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Natural Disasters' Effect on Tourism Employment

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Abstract

Not only do natural disasters cause immediate physical damage to an area, but they often have long-lasting social and economic effects as well. Tourism is a sector of the economy that is relatively fragile and relies heavily on a stable economy. This paper attempts to capture the effect of natural disasters on the tourism industry, specifically tourism employment. This research uses panel data and focuses specifically on 7 metropolitan statistical areas in the United States between 2002-2018. Data collected from the BEA as well as SHELDUS is used in order to quantify this effect. A fixed effects model with a log on the dependent variable finds that for every dollar chance of damage over personal income, tourism employment per capita decreases by about 1.34%. These results are statistically significant at the 5% level.

Keywords: Natural disasters, tourism, employment, disaster damages, job loss, panel data, fixed effects, infrastructure policy

JEL Codes: J21, J49, Q54, Y10, Z30, Z31

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I. Introduction

Understanding natural disasters and their impacts has never been as important as it is today. As these disasters continuously become more frequent in the United States, with 22 disasters in 2020 alone, it is important to understand their effect on different sectors of the economy (NOAA, 2021). An important economic sector in the US is tourism, which accounted for 7.8% of GDP in 2019 (United States of America… , 1995-2019). Determining whether or not there is an effect of natural disasters on tourism employment can better inform future policy and allow for improved disaster planning within the tourism industry.

The response of the tourism sector to a disaster indicates how susceptible the industry is to sudden disruptions in the local economy. For example, the Covid-19 pandemic is the most prevalent modern day example of a crisis that truly highlights the fragility of the tourism industry. Globally, international tourist arrivals dropped by about 78%, which caused a loss of 1.2 trillion US dollars in tourism export revenues. The pandemic also led to a 120 million job loss in the tourism industry (Sigala, 2020). This example, while not technically a natural disaster, is used to highlight just how responsive the industry is to disruptive circumstances.

Previous literature has shown that natural disasters of all types have had varying significant effects on different areas of the tourism sector. While I have not come across literature that highlights tourism employment specifically, Rosselló et al. (2020) links natural disasters to tourism arrivals in order to highlight the mostly negative effect that natural disasters have on the influx of tourists. This paper will highlight other previous literature that builds upon the hypothesis that natural disasters will have a negative effect on tourism employment. The remainder of this paper will first display the data I will be using to analyze natural disasters' effect on tourism employment in the United States at an MSA level. Then, I will describe the

specific models used, followed by a discussion of the results which find that there is a significantly negative effect of disaster damages on tourism employment. Policy recommendations, as well as drawbacks and suggestions for future research, will conclude the paper.

II. Literature Review

Natural hazards/disasters refers to phenomena such as earthquakes, droughts, floods, storms, wildfires, tsunamis, etc. Not only do natural disasters cause damage in the short-term, i.e. physical destruction in its path, but they also create chain reactions of long-lasting issues for communities. These issues may include years of rebuilding, displacement of people from their homes, job loss, crop damage, mental health struggles, and financial insecurity (The World Bank & The United Nations, 2011). This is partially due to the vulnerability of many sectors of the economy in terms of being disrupted by disaster. The World Bank and United Nations report on natural disasters and their policy implications highlights a study done by Lis and Nickel (2009) that examines the budgetary effects of large weather disasters. This study found that disasters immediately increase government expenditures as budgets are reallocated towards relief spending. This shows that governments are mainly reactionary instead of preventative when it comes to disaster spending (The World Bank & The United Nations, 2011). This distinction is important because it highlights that many governments only allocate funding to infrastructure and rebuilding in the aftermath of a disaster, instead of funding infrastructure as a preventative measure.

In order to analyze natural disasters' effect on tourism employment, it is important to understand its effect on other labor markets as well. Previous literature finds that natural disasters

do have an effect on other labor markets. Kirchberger's paper analyzes the shifts from tradeable to non-tradable goods in the wake of an earthquake in Indonesia (2017). For example, the increase in the demand for construction (non-tradable goods) increases the demand for labor within the construction sector, which in turn increases wages in this sector. This leads to a reduction in the demand for tradable goods, which in turn shrinks labor markets that produce these goods, such as agriculture and manufacturing (Kirchberger, 2017). The results of this paper are expected as labor markets in industries such as construction are expected to have an increase in demand during the rebuilding period in the aftermath of a disaster. This analysis shows that disasters do not have one type of effect on all labor. There are differing effects on labor markets depending on the goods or services being produced.

Specific to the tourism industry, Genç (2018) studies the differing effects that natural disasters have on tourism. His paper finds that natural disasters slow down the tourism sector due to decreased labor power or worsening destination image with respect to bad management of crises. However, his research also acknowledges that disasters can also foster solidarity and resilience among the local community. This may contribute to global interest towards an affected area which in turn may enhance economic opportunities such as tourism (Genç, 2018).

Genç's study supports literature by Murphy and Bayley (1989) which discusses tourism recovery and disaster planning. This paper demonstrates the stages of disaster planning and recovery which include: assessment, warning, impact and recovery. In summary, assessment refers to properly conducting multidisciplinary research on a tourist location. Warning refers to the distribution of information, as well as designating restricted areas and creating evacuation plans. Impact refers to the direct impact of the disaster, which includes extensive media coverage. Lastly, recovery refers to assessing the damage, countering negative media coverage,

and creating a plan to bring back tourism. Creating a well thought out disaster plan is especially important in areas where the disaster site *is* the tourist site (i.e. volcanoes, mountains, etc.). Their paper also explains how tourism can actually advance disaster recovery through international news coverage which can lead tourists to visiting an affected area. An increase in tourism to an affected area can boost revenue and contribute to reconstruction of the community (Murphy & Bayley, 1989). Faulkner (1999) also references Murphy and Bayley's work in the CRC Australian Disaster Report when describing tourism in an affected area in the aftermath of a disaster. Faulkner goes on to describe how in spite of this, many tourism organizations have done little in terms of disaster planning. While many tourism executives do have disaster strategies, they are often very limited and under-developed (Faulkner, 1999).

The study conducted by Rossello focused on the effects of different types of disasters on tourism arrivals (2020). This study found that *Tsunamis*, *Floods* and *Volcanoes* constituted substantial negative motivators for prospective visitors, while *Wildfires, Earthquakes, Industrial Accidents*, and *Storms* presented mixed effects on arrivals. However, when economic costs were considered, a negative and significant relationship was found for all types of disasters. This result is a contributing factor to the hypothesis that I have concluded in this paper. Rosselló's work also led me to look at all sides of my hypothesis by referencing dark tourism as a reason why a tourist *would* visit an area affected by disaster (Rosselló et al., 2020). This is a logical counter to my hypothesis as many tourists do participate in dark tourism, which is why it should be considered when hypothesizing the results of this research.

When looking closer at a specific disaster in a specific state, it may be clearer to see the direct effect of a singular disaster on local tourism. A report published by Tourism Economics (2013) highlights the effects of Hurricane Sandy on the tourism industry in New Jersey. This key

result in this report finds that tourism in New Jersey proved to be resilient despite the natural disaster. However, when taking a closer look at employment trends, it is evident that employment growth stagnated in 2013, after Hurricane Sandy. The average growth rate in the years before the disaster was 1.5%; however, in 2013, the growth rate was 0.5%, which is below the average(Tourism Economics: An Oxford Economics Company, 2013). While the disaster did not cause a decrease in tourism employment growth, it did in fact have a downward effect on the growth of tourism employment in the aftermath of the disaster compared to previous years.

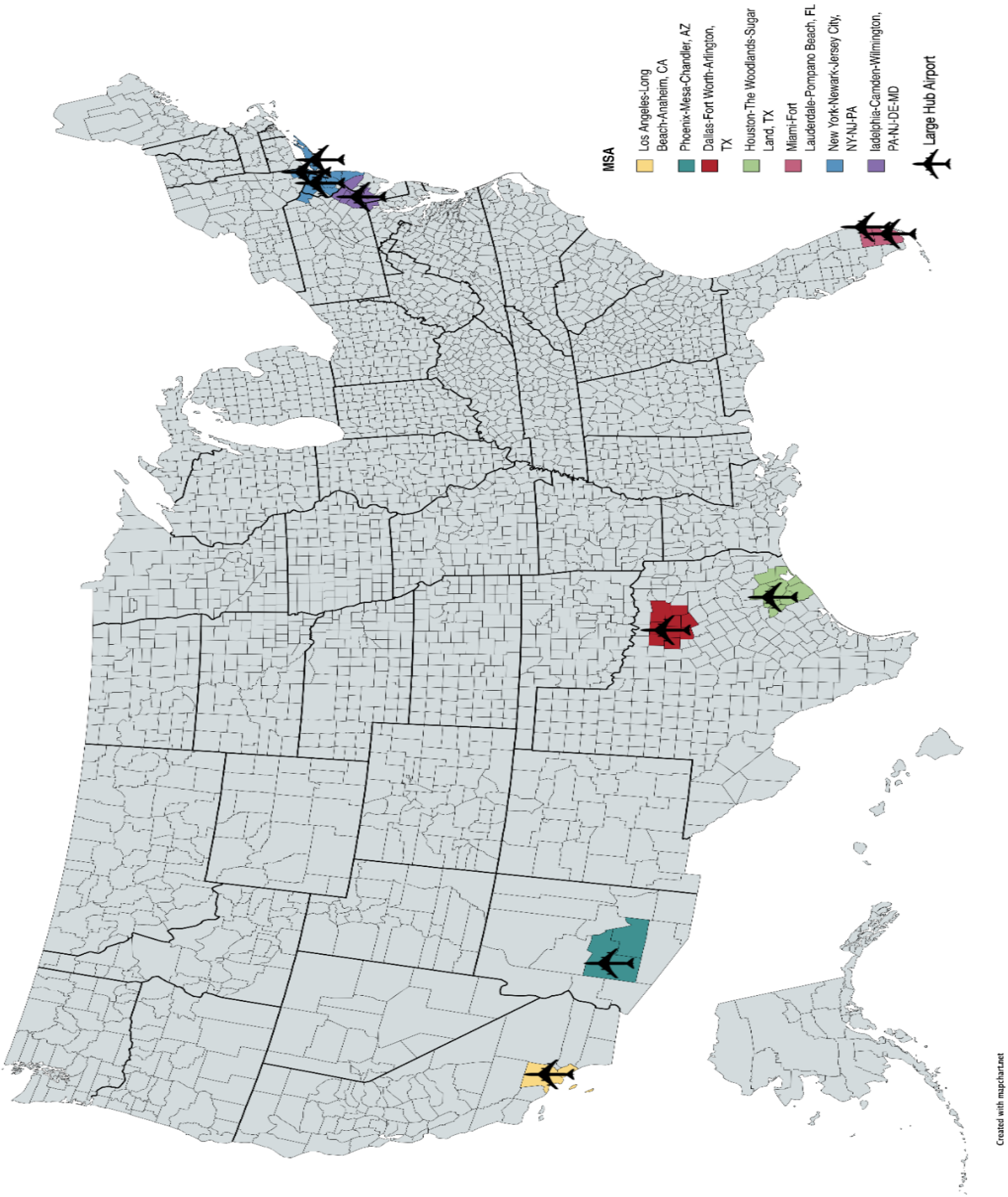
III. Pre-Estimation Discussion

The data used in this research is pulled from 7 MSAs across the United States. The 7 MSAs that this data covers includes:

Dallas-Fort Worth-Arlington, TX
Houston-The Woodlands-Sugar Land, TX
Los Angeles-Long Beach-Anaheim, CA
Miami-Fort Lauderdale-Pompano Beach, FL
New York-Newark-Jersey City, NY-NJ-PA
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD
Phoenix-Mesa-Chandler, AZ

These were the 7 most populous MSAs with (mostly) complete data available. The ordering by population was determined through BEA population data at an MSA level. Figure 1 provides a visual representation of the geographical location of the MSAs. It is important to note that these MSAs are all located in different areas of the US; meaning that they all experience relatively unique climates and natural disasters/phenomena.

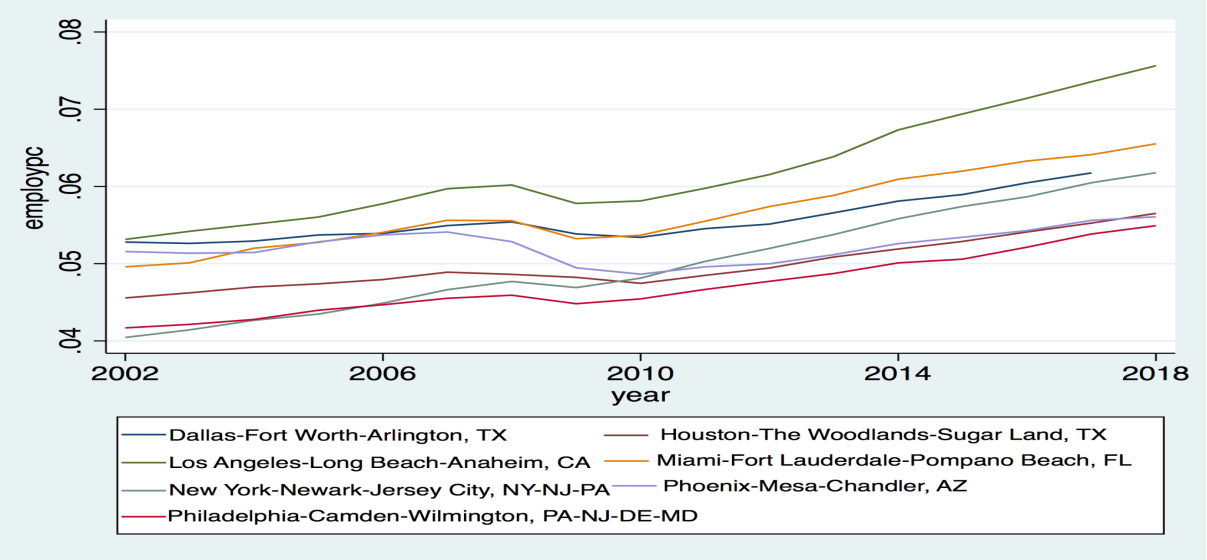
Figure 1: Geographical Locations of MSAs



The map also displays the number of large hub airports in the MSAs. This was included in order to demonstrate that these MSAs are popular destinations in terms of travel and tourism.

Tourism employment is a useful indicator of the general economic trends of tourism in an area. Tourism employment is made up of employment in arts, entertainment, recreation, accommodation, and food services. Figure 2 displays the employment per capita trend over 17 years in each MSA.

Figure 2: Employment per Capita over 17 Years by MSA

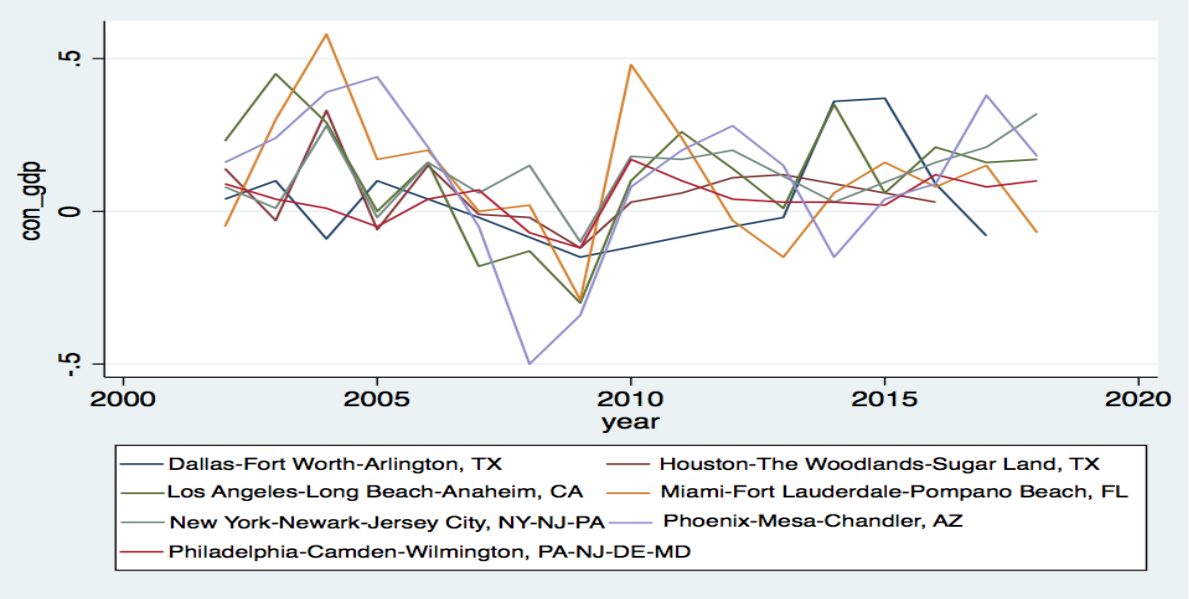


Between 2002-2018, tourism employment per capita experienced a general upward trend, dipping slightly around 2008. This suggests that tourism employment has been growing over time and is not affected by financial crises in the long run.

To further this discussion, it is important to witness how tourism contributes to the GDP of each MSA. Figure 3 displays the tourism contribution to GDP. According to the graph, tourism contribution to GDP seems to be procyclical, and does not seem to be affected by the rising employment in the tourism sector. This is potentially due to the fact that as tourism grows, as indicated by figure 2, other business sectors are growing at the same time. Therefore, the share of tourism as a portion of GDP always remains relatively the same in relation to other sectors.

The graph in Figure 3 resembles the cyclical flow of the US economy. For example, it is clear that the steep decline in 2008 represents the financial crisis. However, the contribution to GDP quickly recovers and continues to follow a natural flow of the economic cycle. This may explain why the graph depicting tourism's contribution to GDP is procyclical, instead of a graph that resembles an upward trend similar to the employment graph in figure 2.

Figure 3: Tourism Contribution to GDP



There are many ways natural disasters may affect the tourism sector. Severe damages from disasters may contribute to job loss, supply shortages, and prolonged construction of businesses. It may also delay transportation, shift government funds away from tourism, and influence negative media. All of these factors and more contribute to a weakening tourism economy in the wake of a natural disaster. According to the findings of Rosselló et al.'s paper, the damage from a disaster has more negative consequences on a tourism economy than fatalities from a disaster. Physical barriers to travel, such as damaged infrastructure, transportation delays, and business closures, are more negatively impactful on tourism arrivals than the number of fatalities from a disaster, potentially because tourists do not see fatalities as a direct risk to their

own safety (Rosselló et al.). All of these examples describe an impact on the tourism sector at large; however, employment is also expected to be impacted by natural disasters.

In terms of tourism employment specifically, it is expected that natural disasters will have a negative effect on employment in this sector. Damages caused by disasters may deter tourists from visiting an affected area. This may lead to layoffs and closures, which in turn would decrease employment in the tourism sector. While it may not cause long-term effects, natural disasters may hinder tourism employment in the immediate aftermath of a disaster.

It is also plausible that disasters may have a positive effect on tourism employment. This is largely due to the concept of *dark tourism*. Dark tourism is described as visiting a site that has a history of disaster or tragedy. Some examples of dark tourism include the 9/11 memorial in NYC, Auschwitz concentration camp in Poland, and the Chernobyl disaster site in Ukraine, to name a few (Sampson, 2019). The existence of dark tourism opens up the possibility of a positive effect between disaster damages and tourism employment. The aftermath of a disaster has the potential to attract tourists who participate in dark tourism, depending on the specific details of the disaster. While this could be plausible, it is more likely that a disaster will have negative effects on tourism employment, given the physical damages preventing travel and employment.

IV. Data and Methodology

To determine the causal relationship between natural disasters and tourism employment, this paper will use a panel dataset consisting of data collected from 7 US Metropolitan Statistical Areas (MSAs) from 2002-2018. Tourism employment and related demographic data were collected from the Bureau of Economic Analysis (*County, Metro and Other Local Areas | U.S.*

Bureau of Economic Analysis (BEA), n.d.). Disaster data was collected from SHELDUS, or the Spatial Hazard Events and Losses Database for the US (*Sheldus*, 2017).

SHELDUS Disaster data was recorded at a county level. Data cleaning was needed in order to convert this data from a county level into MSA level for the 7 MSAs selected. Disaster data and tourism data were merged into one master dataset using STATA. Table 1 displays the labels, means, standard deviations, and descriptions of the variables.

Table 1: Means, Standard Deviations, and Variable Descriptions

Variable	Mean (Std. Deviation)	Description
af_employ	331105.4 (175100.9)	Accommodation & Food Employment
aer_employ	131216.4 (106748.7)	Arts, Entertainment, & Recreation Employment
employ	462018.2 (281049.1)	= af_employ + aer_employ
propertydmgadj2015	1.01e+09 (6.95e+09)	Property Damage Adjusted for 2015 Inflation
Percap_income	46708.16 (9464.922)	Per Capita Personal Income
income	4.25e+11 (3.18e+11)	= percap_income * pop
gdp	2.10e+07 (1.71e+07	Gross Domestic Product (of MSA)
damage_inc	.0026325 (.018153)	= propdmgadj2015 / income
employpc	.0533691 (.006635)	= employ / pop

To avoid biased coefficient estimates, a fixed effects model is preferred to avoid an endogeneity problem by controlling for each MSA's effect. It is expected for there to be

idiosyncratic differences between each MSA's relationship in tourism employment and disaster damage. In order to verify that the FE is preferred to the random effects, a Hausman test was run, which indicated that FE is the preferred model. The Hausman test provided a significant p value which solidified that the FE estimator is preferred over the RE estimator in this specific data.

I will be running a RE model as well as a baseline model in order to see the effect of adding time effects into both RE and FE models. The following FE model represents the empirical approach:

$$\frac{employi,t}{popi,t} = \beta 1 damage\_inc_{i,t} + \beta 2 con\_gdp_{i,t} + \beta 3 income_{i,t} + \delta_i + u_{i,t} \quad (1)$$

Where *employ/pop* (employpc) is tourism employment per capita in MSA *i* at time *t*. The key independent variable is *damage_inc*, which represents the amount of disaster damage ($) over personal income. Con_gdp and income are controls across all models. Lastly δ_i represents the MSA fixed effects and $u_{i,t}$ represents the error term.

The FE model accounting for time effects is represented as:

$$\frac{employi,t}{popi,t} = \beta 1 damage\_inc_{i,t} + \beta 2 con\_gdp_{i,t} + \beta 3 income_{i,t} + \delta_i + \tau_t + u_{i,t} \quad (2)$$

Where τ_t represents the time effects. Aside from the time effects term, all other factors in the equation are identical to the first equation (the FE model).

As a reference, the RE model will be represented as follows:

$$\frac{employi,t}{popi,t} = \beta 1 damage\_inc_{i,t} + \beta 2 con\_gdp_{i,t} + \beta 3 income_{i,t} + \Psi + u_{i,t} \quad (3)$$

Where Ψ represents random effects. All other terms have remained constant.

The RE with time effects model is represented as:

$$\frac{employi,t}{popi,t} = \beta 1 damage\_inc_{i,t} + \beta 2 con\_gdp_{i,t} + \beta 3 income_{i,t} + \Psi + \tau_t + u_{i,t} \quad (4)$$

Lastly, a fifth model will be run in which the dependent variable is logged in order to derive a more comprehensive understanding of the results. This model will be expressed as:

$$ln\left(\frac{employi,t}{popi,t}\right) = \beta 1 damage\_inc_{i,t} + \beta 2 con\_gdp_{i,t} + \beta 3 income_{i,t} + \delta_i + u_{i,t} \quad (5)$$

Where the natural log of the dependent variable is being taken. This will allow for the coefficient estimates to be expressed as percentages, which will allow for the interpretations of the results to be more impactful.

V. Results and Discussion

The results from regression models 1 through 4 (RE, RE + time effects, FE, FE + time effects) are reported in Table 2. As shown in this table, the RE model provides statistical significance to the variable of interest at the 10% significance level. For every dollar change in

damage over income, tourism employment per capita drops by 0.0783 jobs. When adding time effects to the RE model, statistical significance is lost; however, the variable of interest still has a negative coefficient, which is to be expected. The FE model, which is the preferred model, provides statistical significance to the variable of interest at the 5% level. For every dollar change in damage over income, tourism employment per capita drops by 0.0786 jobs. However, when adding time effects to the FE model, statistical significance is lost again. Adding time effects seems to remove significance from the model. All models did show a negative coefficient for the variable of interest, which was assumed in the hypothesis.

Table 2: Initial Results

	RE(3)	RE + TE(4)	FE(1)	FE + TE(2)
	employpc	employpc	employpc	employpc
damage_inc	-0.0783*	-0.0363	-0.0786**	-0.0391
	(0.0409)	(0.0326)	(0.0377)	(0.0318)
con_gdp	-0.000137	-0.000781	-0.000191	-0.000886
	(0.00118)	(0.00112)	(0.00108)	(0.00109)
income	3.91e-14***	2.50e-14***	4.08e-14***	2.68e-14***
	(1.83e-15)	(2.47e-15)	(1.73e-15)	(2.50e-15)
_cons	0.0369***	0.0406***	0.0361***	0.0400***
	(0.00283)	(0.00296)	(0.000755)	(0.000922)
N	116	116	116	116

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

After backing out the results from the FE model, it is found that the average disaster, which is about $1B in damages, causes close to a 1750 reduction in the number of tourism jobs. This number was found by the following equation:

average tourism employment loss = average population[(β1)(average damage/income)]

average tourism employment loss = 8,568,807[(0.0786)(0.0026)] ≈ 1750 jobs lost

As this model creates difficulty in interpreting the results, a 5th model is run by logging the dependent variable in order to interpret the results in a more meaningful way. Table 3 provides the results which compare model 1 (FE with no log of the dependent variable), to model 5 (FE with the logged dependent variable).

Table 3: FE with Log on the Dependent

	(1)	(5)
	employpc	lnemploypc
damage_inc	-0.0786**	-1.343**
	(0.0377)	(0.643)
con_gdp	-0.000191	-0.00389
	(0.00108)	(0.0185)
income	4.08e-14***	7.52e-13***
	(1.73e-15)	(2.94e-14)
_cons	0.0361***	-3.257***
	(0.000755)	(0.0129)
N	116	116

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

As shown in Table 3, a log of the dependent variable maintains statistical significance of the variable of interest at the 5% level. For every dollar chance of damage over personal income, tourism employment per capita decreases by about 1.34%. This result is much more comprehensive and provides meaning to the results. Without the log, it is difficult to understand the magnitude of the decrease in tourism jobs.

Possible issues with these results include potential omitted variables. The models used were simplified and did not include all possible variables that could confound the results. This includes but is not limited to tourist arrivals, state of the economy, state funding for disasters, etc. Another potential issue arises in terms of the sample of the data. Only 7 MSA data was collected due to missing data. A larger sample would provide more accurate results as it would encapsulate different regions that experience different disasters.

VI. Case Study

To further this research on disasters and tourism employment, I will be analyzing a specific disaster in a specific area of the US. In order to observe a potential correlation between natural disasters and tourism employment, I will be using data collected before and after Hurricane Sandy hit New Jersey. Direct tourism employment as well as percent change in tourism employment will be used to describe an effect on tourism. A community hardship index created to represent the effects of Hurricane Sandy will be used to describe the magnitude of the natural disaster in a given area. This case study will provide an insight into the relationship between a specific natural disaster occurrence and employment in the tourism industry of a select location.

A community hardship index created by Dr. Halpin (2013) in a report from Rutgers School of Public Affairs and Administration is used to express the severity of Hurricane Sandy. The total impact of Sandy is calculated with 8 indicators across 6 areas: residential, commercial, municipal indicators, emergency shelter and gasoline shortage (Halpin, 2013). In short, the hardship index is created with z-scores that measures these indicators through the formula:

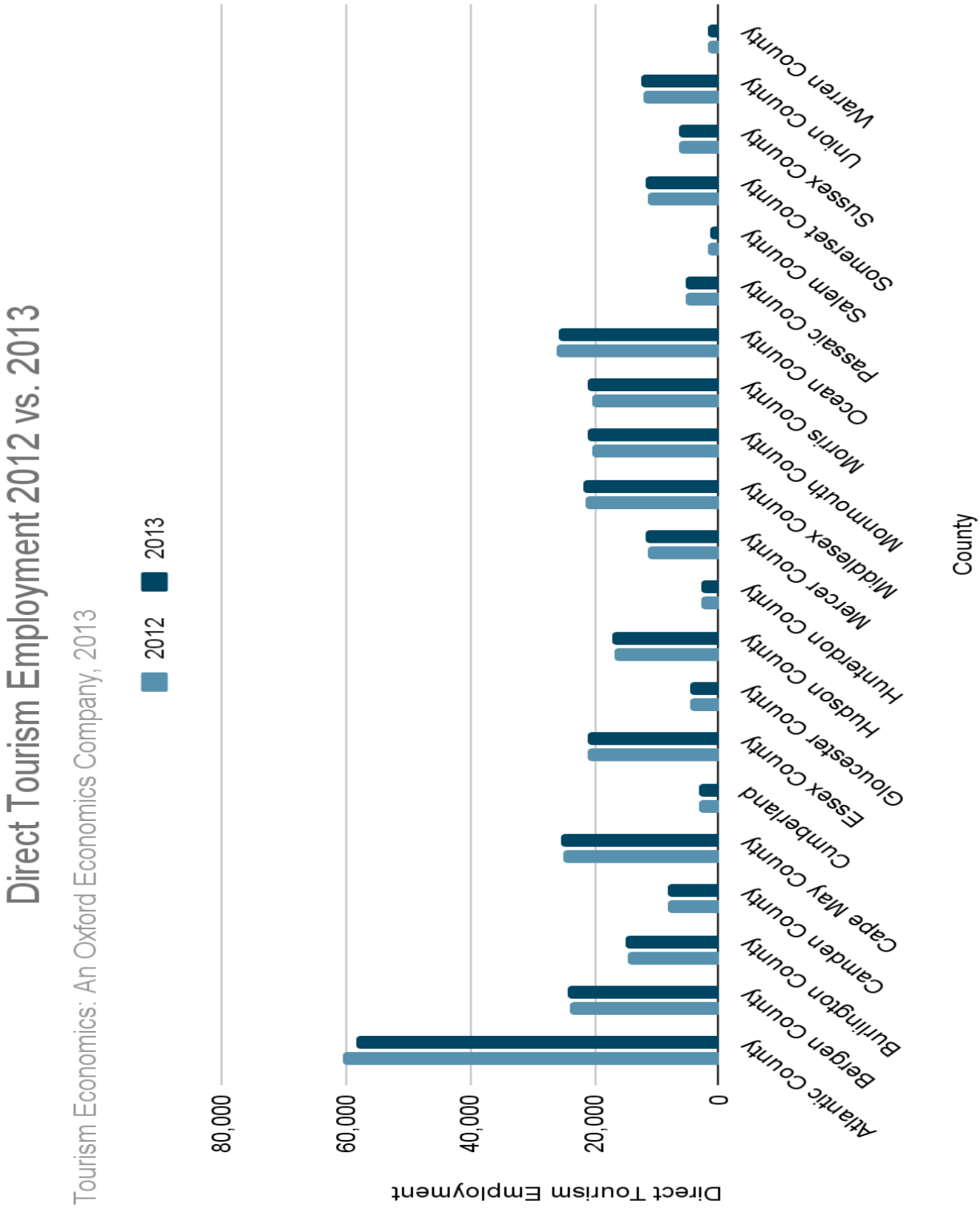
$$z = (x - \mu)/ \sigma$$

Where x is the indicator's value, μ is the unweighted average and σ the standard deviation for that indicator. The score for each area is created by averaging the z-scores together to make the resulting scores more comprehensive, with the total possible points being 100 (Halpin, 2013). The Rutgers report uses this index to assign a score to each municipality within New Jersey. The report also aggregates the scores to a county level, which will be used in this case study.

A report compiled by Tourism Economics (2013) analyzes the economic impacts of tourism in New Jersey both before and after Hurricane Sandy. This report analyses tourism through various indicators such as visitor trips, hotel demand, sales, GDP, and employment, to name a few. This case study will be using data provided from the report on tourism employment. As Hurricane Sandy occurred in Q4 of 2012, I will be comparing employment in 2012 and 2013, considering there is potentially a lagged effect. The effects on employment after a disaster may not be recorded immediately, and unemployment may last longer depending on the timeline of rebuilding and recovery.

Figure 4 depicts the direct number of employment in tourism in both 2012 and 2013 by county. As the graph shows, employment in tourism remains relatively consistent from 2012 to 2013.

Figure 4: Direct Tourism Employment 2012 vs. 2013



However, when comparing to growth from previous years, there does seem to be some downward pressure on growth which is consistent with my findings. The report displays that employment growth was on an upward trend following a downturn during the 2008 financial crisis. Table 4 shows the overall tourism employment in the state between 2006-2013.
As shown in this table, the percent change in tourism employment is negative in 2009. However, from 2010 to 2012, there seems to be steady growth in tourism employment. While the percent change is still positive in 2013, there seems to be downward pressure when comparing to the previous upward trend.

Table 4: Direct Tourism Employment, 2006-2013

Year	2006	2007	2008	2009	2010	2011	2012	2013
Tourism Employment	309,355	313,538	318,929	309,499	308,801	312,369	318,560	320,238
% Change		1.4%	1.7%	-3.0	-0.2%	1.2%	2.0%	0.5%

(Tourism Economics: An Oxford Economics Company, 2013)

For this case study, I will be comparing the change in tourism employment from 2012-2013 to the community hardship index by county in New Jersey. When taking a closer look at the percent change in tourism employment by county,it is evident that each county had a different percent change in tourism employment between 2012 and 2013. Table 5 shows this side by side with the community hardship index and rank.

Table 5: Direct Tourism Employment Compared to Community Hardship Index

Direct Tourism Employment	2012	2013	% Change	CommunityHardship Index	Community Hardship Rank
NJ Overall	318,560	320,238	0.5%	-	-
Atlantic County	60,697	58,375	-3.8%	47	11
Bergen County	23,831	24,196	1.5%	52	9
Burlington County	14,691	14,888	1.3%	39	17
Camden County	8,045	8,111	0.8%	32	20
Cape May County	25,191	25,479	1.1%	47	13
Cumberland County	3,203	3,154	-1.5%	33	19
Essex County	21,002	21,130	0.6%	47	12
Gloucester County	4,493	4,622	2.9%	33	18
Hudson County	16,924	17,049	0.7%	48	10
Hunterdon County	2,751	2,828	2.8%	58	6
Mercer County	11,269	11,585	2.8%	46	14
Middlesex County	21,450	21,926	2.2%	59	4
Monmouth County	20,267	21,086	3.6%	84	1
Morris County	20,267	21,161	4.4%	57	8
Ocean County	26,187	25,644	-2.1%	73	2
Passaic County	5,309	5,375	1.3%	46	15
Salem County	1,569	1,530	-2.5%	31	21
Somerset County	11,282	11,633	3.1%	62	3
Sussex County	6,255	6,341	1.4%	57	7
Union County	12,157	12,484	2.7%	59	5
Warren County	1,637	1,641	0.2%	44	16

(Tourism Economics: An Oxford Economics Company, 2013) (Halpin, 2013)

After looking at this data side by side, there seems to be mixed effects between change in tourism employment and the community hardship index. For example, as shown in table 5, Atlantic county seems to have the largest decrease in tourism employment than any other NJ county. However, this county ranks 11th in the community hardship index compared to the other counties. Monmouth county, on the other hand, ranks first in the community hardship rank but experienced growth in tourism employment (3.6%). Ocean county, which ranked second, experienced a decrease in tourism employment by 2.1%. It is unclear why these differences are present as there does not seem to be a pattern here. However, some plausible causes for these mixed results could be the funding received by each county to rebuild, news coverage, community support, etc.

Although there are mixed effects on a county level in NJ, the overall tourism employment of the state seems to be somewhat affected by Hurricane Sandy. Table 4 best reflects this by showing that even though there was an increase in tourism employment after the disaster, the percent change was lower than the previous trend in tourism employment. This coincides with my findings of regressing tourism employment per capita on disaster damages, which shows downward pressure on employment growth in the tourism sector.

VII. Conclusion

Although there is plenty of literature regarding natural disasters and tourism, there have been no studies that specifically analyze natural disasters' effect on tourism employment in metropolitan areas in the United States. This paper uses BEA and SHELDUS data in order to attempt to understand the relationship between these specific variables. The fixed effects model with a log on the dependent variable provides statistically significant results, which shows that

for every dollar chance of damage over personal income, tourism employment per capita decreases by about 1.34%. This result confirms the hypothesis stated in this paper, as well as coincides with results found in previous literature.

While it does not cause a large effect, natural disaster damages seem to put downward pressure on tourism employment. Tourism employment may be increasing at a rate in which disaster damages do not hinder this growth but rather slow it down. However, this research is only preliminary as there are ways in which these models can be improved. As previously mentioned, additional variables could be added into the model as well as collecting a wider range of data. Nevertheless, the preliminary results of this paper seem to align with the initial hypothesis as well as previous literature.

Considering that damages from disasters hinder employment in the tourism sector, preventative measures should be taken by local and state governments. The report "Natural Hazards, Unnatural Disasters" provided by the World Bank and the United Nations examines government expenditures on disaster prevention and finds that it is lower than relief spending (2011). Relief spending rises after a natural disaster occurs and remains high for the following several years. The report emphasizes that prevention will be more cost effective in the long run and will benefit local communities. One important means of damage prevention is the investment into solid and effective infrastructure. If more care is put into the infrastructure of an area, then there may be less relief funds needed when a disaster does occur (The World Bank & The United Nations, 2011). Of course, further research is needed on natural disasters and their effects on the tourism industry that account for the shortcomings of this paper. It would be interesting to see whether specific infrastructure policies have an effect on tourism in disaster-prone areas.

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