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

Since 2006:
- Population down 12%
- Employment down 16%
- Real GNP down 15%

USVI Also Weak Well Before Irma & Maria

Indexes of Economic Activity, Employment, and Population

Since 2006:
- Population down 4%
- Employment down 15%
- Real GDP down 27%

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

Between Aug. and Nov. 2017, the net number of domestic air passengers departing was roughly 160,000 above trend.

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

• Research\(^1\) 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.

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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

Source: Earth Observation Group; NOAA National Geophysical Data Center.
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**

<table>
<thead>
<tr>
<th>Disaster Description</th>
<th>Location/Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hurricane Katrina</td>
<td>Metro New Orleans (Aug 2005)</td>
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<tr>
<td>Hurricane Hugo</td>
<td>US Virgin Islands (Sep 1989)</td>
</tr>
<tr>
<td>Hurricane Maria &amp; Irma</td>
<td>US Virgin Islands (Sep 2017)</td>
</tr>
<tr>
<td>Hurricane Marilyn</td>
<td>US Virgin Islands (Sep 1995)</td>
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<tr>
<td>Hurricane Maria</td>
<td>Puerto Rico (Sep 2017)</td>
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<tr>
<td>Hurricane Ivan</td>
<td>Pensacola (Sep 2004)</td>
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<tr>
<td>Hurricane Irma</td>
<td>Florida (Sep 2017)</td>
</tr>
<tr>
<td>Hurricane Hugo</td>
<td>US Virgin Islands (Sep 1989)</td>
</tr>
<tr>
<td>Hurricane Georges</td>
<td>Puerto Rico (Sep 1998)</td>
</tr>
<tr>
<td>Hurricane Hugo</td>
<td>Puerto Rico (Sep 1989)</td>
</tr>
<tr>
<td>Hurricane Sandy</td>
<td>NY/NJ Coastal Counties (Oct 2012)</td>
</tr>
<tr>
<td>Hurricane Harvey</td>
<td>Metro Houston (Aug 2017)</td>
</tr>
<tr>
<td>Hurricane Georges</td>
<td>Puerto Rico (Sep 1998)</td>
</tr>
<tr>
<td>Blizzard</td>
<td>Philadelphia Metro (Jan 1996)</td>
</tr>
<tr>
<td>Hurricane Andrew</td>
<td>Metro Miami (Aug 1992)</td>
</tr>
</tbody>
</table>

For context, during the Great Recession, NYC saw a 3.3 percent job loss over the course of 10 months.

Employment Paths Post Hurricanes

Index (Month Before Hurricane = 100)

Jobless Claims Confirm Payroll Data

Weekly Initial Jobless Claims in Puerto Rico Before and After Maria

Actual Claims

Counterfactual

Estimated number of additional jobless claims due to hurricane: 37,000 or 4.2% of employment

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.