



FEDERAL RESERVE BANK *of* NEW YORK

Puerto Rico & the US Virgin Islands in the Aftermath of Hurricanes Irma and Maria

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June 20, 2018

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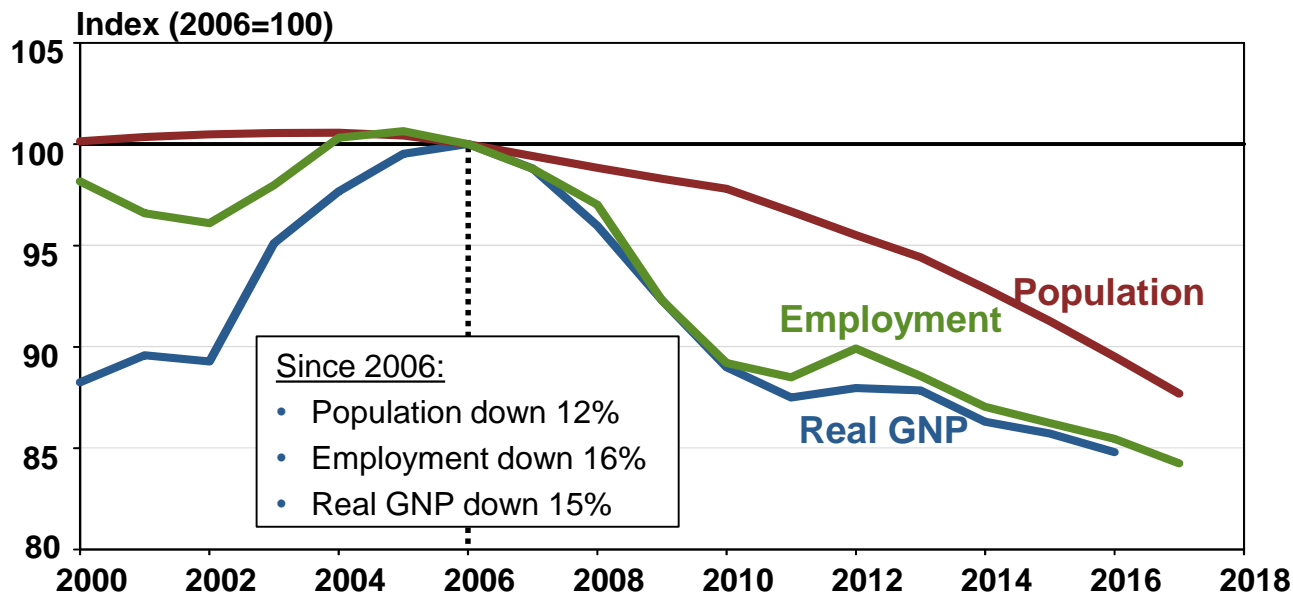
Overview

- Economic & fiscal conditions in Puerto Rico and US Virgin Islands (USVI) were poor even before hurricanes Irma & Maria.
- Puerto Rico's economic downturn began in 2006; the USVI began a few years later.
- We look at a variety of indicators to help gauge the hurricanes' effects on these areas' economy and outlook.
- Despite widespread devastation, the Puerto Rico economy has shown some signs of resilience; the USVI less so.
- 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.



Puerto Rico Economic & Fiscal Conditions

Indexes of Economic Activity, Employment, and Population

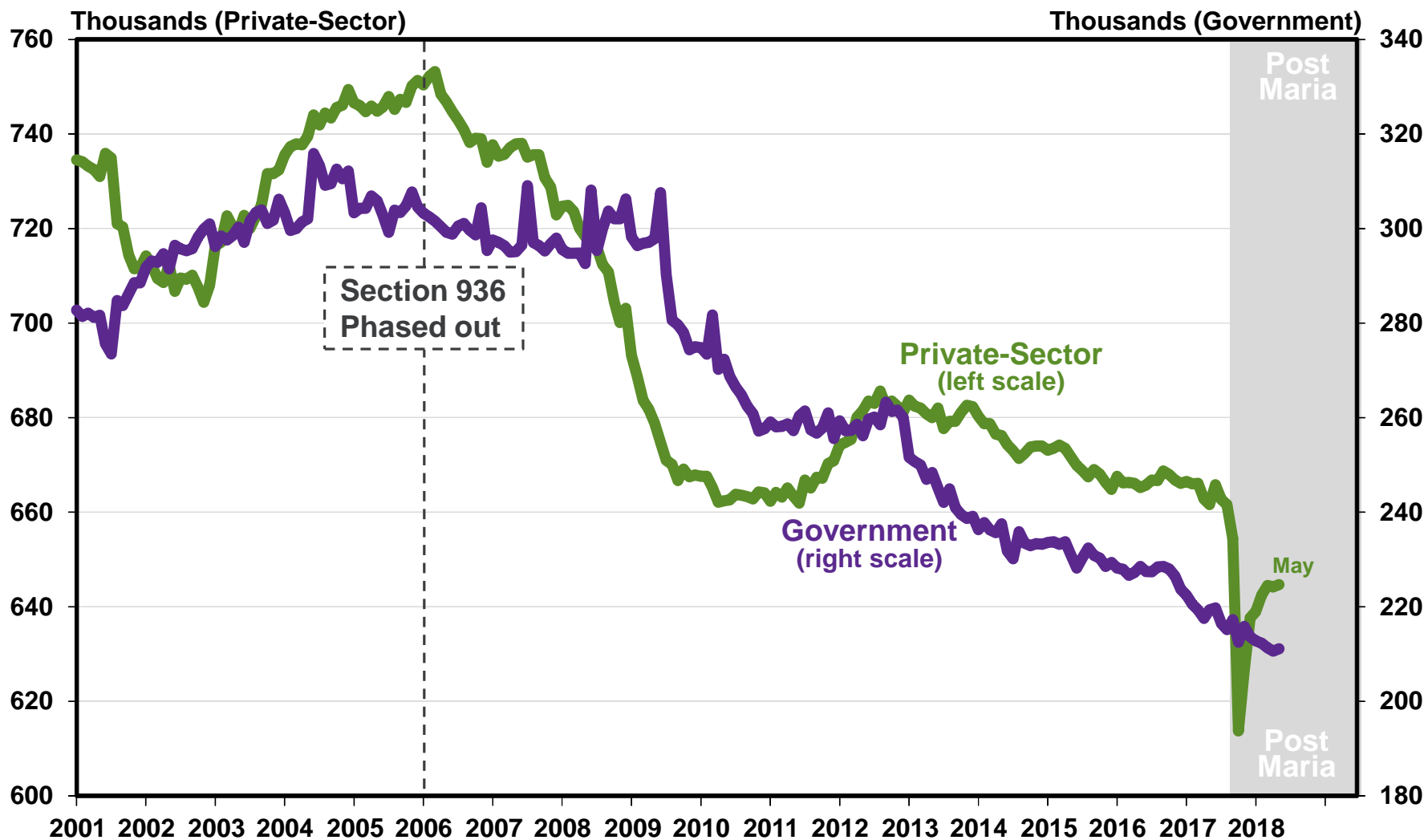


Sources: U.S. Bureau of Labor Statistics, U.S. Census Bureau, Planning Board of Puerto Rico, and Moody's Economy.com.

- 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.
- U.S. Congress implemented PROMESA in 2016 to restore long-term economic growth and fiscal balance, creating a fiscal oversight board and a bankruptcy-like process.

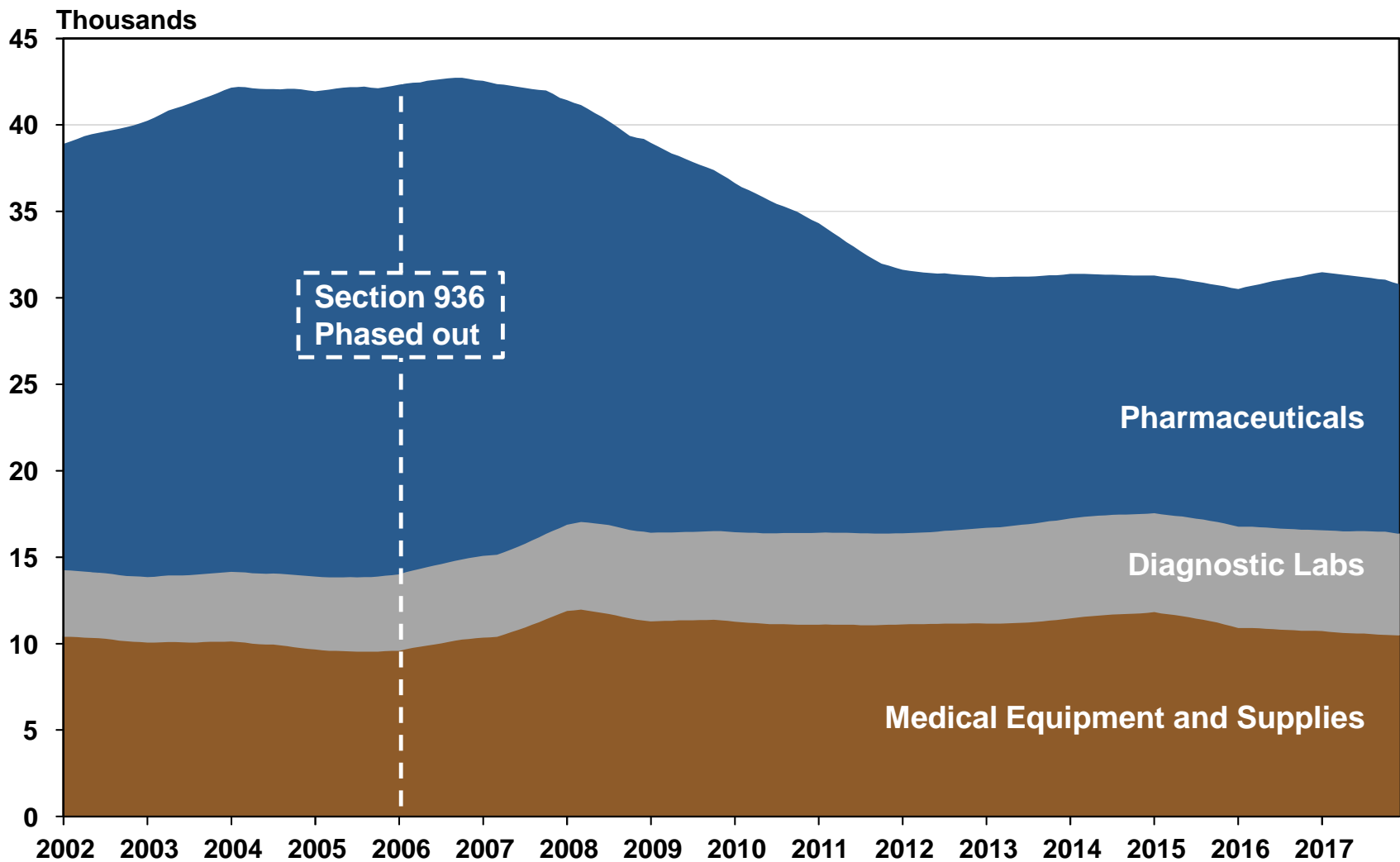
Puerto Rico Economic & Fiscal Conditions

Payroll Employment, Thousands of Jobs, Seasonally Adjusted



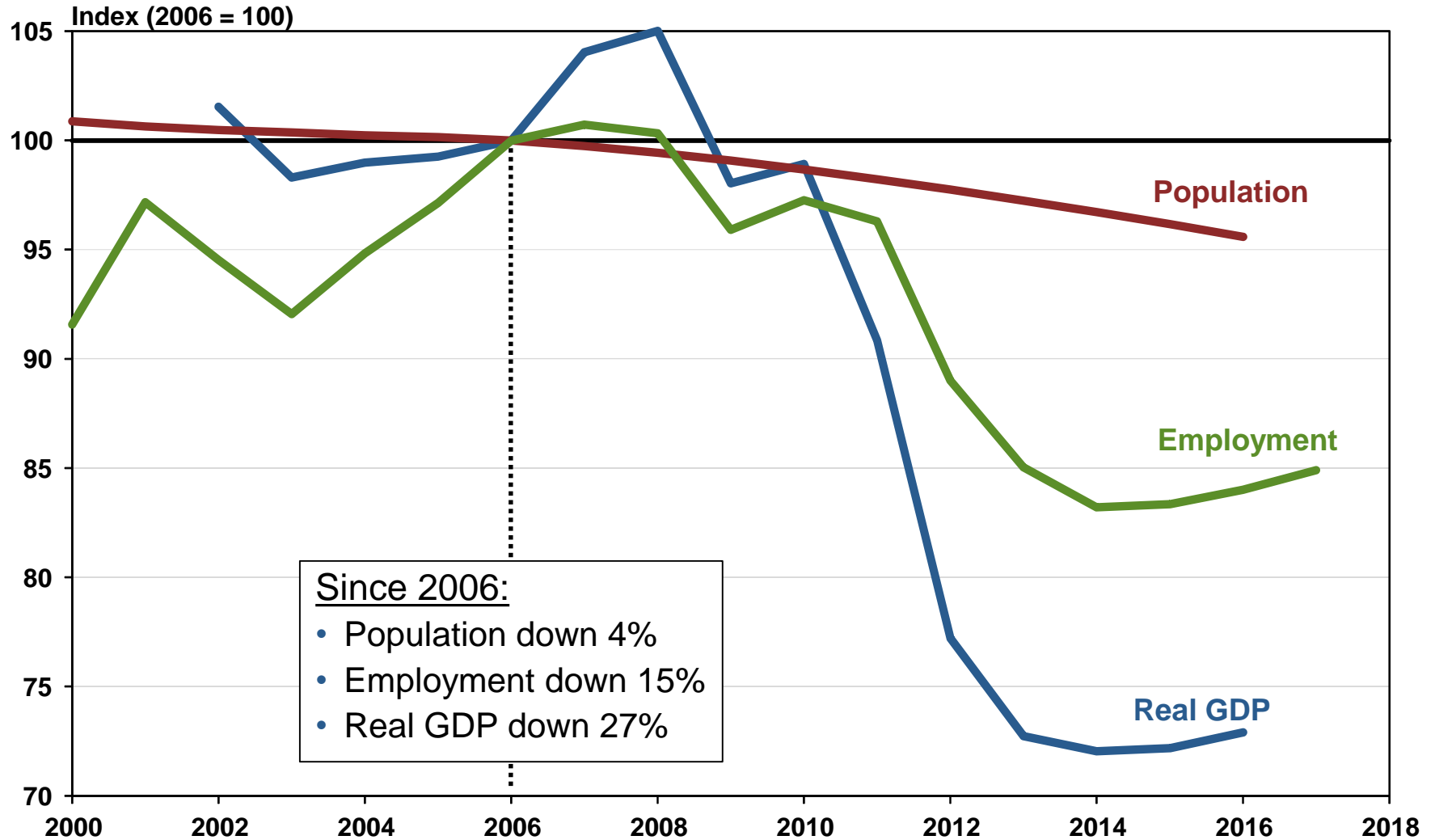
Puerto Rico Economic & Fiscal Conditions

Medical Cluster Employment, 12-Month Moving Average



USVI Also Weak Well Before Irma & Maria

Indexes of Economic Activity, Employment, and Population



Initial Impacts of the Storms

Fallout on Puerto Rico

- Physical damage and loss of life
 - More than 1,000 deaths have been attributed to the hurricane in Puerto Rico, with estimates ranging from roughly 1,050 to 4,600.¹
 - 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
 - Air passenger data through March suggest that 175K residents left Puerto Rico after Maria and had not returned, exacerbating the islands' ongoing population decline.
 - It remains to be seen how many of these migrants will return in the months ahead.
- Economic disruption
 - In the first few weeks, there were widespread power and telecommunications outages, fuel shortages, and transportation blockages.
 - Many areas went without electricity and running water for months.
 - Economic activity fell sharply in September and October but subsequently rebounded.

1) "Estimates of excess deaths in Puerto Rico following Hurricane Maria" Alexis Santos & Jeffrey T. Howard (Dec. 2017)

<https://osf.io/preprints/socarxiv/s7dmu>

"Mortality in Puerto Rico after Hurricane Maria" (New England Journal of Medicine, May 2018)

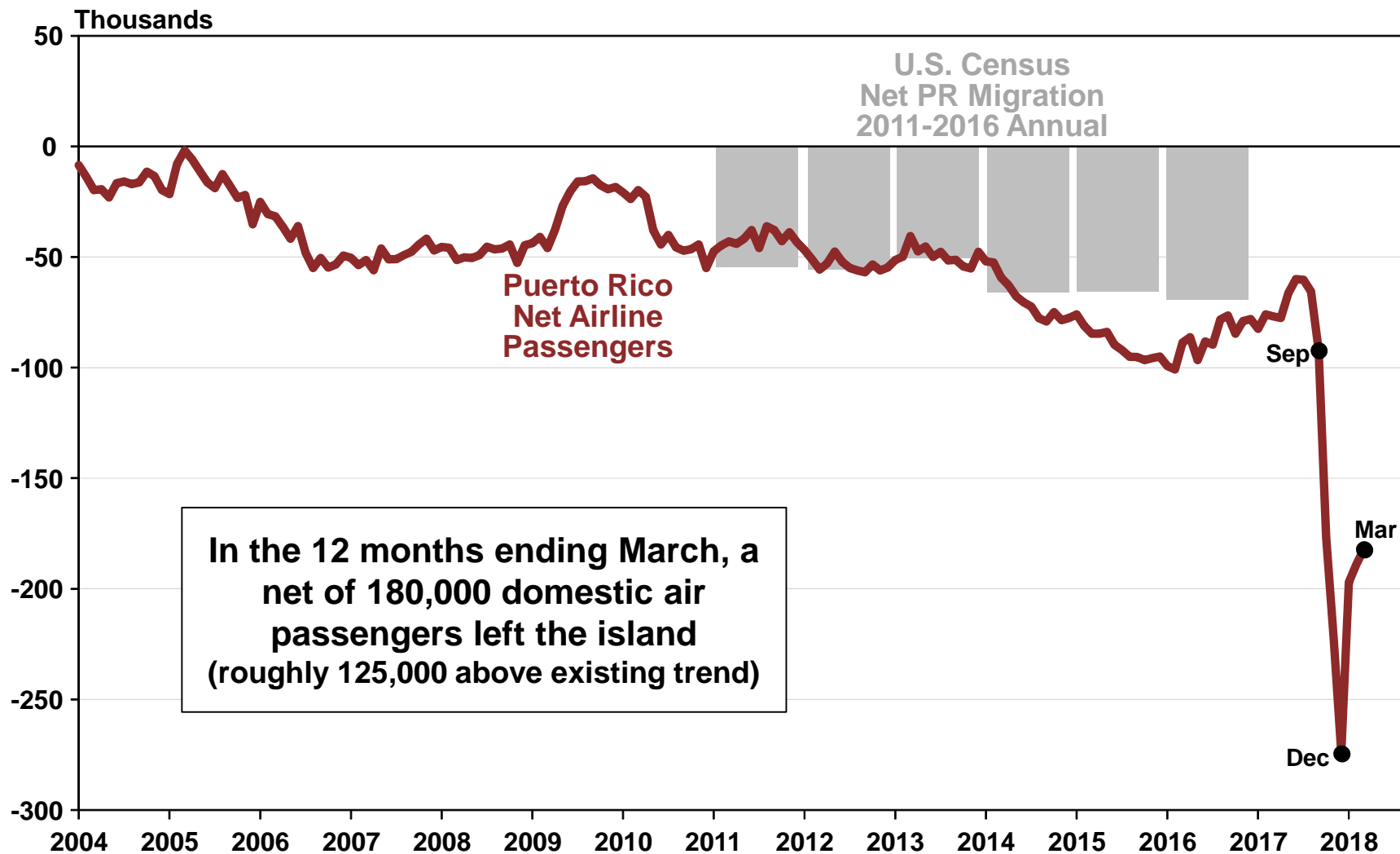
<https://www.nejm.org/doi/full/10.1056/NEJMsa1803972>

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.
- In Puerto Rico, nighttime light images can be used to gauge the loss and subsequent restoration of power after the storms—which localities were most affected, and how quickly they recovered.
- In the US Virgin Islands, where power was restored more quickly, nighttime lights can provide some indication of the reduction in economic activity.

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 and USVI

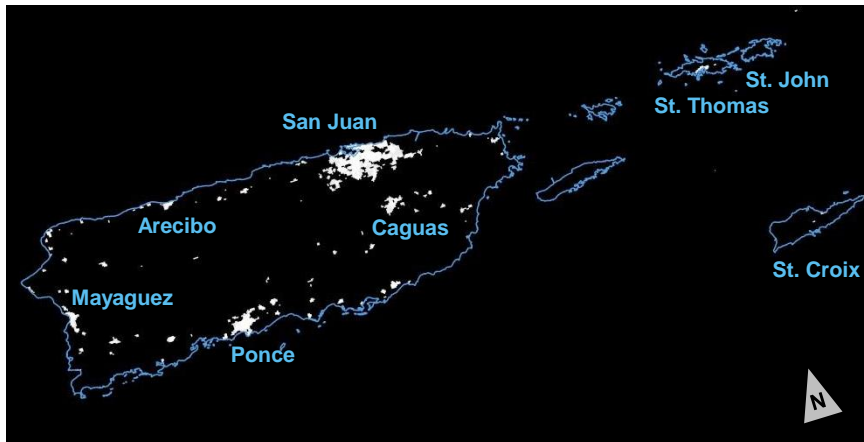
August



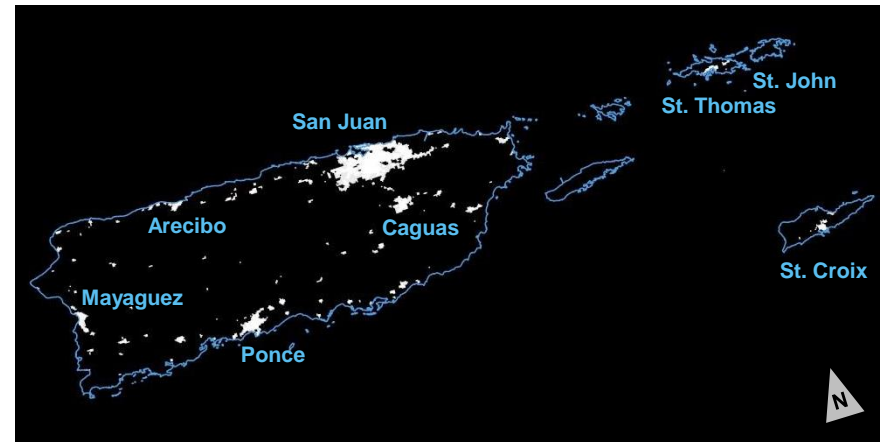
October



December



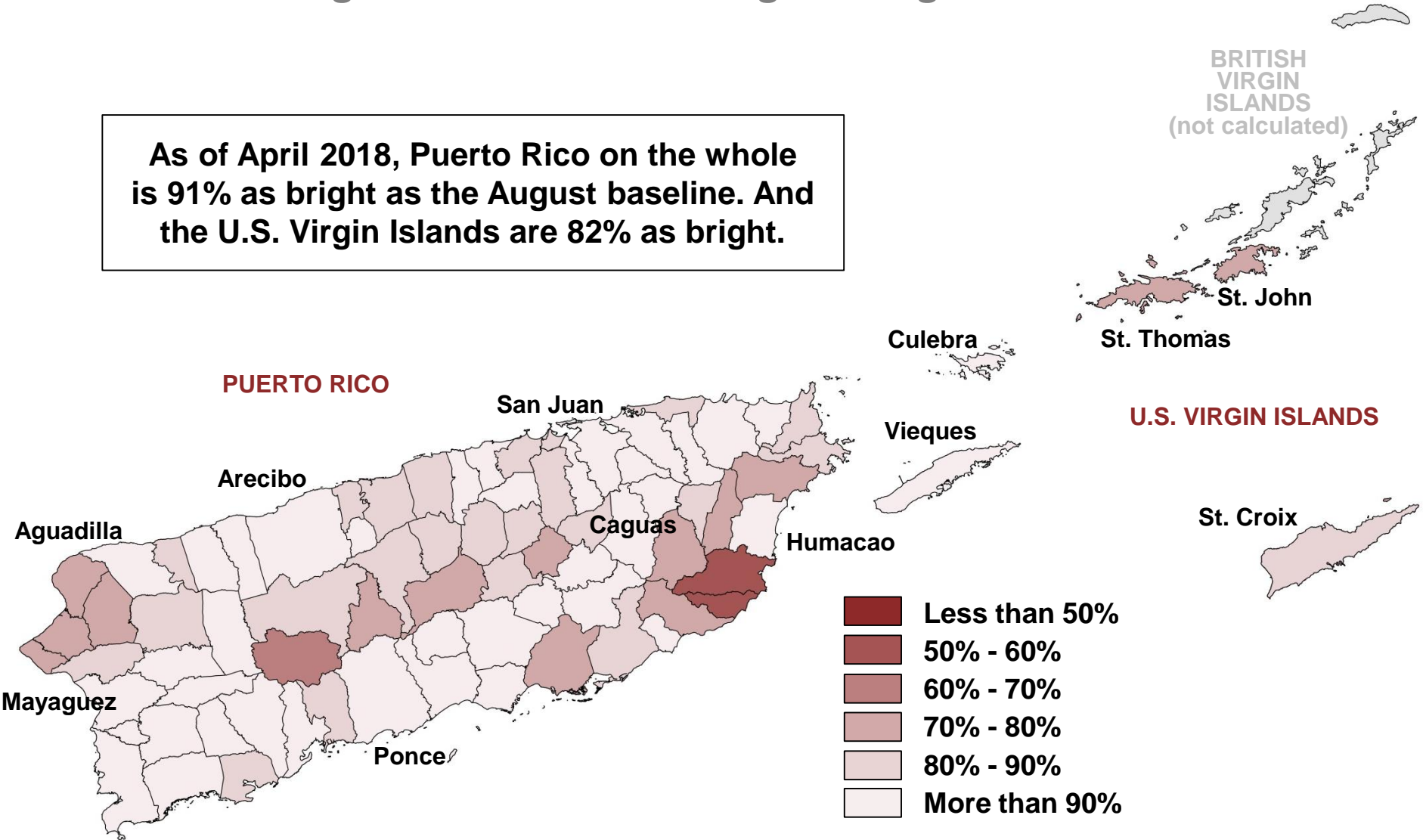
April



April Nighttime Lights

Brightness as a Percentage of August Baseline

As of April 2018, Puerto Rico on the whole is 91% as bright as the August baseline. And the U.S. Virgin Islands are 82% as bright.



Economic Outlook After the Storms

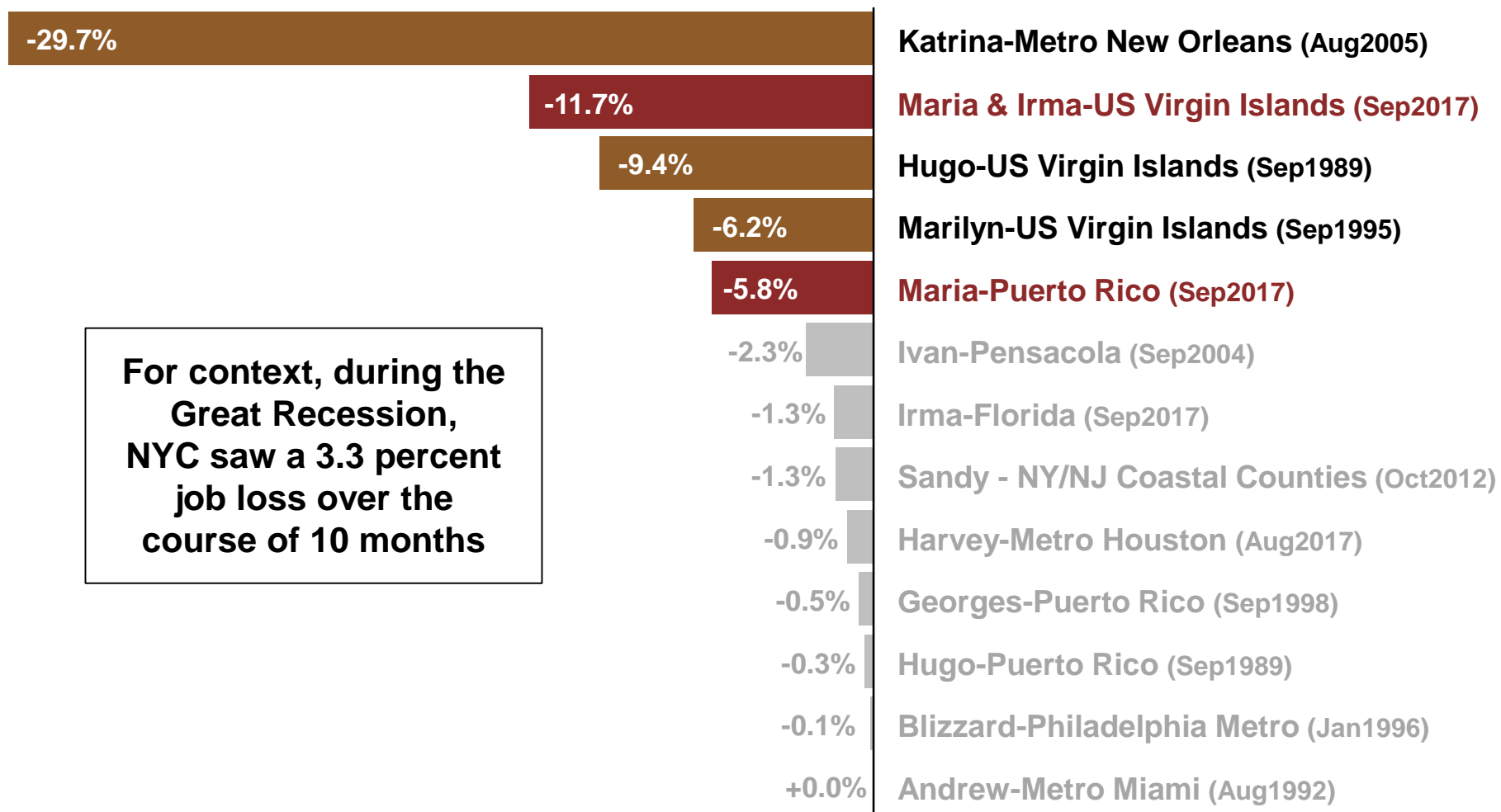
How Does This Compare to Other Disasters?

- Economic effects of natural disasters share some common elements:
 - Economic disruptions tend to be severe for 1-2 months but then dissipate.
 - Typically tourism-related industries are the most adversely affected.
 - 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 lasted much longer than after past disasters.
 - Puerto Rico's dire fiscal situation before the storm is unprecedented.
 - These and other issues make it harder to predict Puerto Rico's prospects.
 - The US Virgin Islands' dependence on tourism likely prolonged the slump.



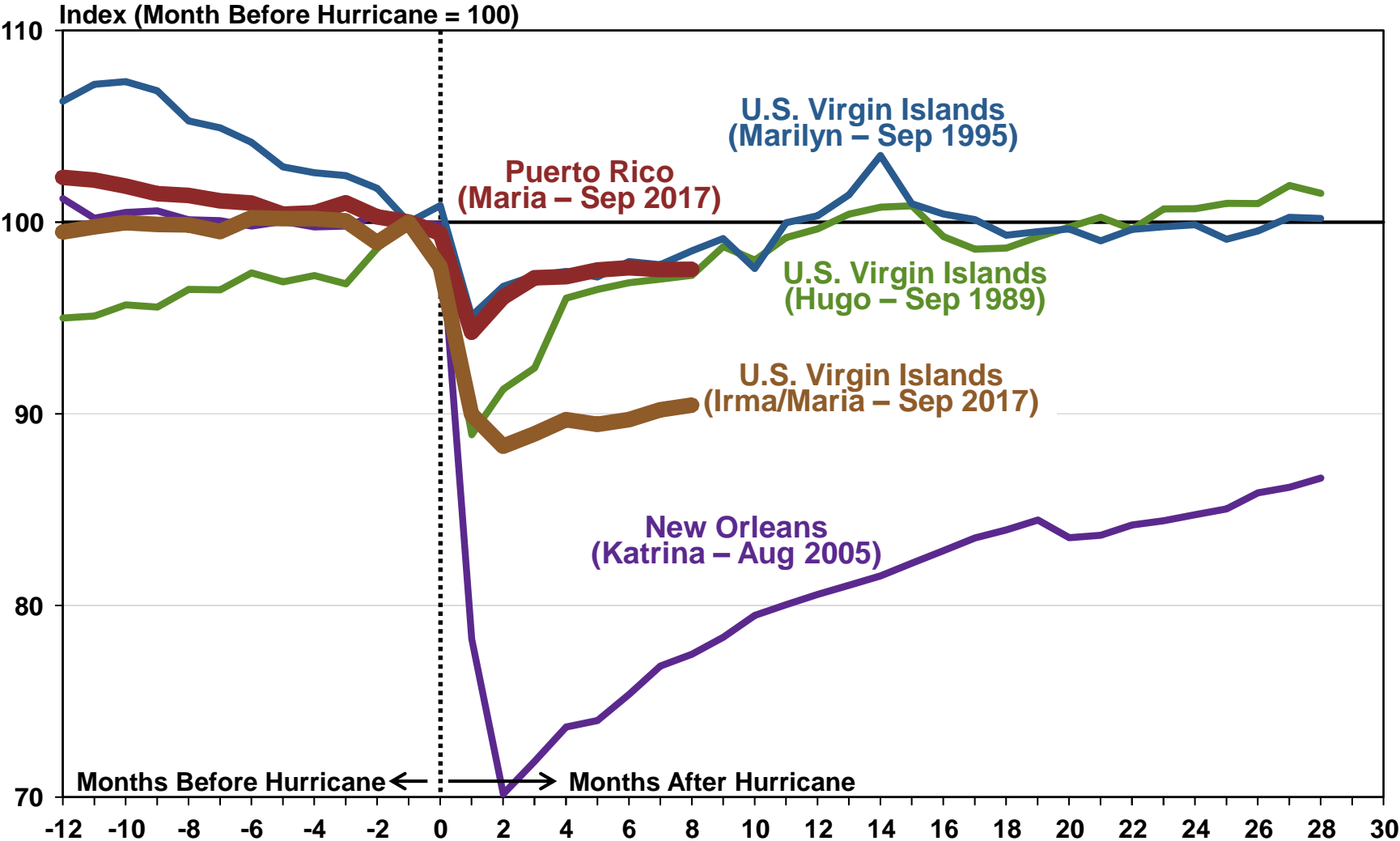
How Does This Compare to Other Disasters?

Local Job Loss Following Natural Disasters, from Onset to Trough



Employment Paths Post Hurricanes

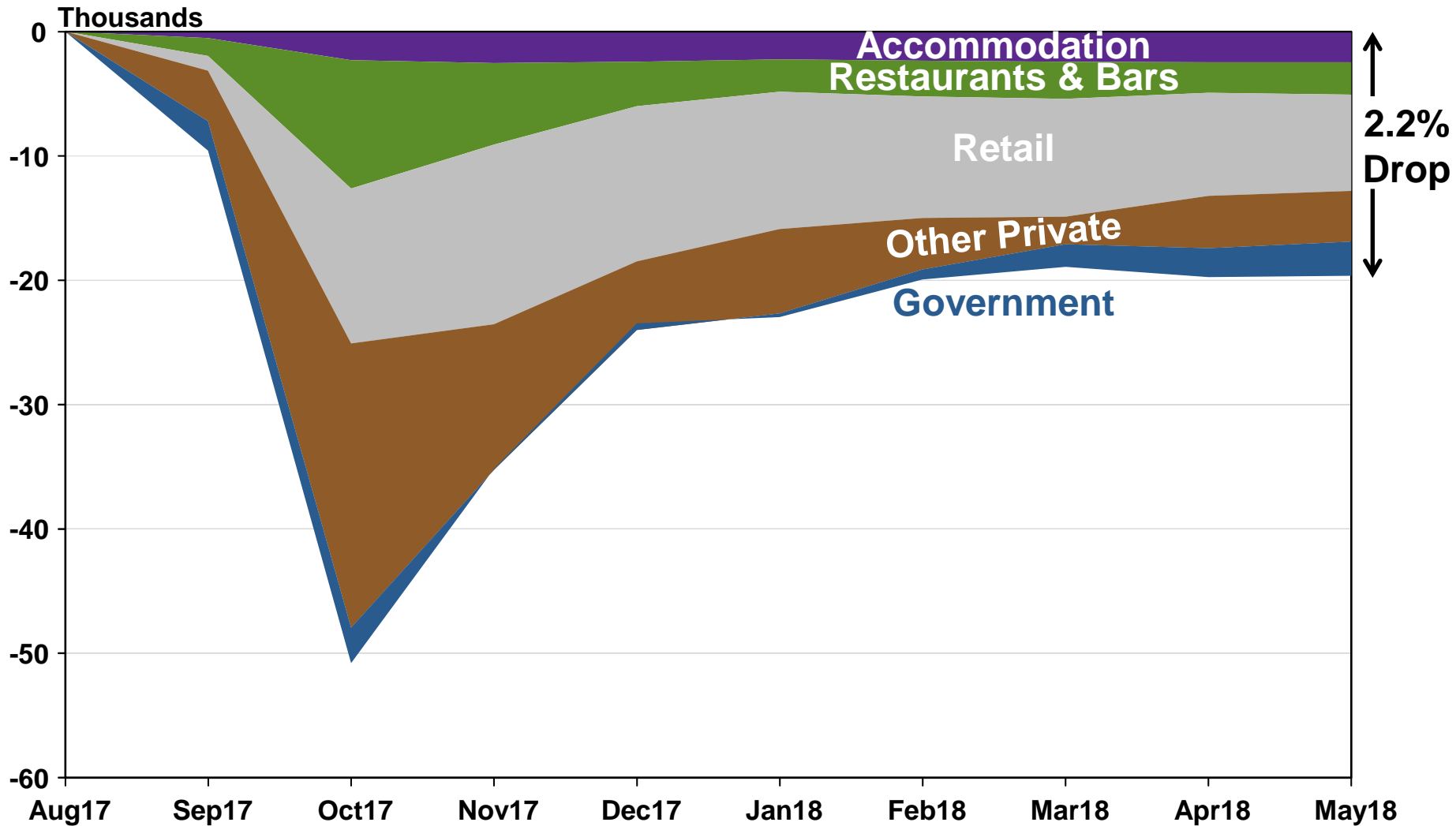
Index (Month Before Hurricane = 100)



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

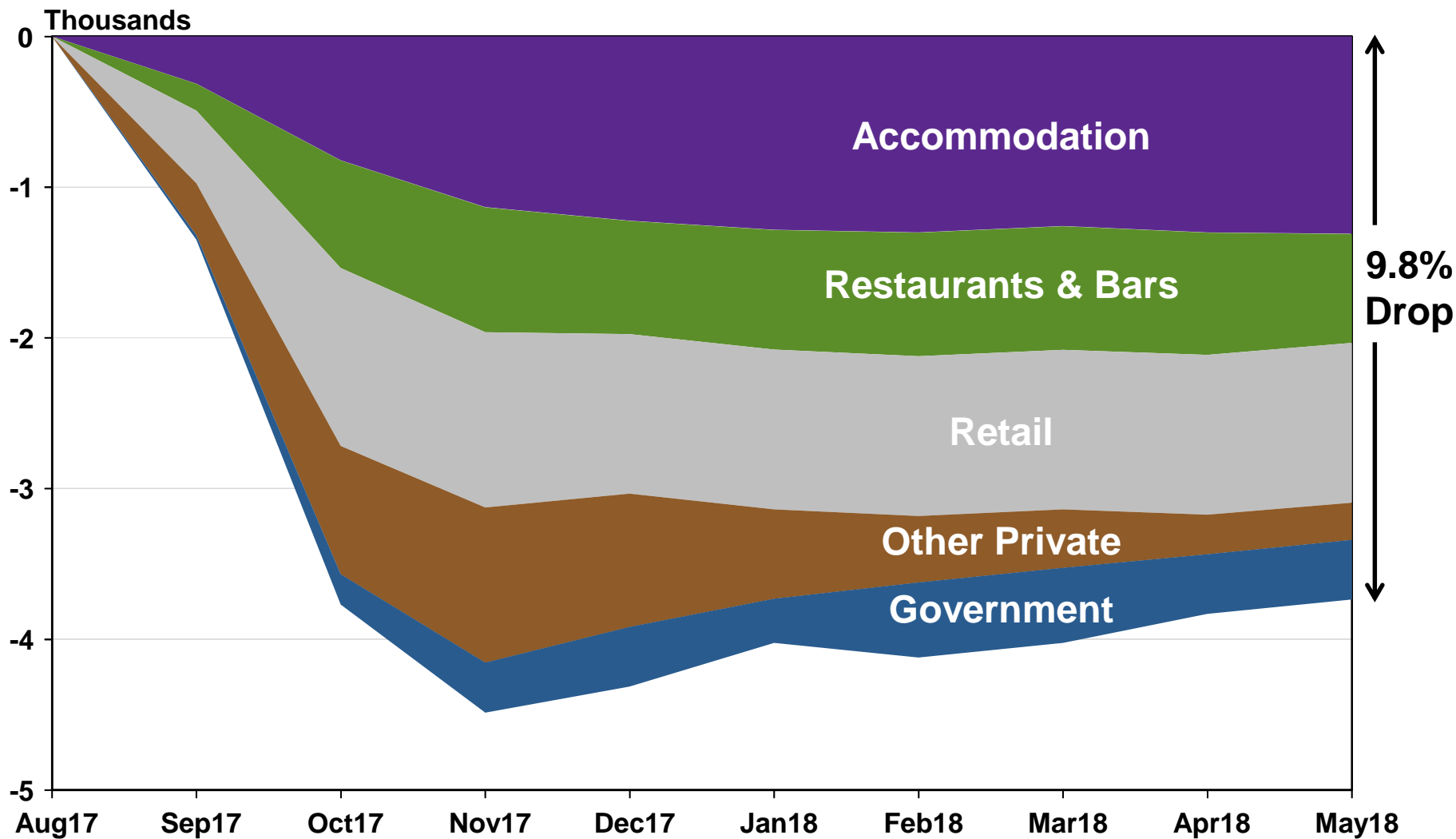
Components of Job Loss by Sector: PR

Thousands of Jobs Lost Since Aug. 2018 (Before Maria)



Components of Job Loss by Sector: USVI

Thousands of Jobs Lost Since Aug. 2018 (Before Irma & Maria)



Assessing the Economic Fallout

- Initial job losses in Puerto Rico (6%) and especially in the USVI (11%), though far less severe than after Katrina, were still substantial.
- The USVI's economy has been much slower to recover than Puerto Rico's, largely due to its dependence on tourism.
- 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 both territories.
- Despite widespread devastation and the dire situation before the storms, Puerto Rico's economy has shown signs of resilience. The Virgin Islands' economy has been more adversely affected.
- Looking ahead, Puerto Rico's recovery will likely be affected by the degree of out-migration, external aid, fiscal & other reforms.
- Some redesign & investment in the electricity and water infrastructure grid also has sizable potential benefits.
- USVI's recovery will likely be affected by how well the tourism infrastructure is restored and how quickly visitors return.

