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**A State-to-State Comparison of the Impacts of the Deepwater Horizon Oil Spill on the Commercial Fishing Supply Chain of the Northern Gulf of Mexico**

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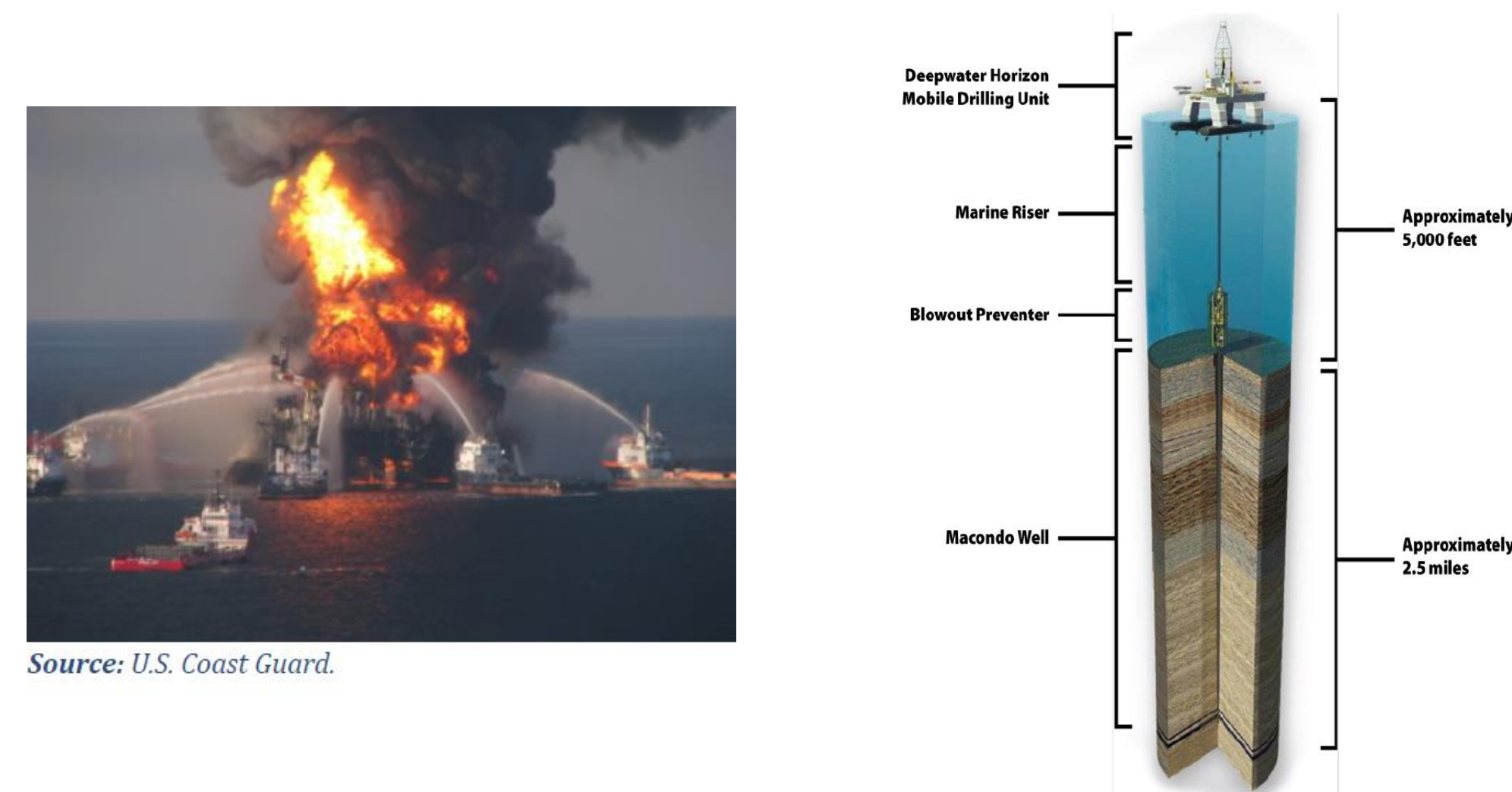
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# A State-to-State Comparison of the Impacts of the *Deepwater Horizon* Oil Spill on the Commercial Fishing Supply Chain of the Northern Gulf of Mexico

Bijeta Bijen Saha, Christa Court, Conner Mullally

## Introduction

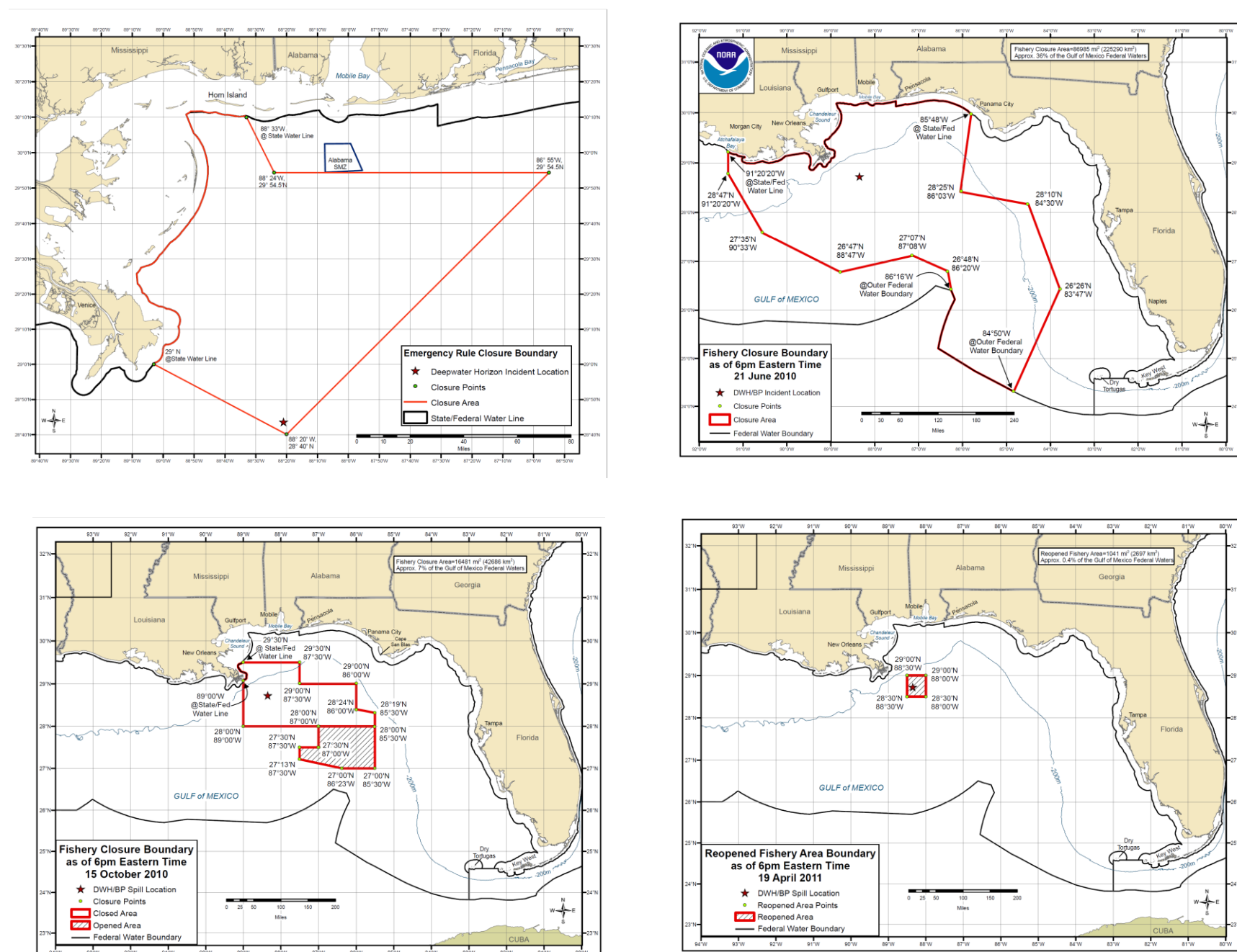
- Deepwater Horizon mobile drilling unit explosion (about 41 miles off the coast of Louisiana) on April 20, 2010
- BP's Macondo well blasted oil and natural gas continuously and uncontrollably for 87 days after the explosion (NOAA)
- Approximately 134 million gallons of oil released into the northern Gulf of Mexico (U.S. v. BP et al. 2015)
- A total of 1.84 million gallons of chemical dispersant used during the spill (USCG 2011)
- 1,300 miles of shoreline affected (Nixon et al., 2015)



## Motivation

- Northern Gulf of Mexico
  - Habitat of diverse fish species and other marine life
  - Most productive oyster reef in the world (Beck et al., 2011)
  - Shrimp industry, the greatest revenue generator in the Gulf
- Aftershocks and Concerns following the Oil Spill
  - Water and air pollution (Beyer et al., 2016)
  - State specific differences in proximity to the location where the oil drilling rig exploded
  - Periodic closure of commercial fishing areas (NOAA)
  - Decrease in demand for Gulf seafood (Telesca, 2012)

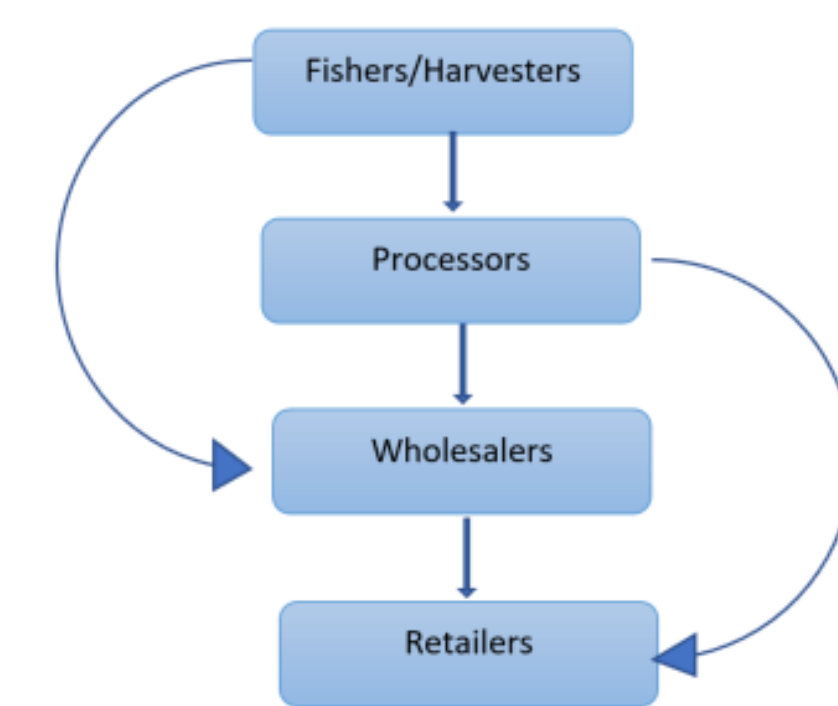
DWH Oil Spill Fishery Closure Map (Source: NOAA)



## Data

Commercial Fishing Supply Chain

- Fishing industry
- Seafood Product Preparation and Packaging industry
- Fish and Seafood Merchant Wholesalers industry
- Fish and Seafood Markets industry
- Quarterly Census of Employment and Wages (QCEW) from Bureau of Labor Statistics (BLS) – A balanced panel data
- From year 2005 to year 2015 (44 quarters)
- Industry code (NAICS) – Fishing industry (NAICS index 11411), Seafood Product Preparation and Packaging (NAICS index 31171), Fish and Seafood Merchant Wholesalers (NAICS index 42446), Fish and Seafood Markets (NAICS index 44522)
- Outcome Variable – Quarterly Establishment Counts, Monthly Employment Level, Average Weekly Wage

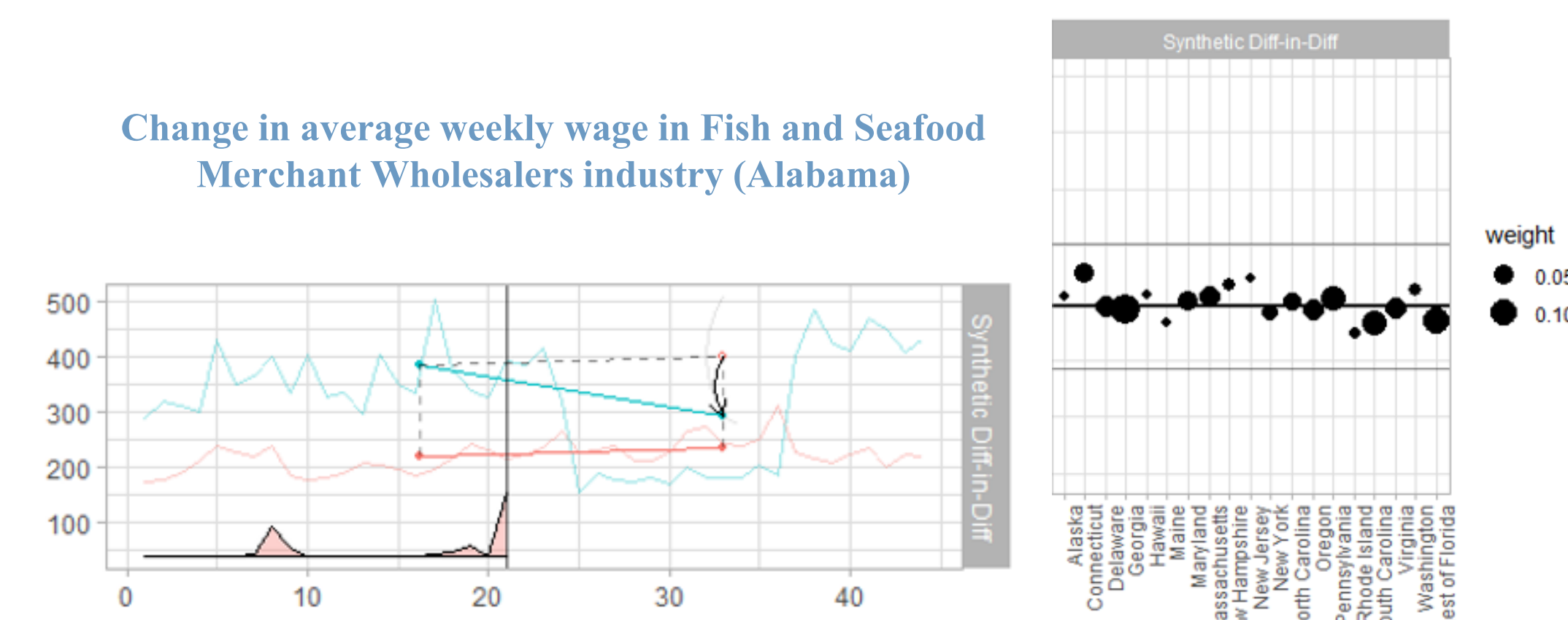


## Identification Strategy

- Treatment – being exposed to the DWH oil spill (each affected region considered a single treatment region)
- We estimate the causal effect of the oil spill incident,  $\tau^{sdid}$
- Synthetic Difference-in-Difference – a weighted regression with unit and time fixed effects
- We use the following two-way fixed effects regression (Arkhangelsky et al., 2020)

$$(\hat{\tau}^{sdid}, \hat{\mu}, \hat{\alpha}, \hat{\beta}) = \arg \min_{\tau, \mu, \alpha, \beta} \left\{ \sum_{i=1}^N \sum_{t=1}^T (Y_{it} - \mu - \alpha_i - \beta_t - W_{it}\tau)^2 \hat{\omega}_i^{sdid} \hat{\lambda}_t^{sdid} \right\}$$

Change in average weekly wage in Fish and Seafood Merchant Wholesalers industry (Alabama)



## Results

Table 1: Impacts on Fishing Industry in Alabama

	Through 2011	Through 2012	Through 2013	Through 2014	Through 2015
Quarterly Establishment Count	1.85 [1.61]	2.23 [5.79]	2.55 [7.38]	2.89 [7.45]	2.42 [5.82]
Monthly Employment Level	-14.63** [5.99]	-10.29 [10.23]	-10.49 [13.21]	-13.49 [12.60]	-12.95 [12.38]
Average Weekly Wage	-391.53*** [96.48]	-152.31* [87.47]	-60.59 [119.47]	-57.12 [131.68]	-52.37 [106.97]
No. of Observations	532	608	684	760	836
No. of Treated Observations	7	11	15	19	23
No. of Total Time-periods (Quarters)	28	32	36	40	44
No. of Post-treatment Quarters	7	11	15	19	23

Table 2: Impacts on Seafood Product Preparation and Packaging Industry in Alabama

	Through 2011	Through 2012	Through 2013	Through 2014	Through 2015
Quarterly Establishment Count	-0.87*** [0.17]	-0.95*** [0.20]	-1.01*** [0.26]	-1.20*** [0.31]	-1.32*** [0.33]
Monthly Employment Level	-32.75* [17.98]	-24.51 [19.53]	-20.21 [26.40]	-19.18 [28.77]	-16.32 [33.05]
Average Weekly Wage	0.30 [47.00]	-1.68 [54.07]	-4.52 [58.98]	0.23 [75.41]	8.99 [79.26]
No. of Observations	532	608	684	760	836
No. of Treated Observations	7	11	15	19	23
No. of Total Time-periods (Quarters)	28	32	36	40	44
No. of Post-treatment Quarters	7	11	15	19	23

Table 3: Impacts on Fish and Seafood Merchant Wholesalers Industry in Alabama

	Through 2011	Through 2012	Through 2013	Through 2014	Through 2015
Quarterly Establishment Count	-0.50 [0.95]	-1.29 [1.68]	-1.82 [1.45]	-1.71 [1.48]	-1.62 [1.25]
Monthly Employment Level	1.64 [9.27]	5.15 [9.96]	1.70 [9.25]	-2.37 [7.11]	-8.97 [5.78]
Average Weekly Wage	-143.35 [92.83]	-176.36** [75.42]	-190.39** [74.72]	-157.66*** [47.62]	-105.35* [60.00]
No. of Observations	560	640	720	800	880
No. of Treated Observations	7	11	15	19	23
No. of Total Time-periods (Quarters)	28	32	36	40	44
No. of Post-treatment Quarters	7	11	15	19	23

Table 4: Impacts on Fish and Seafood Markets Industry in Alabama

	Through 2011	Through 2012	Through 2013	Through 2014	Through 2015
Quarterly Establishment Count	0.46 [0.45]	1.06** [0.50]	1.22** [0.51]	1.19** [0.52]	1.12* [0.58]
Monthly Employment Level	0.72 [3.22]	8.72*** [2.88]	11.86*** [3.03]	8.52*** [3.39]	1.35 [4.11]
Average Weekly Wage	10.57 [83.72]	32.14 [77.78]	35.47 [60.78]	8.85 [72.32]	51.39 [72.53]
No. of Observations	560	640	720	800	880
No. of Treated Observations	7	11	15	19	23
No. of Total Time-periods (Quarters)	28	32	36	40	44
No. of Post-treatment Quarters	7	11	15	19	23

## Results

Table 5: Impacts on Florida, Mississippi, and Texas

State	Industry	Outcome Variable	Through 2011	Through 2012	Through 2013	Through 2014	Through 2015
Florida	Fishing	Average Weekly Wage	-135.53* [77.27]	-125.29 [94.64]	-98.41 [121.82]	-68.10 [133.71]	-63.97 [98.25]
Mississippi	Seafood Product Preparation and Packaging	Quarterly Establishment Count	0.48*** [0.15]	-0.68*** [0.19]	-0.92*** [0.26]	-1.17*** [0.30]	-1.20*** [0.34]
Texas	Seafood Product Preparation and Packaging	Monthly Employment Level	-42.27** [16.43]	-50.48** [20.61]	70.45*** [24.27]	-73.89** [28.73]	-76.96** [35.45]
		No. of Observations	532	608	684	760	836
		No. of Treated Observations	7	11	15	19	23
		No. of Total Time-periods (Quarters)	28	32	36	40	44
		No. of Post-treatment Quarters	7	11	15	19	23

## Conclusion

- Variation in impacts across affected regions and industries
- Identification of the more vulnerable regions and industries
- Potential helpful information when dealing with similar water quality related environmental disasters
- Results of this research can be used
  - to emphasize on the initiatives required to avoid similar accidents in future
  - to compare to any relevant estimates generated on potential impacts in immediate aftermath of DWH oil spill

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