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Trevor Ham

Clark University, tham@clarku.edu

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Economic Effects of Hurricanes in the United States

Trevor Ham

Sponsors: Wayne Gray & Sang Hoo Bae



CLARK UNIVERSITY

Abstract

Every year, the United States faces severe thunderstorms, tropical storms, and hurricanes that have the potential to destroy communities for years. While they are not all Katrina-level disasters, any hurricane can bring lasting damages for an extended period of time. The threat of a major hurricane always looms, and with the acceleration of climate change, we can only expect this problem to accelerate. That is why it is imperative that the United States – and the rest of the world – knows what to expect from a hurricane economically, and how we can best position ourselves to make a speedy recovery.

The Recovery Process

What may be most important to know, is the time it takes for an affected area to recover from a hurricane and the process in which a recovery happens. Of course, this time can vary wildly depending on the strength of the hurricane, but we can still build a relatively strong estimate. Knowing how much the average hurricane affects an area, the increase in production in the year after the hurricane, and the pace of recovery in each subsequent year until a full recovery is made, could be extremely useful for a community and government to know when a hurricane wreaks havoc.

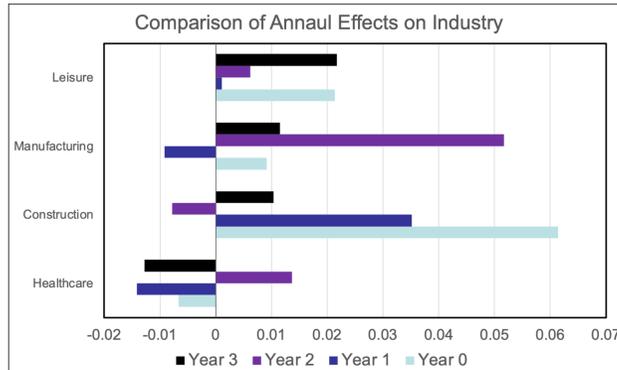
Effects on Different Industries

Different industries will tend to react differently to a hurricane due to the nature of their respective businesses. Some may act in accordance with the general economy, some are fragile and respond especially poorly, some are robust and see little effect, and some can even be antifragile, meaning they benefit from disaster.

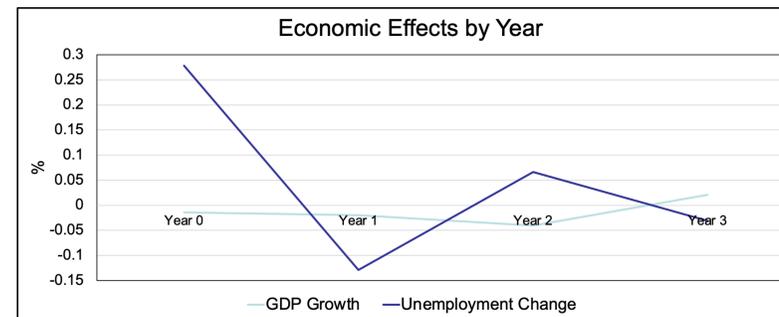
Government Aid

Hurricane relief is essential to helping places recover much quicker than they would otherwise – or is it? I tested how government aid is distributed and its effectiveness towards speeding up the recovery process of an area. Understanding its impact can help us better allocate government aid in the future, assuring places get the help they need without taxpayer money and resources going to waste.

Economic Effects on Different Industries on GDP				
VARIABLES	Healthcare GDP	Construction GDP	Manufacturing GDP	Leisure GDP
	(1)	(2)	(3)	(4)
Year of Hurricane	-0.00669	0.0614	0.00916	0.0214
1 Year After	-0.0141	0.0352	-0.00919	0.00113
2 Years After	0.0137	-0.00783	0.0517	0.00620
3 Years After	-0.0128	0.0104	0.0115	0.0217



Initial Economic Effects of a Hurricane		
VARIABLES	GDP Growth (%)	Change in Unemployment
	(1)	(2)
Hurricane	-0.0142	0.0253**



1.1 Timeline of the Recovery

In testing the economic effects of hurricanes, I use 2 economic indicators: GDP and unemployment. First, I looked at the effects in the year of the hurricane and saw, on average, the amount of economic damage that can be expected from a hurricane. As seen in the graph above, we can expect GDP to fall by 1.42% and unemployment to increase by 2.53%. While seemingly small figures, county-wide figures and annual GDP declines of that magnitude are rare, representing a fairly great impact felt by affected citizens.

The Next Year

It may have come as no surprise that there was significant economic damage in the year of a hurricane, but how about the following year? When I compared the GDP growth and change in unemployment levels in places that were hit with a hurricane the previous year against places who were not hit, there was still clearly a drop in GDP, but also a drop in unemployment. I theorize that unemployment numbers may look better the year after a hurricane because people are beginning to get back the jobs they lost right after the hurricane hit. In the next year, there are plenty of vacancies being filled and people looking to get back to work, but overall, the area is still likely to be worse off compared to an unaffected area who did not see such a big change in unemployment, because there were no lost jobs to fill.

2 Years Following

What about 2 years following a hurricane? Well according to the figure above, the same negative trends continue. GDP continues to fall, and unemployment is growing once again. The rebound in unemployment is not longer visible, and an area is still feeling a significant amount of economic damage, even 2 years after the hurricane took place. In fact, the numbers are no better than the year of the hurricane, and improvement is yet to be seen.

3 Years Following

Finally, 3 years after the hurricane hit the affected area, we are able to detect a recovered economy. GDP is finally growing fast enough to begin to offset the damage of the last 3 years, and unemployment is finally falling again. It appears that the negative effects of a hurricane can still be felt until 3 years of recovery has passed.

1.2 Effects on Industries

Healthcare and Social Services

When testing how different industries are affected by a hurricane, I took the GDP of healthcare and social services and viewed how they reacted, in comparison to the rest of the county. This industry saw negative effects in the year of the hurricane, the year following, and 3 years after the hurricane, showing that this industry was especially fragile to a hurricane due to the additional relief needed.

Construction

Naturally, I expected the construction industry to respond well a hurricane, especially in the year following. We would expect construction to have plenty of demand in the rebuilding process. In my results, they *benefitted* from the occurrence of a hurricane in the year of the hurricane, the year following, and 3 years after the hurricane. The construction industry was not only robust to a hurricane, but antifragile.

Manufacturing

In order to gauge the effects of a hurricane on manufacturing, I combined numerous different types of manufacturing subindustries and examined the change in their output after a hurricane. Generally, there was little significant effect. The manufacturing industry was robust and did not see a huge effect from a hurricane, possibly due to its relative diversity and the consistent demand in the industry.

Art, Food, & Entertainment

I combined arts, food, and entertainment together, since they are all related to leisure and generally thrive off people's disposal money. This led me to believe they would be especially fragile to a hurricane, but that wasn't apparent in my results. The industry saw increased output, but with no statistical significance and small coefficients, I believe that they don't benefit, but are not very affected – which still beats my expectations.

1.3 Government Aid

In order to test government aid, I used data for Hazard Mitigation Assistance Grants (HMAG) from the Federal Emergency Management Agency (FEMA). I compared the economic indicators of places that received the grants against those who didn't, and if the grants were successful, you would expect the GDP and unemployment to recover faster in places who received government aid.

Effects From HMAG Dummy

When I got my results back, I saw some worrisome results. In very single year, from the year of the hurricane to 3 years following the hurricane, areas that received an HMAG grant had *lower* GDP growth than areas who did not receive the grant. This would indicate a negative effect from the grants, and they may actually be harmful. However, those results were insignificant. I then tested it on unemployment, to see if it at least helped people retain or find jobs. But still, all the effects on unemployment were bad, as unemployment grew in each instance. Somehow, places who received the grant seemed to experience more job loss than other places. Every single year, expected unemployment rose, and this time the data is significant. For those who have received HMAG grants, regardless of amount, their economy was worse off, at least in terms of GDP and unemployment.

Effects From HMAG Based on Quantity

While the data shows that just receiving the HMAG grants isn't an indicator of quicker economic growth, it also begs the question as to how much the amount of funding in the grant helps. According to my findings: not so much! By using the same methods as I did with the HMAG dummy variable, I found very similar results, with GDP growth decreasing every year, and unemployment increasing. With each additional increase in HMAG funding, you could expect the affected area to perform worse economically, which is quite counterintuitive. If there are benefits to these grants, they certainly aren't being realized in terms of GDP and unemployment.

Effects of Receiving an HMAG Grant on GDP				
VARIABLES	GDP Growth (1)	GDP Growth (2)	GDP Growth (3)	GDP Growth (4)
Effect of HMAG Grant	-0.0120	-0.00303	-0.00328	-0.00465
Year of Hurricane	-0.00863			
1 Year After		0.0149**		
2 Years After			-0.00612	
3 Years After				0.0258***

Effects of Receiving an HMAG Grant on Unemployment				
VARIABLES	Change in Unemployment (1)	Change in Unemployment (2)	Change in Unemployment (3)	Change in Unemployment (4)
Effect of HMAG Grant	0.0337***	0.0364***	0.0364***	0.0394***
Year of Hurricane	-0.0315***			
1 Year After		-0.0465***		
2 Years After			0.0173*	
3 Years After				-0.00654

Conclusion

Of the conclusions I came to, some were worrisome, some were expected, some were surprising, and others were just good to know. I came into this project with a lot of questions and while I have answered some of them, I have also generated more questions that I think could be further explored in the future. These conclusions could be used to help plan the recovery process, understand who is affected most, and be a guide for distribution of private and government aid.

Recovery Timeline

It seems clear that the economic effects of a hurricane last much longer than just the year of the hurricane. It won't be until 3 years after the disaster that we will see the economy recover. Also, there seems to be opportunity for job growth in the year following a hurricane, so employees and businesses could take advantage of this opportunity and view this time as a great opportunity, instead of seeing it just as a broken area.

Effects on Industries

The data shows that construction seems to be positively affected by a hurricane, both manufacturing and leisure (art, food, entertainment) seem relatively unaffected, and the health and social services industry is especially damaged after a hurricane. While these results aren't extremely surprising overall, I was not expecting to see leisure be unaffected (and possibly benefit from) a hurricane.

Government Aid

The most surprising conclusion in all my findings in the lack of effectiveness from government aid. However, it is far too early to tell whether government aid is *really* that useless for a few reasons. Only HMAG grants were tested, and the only measurements of its effectiveness is unemployment and GDP. It is very possible that affected communities are benefiting in other ways that aren't reflecting in these statistics. It would be very interesting to see what further research on this topic would unfold.