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**Cover Photo:** This aerial image was taken in Holiday Beach near Rockport, Texas, on September 5, 2017, by Lone Star Unmanned Aircraft Systems Center, Texas A&M University-Corpus Christi.
SUMMARY

This report describes the economic aftermath of Hurricane Harvey within the first year after it swept across south and southeastern Texas. Much as the communities in the 41-county federally declared disaster region faced damage to homes, businesses and infrastructure, this epic storm’s immediate impact on the local economies was subsequently dwarfed by federal disaster relief programs that helped kick-start recovery and rebuilding activities by the end of 2017. While scores of impacted businesses remain closed and home repairs are still underway, traditional economic indicators suggest that the overall economic health of hard-hit communities has returned to the pre-Harvey condition, if not better.

This update is part of the Economic Recovery and Resilience project funded by the U.S. Economic Development Administration (EDA).

Read the online version of this report at stedc.atavist.com.

HIGHLIGHTS

- Harvey disproportionately affected relatively smaller communities, some of which also bore the brunt of physical damage.
- Indirect economic impacts in terms of losses in local employment and business revenue were soon offset by gains from recovery and rebuilding efforts.
- Economic recovery in hard-hit areas was in full swing within one year of the storm. The main drivers for local economic growth were disaster relief programs that have boosted local economic activity, leading to employment and business income growth that may not be sustainable in the long run.

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Introduction

It’s been one year since Hurricane Harvey wreaked havoc across Texas. In addition to dozens of deaths, this record-breaking storm brought massive destruction to homes and other properties in a widespread region along the state’s Gulf Coast. As a complement to our first update, this data-driven report describes Harvey’s economic aftermath and how the affected areas have recovered within the first year. The objective is to provide public officials, policymakers and constituents with fresh insights into community recovery from the economic shocks inflicted by Harvey.

This report covers the 41 counties of the federally designated Harvey disaster region (DR-4332) that were eligible for Individual Assistance from the Federal Emergency Management Agency (FEMA). Our report in the last quarter focused on 22 counties that bore the brunt of property damage.[1] Data extension to another quarter also allows us to better understand changes in the local economies as those impacted communities began to rebuild and recover.

As you’ll see, Texans have proved to be resilient. A wide-ranging view of economic indicators suggests that recovery is already in full swing within most communities in the disaster region.

Harvey Disaster Region
Harvey was a Category 4 storm measuring about 200 miles across. The federally declared disaster region covers about 41,500 square miles of land mass, larger than the states of Connecticut, Massachusetts, New Hampshire, Rhode Island and Vermont combined. Most of those 41 counties are in the south and southeastern parts of Texas along the Gulf Coast between Kleberg and Jefferson counties.

Immediate Impacts

Hurricane Harvey made its first landfall on San Jose Island near Rockport on August 25, 2017, with wind gusts over 130 miles per hour and storm surge as high as 12 feet. During the next five days, the storm stalled over southeastern parts of Texas, causing record amounts of rainfall over 60 inches.

NOAA estimated that Harvey caused at least $125 billion in economic damage, the second costliest natural disaster in U.S. history, exceeded only by Hurricane Katrina. While economic costs of Katrina came mostly from storm surge, Harvey’s impacts were largely from flooding near the Houston area.

Harvey caused nearly 100 deaths in Texas and massive damage to physical properties and infrastructure. Beyond such direct losses, how a storm’s economic impacts are calculated is not an exact science. In fact, losses as outcomes of physical damage does not show up in conventional measures of economic activity, such as employment, output and income.

The main challenge in measuring the economic costs of a disaster event like Harvey is the indirect economic impact. Harvey immediately caused disruptions in business and other productive activities due to evacuations and lost utilities, damage to structures and equipment, displaced employees and so on. These changes hurt the regional economy through losses in business sales, jobs and wage earnings.

But these negative impacts of Harvey on the local economies have proved to be temporary. Economic gains stemming from recovery efforts and rebuilding activity offset most of the overall indirect economic loss as soon as early 2018, less than half a year following the storm.

In addition to insurance payments, the infusion of disaster relief funds from various government agencies and philanthropic organizations have facilitated construction and repair activities that in turn have spurred local business and job growth. The following provides a snapshot of the post-Harvey economies in the disaster region based on the data available so far.
Property Damage

According to the Texas Department of Public Safety, Harvey damaged more than 290,000 homes, with nearly 17,000 destroyed. At least 160,000 structures were flooded in Harris and Galveston counties alone. Flooding also destroyed more than 300,000 vehicles in the Houston region.

The extent of property damage was not felt evenly across the disaster region. The Houston area or Harris County sustained the most property damage by the absolute number simply because that region has the largest population, but Harvey disproportionately affected small communities. According to FEMA, the shares of damaged homes are the highest in areas of the Coastal Bend, where Harvey made its first landfall, and counties in the eastern end of Texas, such as Jefferson and Orange. In particular, more than 75% of homes in Aransas and Refugio counties were damaged, and about 25% of them were considered destroyed or uninhabitable.
Lost Businesses

In addition to home and personal properties, Harvey directly damaged business properties due to winds, storm surge, or flood water. During the fourth quarter of 2017, the 41-county disaster region as a whole reported 38,000 newer business establishments, or a 13.5% drop, compared to the same quarter in 2016. These establishments might be closed either temporarily or permanently.

The pattern of lost businesses across the region corresponded to the pattern of property damage. Harris County alone witnessed a loss of about 23,650 business establishments, which accounted for about 15% of the county business population. A total of about 2,000 establishments also disappeared within the Coastal Bend region. Its local communities devastated by Harvey, such as Port Aransas and Rockport-Fulton, each lost about 13% of businesses during that quarter.

Temporarily closed businesses in Port Aransas were responsible for only 61 of the 1,600 fewer establishments in Nueces County. This suggests that the economic impact might have spread beyond the communities hit directly by the storm. Indeed, other parts of Texas collectively also lost 12% of business establishments during that same quarter, which was not much lower than the 13.5% reduction in the disaster region. The spread of disaster impacts across the state might result from a disintermediation of supply chains, particularly from the metro areas of Houston, Corpus Christi and Victoria.

Other economic factors might also have affected the business conditions of local communities in Texas, notably changing oil prices, but reductions in business establishments were more consistent across the 41 disaster counties than other regions. No county within the disaster region gained any business outlets. The losses were also broad based, spreading rather evenly across all industries. Construction experienced the least loss due in part to recovery and rebuilding activities that began soon after the storm.

While the disaster region and the state as a whole suffered losses in business establishments, sales volumes in fact expanded in the vast majority of Texas counties. Even in communities ravaged by Harvey, increased business activity among surviving businesses more than offset lost sales from closed businesses. The disaster region as a whole saw at a net gain of 5% in sales. Port Aransas in Nueces County and Tyler in eastern Texas were exceptions, each garnered 48% less in sales.
Lost Business Establishments, 4th quarter 2017, Y-o-Y Change

**Ranked By Number**

1. Harris
2. Montgomery
3. Fort Bend
4. Nueces
5. Galveston
6. Brazoria
7. Jefferson
8. Victoria
9. Orange
10. Hardin
11. Bastrop
12. Liberty
13. San Patricio
14. Wharton
15. Walker
16. Waller
17. Austin
18. Aransas
19. Chambers
20. Fayette
21. Polk
22. Colorado
23. Calhoun
24. Jasper
25. Caldwell
26. Bee
27. Lee
28. Kleberg
29. DeWitt
30. Matagorda
31. Lavaca
32. Tyler
33. San Jacinto
34. Gonzales
35. Grimes
36. Goliad
37. Karnes
38. Jackson
39. Sabine
40. Refugio
41. Newton

**Ranked By % of Total**

1. Orange
2. Harris
3. Hardin
4. Goliad
5. Calhoun
6. Nueces
7. Victoria
8. Tyler
9. Aransas
10. Waller
11. Fort Bend
12. Montgomery
13. Wharton
14. Bee
15. Galveston
16. Jefferson
17. Lee
18. Austin
19. San Jacinto
20. Walker
21. Brazoria
22. Colorado
23. San Patricio
24. Kleberg
25. Jasper
26. Liberty
27. Chambers
28. DeWitt
29. Lavaca
30. Sabine
31. Newton
32. Refugio
33. Polk
34. Karnes
35. Matagorda
36. Caldwell
37. Gonzales
38. Fayette
39. Bastrop
40. Jackson
41. Grimes

Source: Texas Comptroller of Public Accounts.
Business Outlets by County, 4th Quarter 2017, Y-o-Y Change

Source: Texas Comptroller of Public Accounts.
Recovery at Ground Zero

Aransas County, and particularly its Rockport-Fulton community, are ground zero of the Harvey disaster region. According to FEMA, this area not only experienced the most impact of Harvey, but it also has the least rebuilding capacity to recover.[2] In contrast to Harris County with a population of 4.5 million, Aransas is one of the smallest Texas counties with about 25,000 residents before Harvey.

Yet Aransas County has shown extraordinary resilience. Disaster resilience refers to the capacity to resist external shocks, or actions that promote timely recovery from downturns caused by natural disasters. The first chart of the next page plots the historical pattern of the county unemployment rate beginning August 2017. The dash line represents our baseline projection under the counterfactual assumption that the storm event did not occur at all. The extent of Harvey’s immediate economic impact is well captured by a drastic surge of the unemployment rate from below 5% in months before the storm to above 10% in September.

But since then, Aransas County’s unemployment rate inched down persistently, returning to the pre-Harvey level by August 2018. Improvement in the local economy paralleled gains in sales tax revenues over time, as seen in the second chart. In February, six months following the storm, about half of businesses resumed operation. While about 15% of business establishments in the county remained closed one year after Harvey, sales growth among businesses that have reopened their doors together has more than offset the losses from closed businesses.

Along with business recovery, the infusion of financial resources from various sources, particularly federal and state government agencies and philanthropic organizations, such as the Rebuild Texas Fund, has helped jumpstart the local economy. By August 2018, FEMA had provided Aransas County with slightly less than $30 million in individual and housing assistance to 7,326 residents, along with $104 million in disaster loans through the Small Business Administration (SBA) and $179 million in flood claims. The federal government had also funded 45 public infrastructure redevelopment projects for a total of about $35 million. An increase of more than $312 million in spending programs over the year has boosted growth in local business and employment, as well as a gain in the labor force within Aransas County.
Post-Harvey Economy of Aransas County

Unemployment Rate (%)

Source: Texas Workforce Commission, and South Texas Economic Development Center.

Sales Tax Revenues by Collection Month (Y-o-Y % Change)

Source: Texas Comptroller of Public Accounts, and South Texas Economic Development Center.
By the end of the first year, about 85% of businesses in Rockport and Fulton had returned. This pace of business recovery was phenomenal, especially in comparison with the business reopening rate of 65% in New Orleans two years after Hurricane Katrina of 2005 hit the area.[3] Much as this area relies on tourism as its main economic driver, Harvey ravaged a large portion of its hotel and motel establishments, many of which will not be open again until the end of 2018.
Community Recovery Across the Region

Aransas County’s experience was in fact quite unique. Measured by the conventional economic indicators, the extent of immediate impact and the progress of subsequent recovery have varied widely across the 41-county disaster region.

Changes in the local unemployment rate as a gauge of local economic performance reflected the extent of direct damage to homes and businesses at the county level. As the following charts show, the unemployment rates of most counties have so far stayed close to the baseline or pre-Harvey levels. Other than Aransas, Refugio County is a notable exception, as it is another Coastal Bend area directly hit by Harvey.

As for Aransas County, most areas in the disaster region in fact garnered more business sales and thus sales tax revenues soon after the storm. As the following charts for local sales tax collections indicate, the majority of counties have gained tax revenues on a sustained basis through the end of the first year, despite their losses of some business establishments.[4] In fact, counties that sustained relatively more property damage have tended to grow at a more robust pace.

Harvey’s impact on the local economy is also not crystal clear for Harris County. As for its surrounding community, Harris County’s actual unemployment rate fell below the baseline level beginning April 2018. The county has also generated more sales tax dollars than before the storm.

Much as Harvey still adversely affects many Texans’ livelihoods today, the county-level data seem to paint a rosy picture. The observations corroborate the key findings of the Texas Comptroller of Public Accounts, which projects that much of the storm’s immediate impact on the regional economy would have largely been offset by gains related to recovery and rebuilding efforts by the end of the first year.[5]

What exactly has been driving the local economies of the disaster region?
Unemployment Rates by County (%)

Source: Texas Workforce Commission, and South Texas Economic Development Center.
Unemployment Rates by County (%), Continued

Source: Texas Workforce Commission, and South Texas Economic Development Center.
Unemployment Rates by County (%), Continued

Source: Texas Workforce Commission, and South Texas Economic Development Center.
Unemployment Rates by County (%), Continued

Source: Texas Workforce Commission, and South Texas Economic Development Center.
Sales Tax on Collection Month by County, Y-o-Y % Change

Source: Texas Comptroller of Public Accounts.
Sales Tax on Collection Month by County, Y-o-Y % Change, Continued

Fort Bend

Galveston

Goliad

Gonzales

Grimes

Hardin

Harris

Jackson

Jasper

Jefferson

Source: Texas Comptroller of Public Accounts.
HARVEY: THE ECONOMIC AFTERMATH

Sales Tax on Collection Month by County, Y-o-Y % Change, Continued

Source: Texas Comptroller of Public Accounts.
Sales Tax on Collection Month by County, Y-o-Y % Change, Continued

Source: Texas Comptroller of Public Accounts.
Government Intervention

The government responded expeditiously to Hurricane Harvey and Irma in 2017 with massive relief programs. For Harvey, FEMA alone provided nearly $14 billion to the Texas impacted communities and their residents within one year following the event. FEMA has approved 373,470 applications for Individual Assistance (IA) programs that provide relief for housing and other disaster related expenses. The National Flood Insurance Program (NFIP) has also paid out a total of $8.8 billion for 91,000 flood insurance claims. The Public Assistance (PA) program has funded a total of 1,279 requests for debris removal, and 1,318 public infrastructure projects for a total of $823 million.

Total Federal Disaster Relief Funds as of August 2018

Source: FEMA, August 20, 2018.
As the above scatter plot shows, the total amounts of federal funds distributed across the 41 disaster counties as of August 2018 matched closely to the number of approved applications for Individual Assistance, which serves as a measure of the extent of immediate impact of Harvey on the affected communities. In other words, the levels of government relief efforts matched closely the direct economic losses and rebuilding needs of individual communities.

As for the unemployment rate, the baseline employment levels are projected under the counterfactual assumption that the storm event did not occur. The difference between the actual and baseline employment levels represent the employment change as the result of Harvey and the community’s subsequent recovery process.
The following chart shows the average employment change of individual counties over the first eight months of 2018. The 41-county region as a whole added an average of about 19,500 jobs per month during that period. The employment data are plotted against the total amounts that the federal government provided individual counties through June 2018 in the form of funds to individuals and government entities, and loans to businesses.\(^6\) The two sets of data are highly correlated. The straight line that best fits all 41 data points slopes upward, meaning that a county with more added jobs tended to have received a higher dollar amount of federal aid, and vice versa.

**Government Aid vs. Employment Change**

Source: FEMA, and South Texas Economic Development Center.
As a simple correlation statistic called $R^2$ suggests, the federal government’s disaster relief programs explain a whopping 92% of variation in employment changes across the 41 disaster counties. In other words, federal programs at work have accounted for most post-Harvey job growth in this region. In particular, Harris County (on the upper right corner of the scatter plot) received nearly $4 billion from the federal government through June 2018, and it has added a monthly average of 11,400 jobs so far this year.

The observation of such a strong link between changes in a county’s employment level and the federal funds it has received is incredible. This is because an area’s employment is often affected by a wide array of factors. Above all, construction activity takes time to complete, and some federally funded projects may not have started at all.

But as the economies of many affected areas ground to a halt in the wake of the disaster, government relief efforts have apparently provided the much needed fuel to jumpstart their economic engines. Another significant funding source for rebuilding activity is Rebuild Texas Fund of the Michael & Susan Dell Foundation, which has distributed more than $50 million within one year following Harvey.

Harvey served as a natural experiment that generated substantial economic shocks to test Texans’ resilience in the long run. With hindsight, full recovery from a natural disaster like Harvey will likely take years to complete. While empirical findings on the benefit of fiscal stimulus to a region’s long-term economic growth are mixed in the academic literature, we have found strong evidence to support the efficacy of large-scale government spending programs as impetus to revitalize a regional economy.
ENDNOTES

[1] This update covers all 41 counties of Harvey disaster areas for Individual Assistance. Our previous report covers 22 of these counties that bore the brunt of devastation by Harvey: Aransas, Bastrop, Bee, Brazoria, Calhoun, Colorado, DeWitt, Goliad, Hardin, Harris, Jackson, Jasper, Jefferson, Newton, Nueces, Orange, Polk, Refugio, San Jacinto, San Patricio, Tyler, and Victoria.

[2] For each county, we made baseline projections for its unemployment rate and employment level between September 2017 and December 2018. These projected data, or forecasts, are constructed by applying a statistical model that best fits the actual monthly data between January 2000 and July 2017. This model takes into consideration of the historical trend over a long period and seasonal patterns within a year.


[4] For counties that do not impose a sales tax, such as Newton, we used the data of its largest city.


[6] We allowed two months for the government’s obligated aid to begin to take effect on the local economy. If we use the total government funds through August instead of June, the degree of correlation ($R^2$) with employment in fact drops to 0.79. This comparative result confirms that it takes time for government spending programs to impact the local economy. Also, we ignore employment changes before January 2018 as most FEMA programs did not take effect until months after Harvey.

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