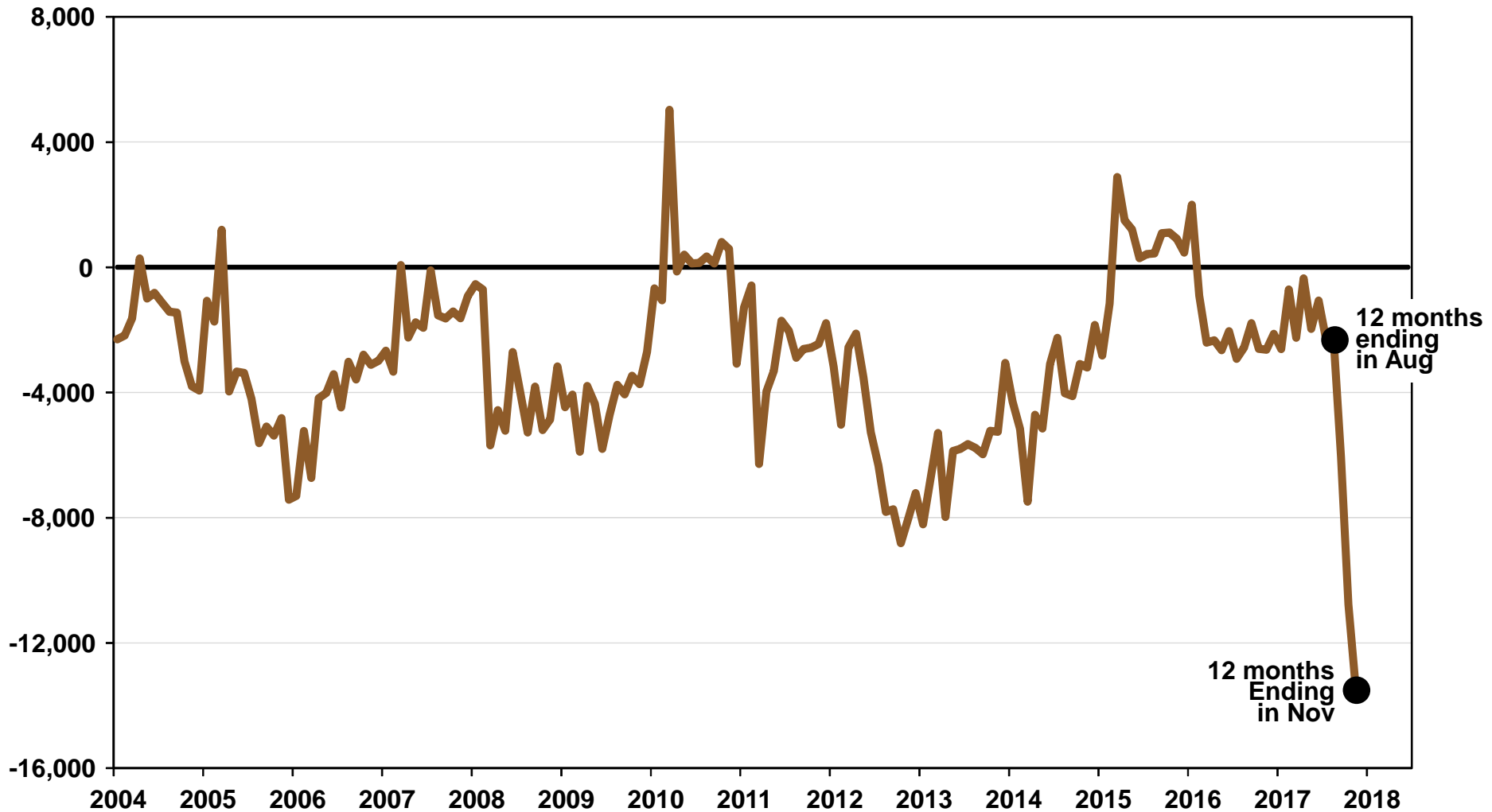
Weekly Initial Jobless Claims in USVI Before and After Irma & Maria



Note: Since there was no significant time trend pre-storm, the counterfactual is set to the level from the same week of the prior year.
Source: U.S. Department of Labor. Employment and Training Administration; Haver Analytics; Staff calculations.

Population Loss After the Storms

Net Domestic Passengers to U.S. Virgin Islands, 12-Month Rolling Sum



Note: Airports are Cyril E. King Airport in St. Thomas and Henry E. Rohlsen Airport in St. Croix.
Source: U.S. Bureau of Transportation Statistics and FRBNY staff calculations.