

The Labor Market Impacts of the 2010 *Deepwater Horizon* Oil Spill and Offshore Oil Drilling Moratorium

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Abstract

On April 20, 2010, the Transocean *Deepwater Horizon* suffered a catastrophic blowout while drilling in a BP lease in the Gulf of Mexico's Macondo Prospect that resulted in the largest oil spill in U.S. history. In response to the spill and concerns about the safety of offshore oil drilling, the U.S. Department of the Interior suspended offshore deep water oil and gas drilling operations on May 27, 2010, in what became known as the offshore drilling moratorium. The media portrayed these events as adversely impacting local employment. The unprecedented mobilization of spill response resources, the BP compensation fund, and the rig workers relief fund, all provided employment opportunities and income to counter at least some of these adverse employment impacts. Taking advantage of the unexpected nature of the spill and the unexpected decision to impose a drilling moratorium, I employ an event study empirical strategy to estimate the net effects of these events on employment and wages in Gulf Coast counties and parishes. Using monthly county/parish-level employment data from the Quarterly Census of Employment and Wages, I estimate that the most oil-intensive parishes in Louisiana experienced a net increase in employment and a net increase in wages relative to a no-spill/spill response/moratorium counterfactual. In contrast, some Florida coastal counties experienced a decline in employment as a result of these events. Additional analysis with sales tax data and commercial air arrivals further substantiate these findings.

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1. Introduction

On April 20, 2010, the Transocean *Deepwater Horizon* suffered a catastrophic blowout while drilling in a BP lease in the Gulf of Mexico's Macondo Prospect that resulted in the largest oil spill in U.S. history. In response to the spill and concerns about the safety of offshore oil drilling, the U.S. Department of the Interior suspended offshore deep water oil and gas drilling operations on May 27, 2010, in what became known as the offshore drilling moratorium. The media portrayed these events as adversely impacting local employment, with images of out-of-work fishermen and rig workers.

This paper examines the net impact of the oil spill, the drilling moratorium, and spill response on employment and wages in the Gulf Coast. The spill and moratorium represented unexpected events in the Gulf Coast region. The economic impacts of these events were expected to and did vary within and among the Gulf states. Coastal counties and parishes in this region were expected to bear the vast majority of the effects of these two events, while inland areas were expected to be largely unaffected. The moratorium was expected to affect Louisiana – with significant support of the offshore drilling industry – but not, for example, Florida, which had no active drilling off of its coastline. The timing and magnitude of the spill response varied across the states over the course of the spill as well.

These characteristics of the spill and moratorium motivate the empirical framework. I use an event study differences-in-differences strategy to estimate the impacts of the spill, spill response, and moratorium on employment. In this framework, the spill, spill response, and moratorium are considered exogenous events that “treat” coastal counties in the Gulf region. Given the surprise nature of these events, they can credibly be characterized as exogenous and hence the pre-event period should not include anticipatory behavior in the Gulf economy. I employed the National Oceanic and Atmospheric Administration (NOAA) definition of coastal counties to identify the counties “treated” by the spill and spill response in my analysis, and I separately categorized five Louisiana parishes identified by the U.S. government as most active in support of offshore drilling activities for “treatment” by the drilling moratorium.

To estimate the net effects of these events on employment, I use monthly county/parish-level data from the Quarterly Census of Employment and Wages. Figure 1 illustrates graphically the employment levels in the Louisiana oil parishes, the non-oil coastal parishes of Louisiana, counties on the Florida Gulf Coast, and the control (inland) counties in the Gulf States and identifies the dates of the spill and the drilling moratorium. To facilitate comparisons over 2010, I have indexed total employment for these four groups of counties such that they each equal 1.0 in January 2010. Employment growth among these four groups follows a nearly identical trajectory through April 2010 and then a significant divergence occurs. Florida Gulf Coast counties experience a significant drop in employment from May through July and then begin to experience employment growth immediately after the capping of the well (July 15). The non-oil parishes on the Louisiana coast track quite closely the employment path of the inland counties throughout the spill. In contrast, the Louisiana oil parishes had effectively flat employment throughout the spill and moratorium and avoided the decline in employment that affected these other Gulf Coast regions during May, June, and July of 2010.

In the statistical analysis, I find that the net employment effect of the spill, spill response, and moratorium is a fairly precise zero for most parts of the Gulf Coast during 2010. In particular, the Texas coastal counties and the non-oil Louisiana coastal parishes experienced net job impacts within a 95 percent confidence interval of about -0.3% and +0.9%. Mississippi coastal counties experienced net employment impacts ranging between about -1.1% and +0.4%. Three sub-regions in the Gulf Coast did expect statistically significant changes in employment. I find that the most oil-intensive parishes in Louisiana witnessed a 1.2% increase in employment (95 percent confidence interval, 0.4 to 2.0%), and the Alabama coastal counties experienced a 1.3% increase in employment as well. In contrast, the Florida counties on the Gulf Coast experienced a 1.8% decrease in employment (95 percent confidence interval, -1.1 to -2.5%).

Complementing these employment impacts, I find that the Louisiana oil parishes experienced a statistically significant increase in the average wage of about 2 percent. Likewise, the Alabama coastal counties enjoyed higher wages of about 4 to 6 percent during the spill and Texas appears to have had about 1.5 percent higher wages. The rest of the Gulf Coast counties and parishes experienced small and statistically insignificant impacts on wages.

I undertook an array of robustness checks of the base econometric model. First, I accounted for seasonality in labor markets by extending the panels and controlling for month fixed effects, which I permitted to vary between coastal and non-coastal regions in some specifications. Second, I modified the definition of coastal county/parish to focus on only those with significant coastline on the Gulf of Mexico. Third, I substituted U.S. non-Gulf State counties as controls for the inland Gulf State counties and parishes. Finally, I omitted all Texas observations, since the state was effectively “up current” from the spill and largely unaffected by spill and spill response. These confirm the key findings that the oil parishes’ employment and wage levels were higher than they would have been otherwise as a result of the net effect of the spill, response, and moratorium.

As measures of external validity, I employed the base econometric specification with two alternative measures of economic activity. First, I analyzed parish-specific sales tax data for Louisiana. Second, I investigated quarterly air travel passenger arrivals by airport in the Gulf Coast states. These supplemental analyses show statistically higher levels of economic activity covered by the sales tax in the oil parishes than in other Louisiana parishes during this time, and some evidence of lower air passenger arrivals in Florida Gulf Coast airports than other airports during this time (statistically significant at the 10 percent level).

The next section describes the predicted labor market impacts reported during the spill and moratorium in 2010. The third section presents the empirical strategy followed by the empirical results in section four. Section five presents three types of robustness and external validity checks: robustness of empirical model, evidence of economic activity in non-employment indicators, and robustness of findings in program participation data. The final section concludes.

2. Predicted Labor Market Impacts of the Spill and Drilling Moratorium

Starting in the first weeks after the *Deepwater Horizon* sank to the bottom of the Gulf of Mexico, analysts and politicians began to predict the potential employment impacts of the spill and the drilling moratorium. In May 2010, the Atlanta Federal Reserve Bank identified about 130,000 jobs at risk from the spill in the forestry/fishing, arts/entertainment/recreation, and accommodation and food services

industries in the Gulf States (Chriszt and Hammill 2010). An economist at the University of Central Florida estimated that 39,000 (195,000) jobs could be lost in Florida if the spill caused a 10% (50%) decline in tourism (Harrington 2010). The spill adversely impacted local employment through the closing of state and federal Gulf fisheries and by discouraging some tourists from vacationing on the Gulf Coast that summer (Aldy 2011).

Some early evidence suggested that regional tourism, especially in Florida, would bear adverse impacts from the spill. Oxford Economics (2010) presented information reflecting tourist travel intentions to the Gulf Coast in summer 2010. First, they reported on consumer webpage views for TripAdvisor, which is the world's most popular travel website for destinations, hotels, restaurants, etc. Gulf coast destinations of Clearwater, Destin, Gulf Shores, Fort Myers Beach, Key Largo, Panama City Beach, and Pensacola each had changes in TripAdvisor page views in June 2010 relative to June 2009 ranging between -25% and -52%, while Atlantic coast destinations, such as Daytona Beach, Hilton Head, Miami, Myrtle Beach, and West Palm Beach experienced changes in page views ranging between -4 and +17%. Oxford Economics also reported that a June 2010 survey found that 10% of households intending to travel to the Gulf Coast for vacation had changed their plans as a result of the oil spill. Oxford Economics (2010) estimated a reduction in tourism revenues by 12% in the first year after the beginning of the spill.

Within a week of the U.S. government's announcement of the drilling moratorium, representatives of the oil and gas industry highlighted potentially large employment losses (see Table 1). The Louisiana Mid-Continent Oil and Gas Association identified potential job losses in excess of 30,000 (Louisiana Workforce Commission 2010). In June, several economists at Louisiana State University independently estimated moratorium-related job losses in the range of 10,000 – 20,000 for the state of Louisiana (Dismukes 2010; Mason 2010; Richardson 2010). The U.S. government also employed regional multiplier models in two analyses: an internal Department of Interior assessment in July reportedly estimated job losses in excess of 23,000 (Power and Eaton) while an interagency working group report published in September estimated job losses in the 8,000 – 12,000 range (Interagency Economic Report 2010).

Senator Mary Landrieu of Louisiana stated that the moratorium “could cost more jobs than the spill itself” (Condon 2010). John Hofmeister, the former CEO of Shell, stated that “50,000 people could lose their jobs” (Desel 2010). The head of one Florida-based investment firm wrote in his oil spill blog that “an extended moratorium... will cost up to 200,000 higher-paying jobs in the oil drilling and service business and that the employment multiplier of 4.7 will put the total job loss at nearly 1 million permanent employment shrinkage over the next few years” (Kotok 2010).

The pre-spill employment data and a note on the use of regional multiplier models can put these moratorium job loss estimates in context. First, the number of rig workers working on projects in the Gulf of Mexico covered by the moratorium was about 9,000 (Interagency Economic Report 2010). The total number of workers in the oil and gas industry and in support services to oil and gas extraction in the Gulf States in April 2010 numbered about 110,000 (BLS n.d.). Nationwide, the oil and gas industry and associated oil and gas support services (NAICS 211 and NAICS 213112) employed about 350,000 workers in April 2010 (BLS CES n.d.).

Second, a number of analysts quickly undertook multiplier analysis of the moratorium after its announcement. While it is somewhat ironic that none of these analysts employed their modeling tools to evaluate the employment and economic activity impacts of the spill itself, more importantly, they

erred in failing to fully represent the economic environment during 2010. In particular, the analysts ran these multiplier models effectively assuming that a moratorium caused immediate, mass layoffs of offshore drilling rig workers (which did not occur; see section 5.3) and assuming no other shocks to economic activity, such as the unprecedented mobilization of spill response activity involving nearly 50,000 individuals. As a result, the ex post statistical analysis of labor market data in this paper presents a significantly different assessment of the labor market implications of the drilling moratorium than those assumed in the multiplier model analyses.

3. Empirical Strategy

The *Deepwater Horizon* oil spill and the offshore drilling moratorium were two unprecedented and unexpected events. Prior to April 20, 2010, the largest offshore drilling accident, near Santa Barbara, California in 1969, amounted to about 100,000 barrels over 11 days (National Commission 2010). With an estimated release of about 5 million barrels of oil over nearly three months, the *Deepwater Horizon* spill was some 50 times larger than the second biggest spill in U.S. history.

The May 27, 2010 offshore drilling moratorium was also an unexpected event. In 2009, a bipartisan energy bill passed the Senate Energy and Natural Resources Committee that would have opened up the eastern Gulf of Mexico to drilling (The American Clean Energy Leadership Act, S. 1462). In March 2010, President Obama announced a new offshore leasing plan that would also make available more of the Gulf to offshore drilling. Prior to the spill, political momentum pointed toward more Gulf of Mexico offshore drilling, not the potential for restricted access and drilling activities. A search of GoogleNews, shows no media articles calling for a moratorium on drilling throughout the Gulf of Mexico before May 27, 2010.

The economic impacts of the spill and moratorium events varied within and among the Gulf States. Coastal counties and parishes in this region bore the vast majority of the effects of these two events, while inland areas were largely unaffected. Figure 2 illustrates the coastal and inland counties for each of the five Gulf States as well as the location of the *Deepwater Horizon* oil spill. Figure 3 presents total employment for coastal counties and parishes. The moratorium was expected to affect Louisiana – with significant support of the offshore drilling industry – but not Florida, which had no active drilling off of its coastline, as evident by the oil and gas extraction and mining support activities employment presented for coastal counties and parishes in Figures 4 and 5. Those parts of the Gulf Coast region relying on tourism, as noted above, likely experienced a decline in vacationers, and Figure 6 illustrates the spatial distribution of accommodation employment.

The timing and magnitude of the spill response varied across the states over the course of the spill as well. The spill began with the *Deepwater Horizon* explosion on April 20 and the sinking of the rig on April 22. Soon after the rig collapsed to the bottom of the Gulf of Mexico, remote robots captured video of oil leaking from the well. Throughout May, BP undertook an array of efforts to contain the well without immediate success, and by the end of the month it appeared very likely that the spill would not be stopped until a relief well intercepted the leaking well some 17,000 feet below sea level. On May 27, the Department of the Interior issued a suspension order for deepwater drilling, commonly referred to as the offshore drilling moratorium. The drilling moratorium was described as likely being a 6-month suspension. On June 22, the U.S. District Court in New Orleans granted a preliminary injunction against the Department of the Interior. The Department issued a second moratorium on July 12. Three days

later, the leak was capped. On September 19, the relief well officially killed the well. Nearly a month later on October 12, the Department lifted the drilling moratorium.

These spatial and temporal characteristics of the spill and moratorium motivate the empirical framework. I use a differences-in-differences strategy to estimate the impacts of the spill and moratorium on employment. In this framework, the spill and moratorium are considered exogenous events that “treat” coastal counties in the Gulf region. Given the surprise nature of both events, they can credibly be characterized as exogenous and hence the pre-event period should not include anticipatory behavior in the Gulf economy (i.e., relocating fishing vessels to the Atlantic coast in anticipation of the spill or relocating drilling rigs to another region in anticipation of the moratorium).

I employ the National Oceanic and Atmospheric Administration’s definition of Gulf of Mexico coastal counties and parishes for Alabama, Florida, Louisiana, Mississippi, and Texas (NOAA n.d.). These counties are assumed to be “treated” by the spill for May through July 2010. In addition, I isolate the five Louisiana parishes identified by the U.S. government as most active in support of offshore drilling activities (Interagency Economic Report 2010).¹ These are assumed to be treated by the moratorium for June through October 2010. For the “control” group, I employ all non-coastal counties and parishes in these five states (an assumption I test later in the robustness checks). Table 2 presents summary statistics on the number of coastal and inland counties by Gulf State as well as average employment levels.

Formally, I specify the following regression equations:

$$(1) \ln(y_{it}) = \alpha_i + \delta_t + \beta 1[\text{spill}]_t 1[\text{coastal}]_i + \varepsilon_{it}$$

$$(2) \ln(y_{it}) = \alpha_i + \delta_t + \beta 1[\text{spill}]_t 1[\text{nonoil coast}]_i + \delta 1[\text{moratorium}]_t 1[\text{oil}]_i + \varepsilon_{it}$$

$$(3) \ln(y_{it}) = \alpha_i + \delta_t + \sum_{j=1}^5 \beta_j 1[\text{spill}]_i 1[\text{state}]_j 1[\text{nonoil coast}]_i + \delta 1[\text{moratorium}]_t 1[\text{oil}]_i + \varepsilon_{it}$$

in which y represents one of two labor market outcomes: (a) total employment for county i in month t , or (b) average weekly wage for county i in quarter t ; α represents county fixed effects, δ represents month-year (quarter-year) fixed effects in the employment (wage) specifications; the indicator functions $1[\text{spill}]$ and $1[\text{moratorium}]$ take the value of 1 for the months May through July and for the months June through October, respectively²; the indicator functions $1[\text{coastal}]$, $1[\text{oil}]$, and $1[\text{nonoil coast}]$ take the value of 1 for NOAA-classified Gulf Coast counties and parishes, the five Louisiana “oil” parishes of Iberia, Lafayette, Lafourche, Saint Marys, and Terrebonne, and all coastal counties and parishes except for the five oil parishes; and the indicator function $1[\text{state}]$ takes the value of 1 for each of the five states in the Gulf region. I estimate the base models with data for January through October 2010 (I test for sensitivity to panel length and seasonal controls in the robustness checks). The standard errors are clustered by county/parish to account for potential serial correlation in the data (Bertrand et al. 2004).

¹ Dismukes (2010) estimates that nearly three-quarters of the economic impacts of the moratorium would be borne by these five parishes in his multiplier analysis for Louisiana.

² For the wage analyses, these indicators take the value of 1 for 2010 quarter 3. The spill began in week eight of the second quarter, and the moratorium began in week 13 of the second quarter. Given this timing and the likely lag time for wage adjustment, I specify the wage models such that the net treatment of spill, spill response, and moratorium are assumed to occur in quarter 3 of 2010.

To implement this model, I employ monthly county/parish-level employment data and quarterly county/parish-level wage data from the Quarterly Census of Employment and Wages. The BLS and state employment security agencies compile monthly employment and quarterly wage data for workers covered by various unemployment insurance programs, and hence is effectively a measure of employment provided by employers. It does not include data on the self-employed, proprietors, armed forces, domestic workers, and railroad workers.³ This dataset only permits an investigation of employment levels; it does not include data on labor force participation, unemployment, or unemployment rates. While the Current Population Survey's Local Area Unemployment Statistics (LAUS) provides such information at the county-by-month level, the LAUS data are imputed for most counties and months, in contrast to the QCEW count data. In addition, the QCEW provides employment and wage data, for some counties and parishes in these region, by sector and industry, and I use these data to investigate the composition of labor market impacts.

4. Results

Employment

Table 3 presents the employment results for estimating models (1) – (3). Model (1), which permits an examination of a common treatment of the spill, spill response, and moratorium on all coastal counties and parishes, shows fairly precise zero impacts for the Gulf Coast counties. The estimated coefficient cannot be distinguished from zero and the 95 percent confidence interval ranges from about a 7/10 of 1 percent decline to a 1/10 of 1 percent increase in employment.

Model (2a) allows for differential impacts for the five oil-intensive parishes of Louisiana and for the rest of the Gulf Coast counties. This model effectively focuses on the treatment of spill, spill response, and moratorium on the oil-intensive parishes and the treatment of spill and spill response on the rest of the Gulf Coast region, which had little economic activity that could be impacted by the offshore drilling moratorium. Not surprisingly, the non-oil Gulf Coast counties show similar impacts as the entire Gulf Coast in the model (1) results. The oil parishes exhibit a statistically significant employment increase of 1.2 percent.

Model (3a) provides even greater flexibility in estimating the impacts of treatment by the spill, spill response, and moratorium by allowing for effects to vary by state and, again, for the Louisiana oil parishes. The results in column (3a) illustrate a statistically significant 1.2 percent employment gain in the Louisiana oil parishes, a statistically significant 1.3 percent employment gain in Alabama coastal counties, and a statistically significant 1.8 percent employment decline in Florida Gulf Coast counties. Based on April 2010 employment levels in these three regions, these statistically significant estimated impacts translate into about 3,200 more jobs in the oil parishes, 3,500 more jobs in the Alabama coastal counties, and 48,000 fewer jobs in the Florida coastal counties reflecting the net effects of the spill, spill response, and moratorium.

To complement these analyses of total employment, I have also estimated models (1) – (3) for industry-specific samples for the oil and gas extraction (NAICS 211), support activities for mining (NAICS 213, which includes drilling oil and gas wells NAICS 21311), and accommodation (NAICS 721). These industry-

³ For more information on the QCEW, refer to <http://www.bls.gov/cew/cewover.htm>.

specific analyses permit further investigation of the impacts of the spill, spill response, and moratorium on directly affected industries. While additional industries, such as fishing (NAICS 1141) and water transportation (NAICS 483), would certainly be of interest for this kind of analysis, the censoring of the public domain county-level employment data renders these panels much too small (3 and 20 counties, respectively, out of 534 in the region). Table 3 presents the results for model (3) for oil and gas extraction, support activities for mining, and accommodation, and these samples have 62, 134, and 257 counties, respectively. As a result of censoring, the models for oil and gas extraction only include counties from Louisiana and Texas.

The Louisiana oil parishes experience a statistically significant increase in oil and gas extraction employment of about 3 percent, a statistically significant increase in accommodation employment of about 5 percent, and a statistically significant decrease in support activities for mining employment of about 6 percent. The non-oil parishes of Louisiana appear to experience a decline in oil and gas extraction employment of about 1.7 percent. The Texas coastal counties do not experience statistically significant changes in oil and gas extraction employment. There is some evidence of a decline in Texas accommodation employment. Otherwise, there are no statistically significant changes for Texas in these models with these panels. The non-oil Louisiana parishes appear to experience no statistically significant employment changes during the oil spill. The coastal counties of Alabama, Mississippi, and Florida experience a statistically significant decline in support activities for mining, but it is important to recognize that while not censored, the employment levels for this industry in these counties are relatively low, measured in the tens of employees per county-month. As evidence of a potential adverse impact of the spill on tourism, Florida and Mississippi experience statistically significant declines in accommodation employment of 3 and 5 percent, respectively.

Wages

The labor market impacts of the spill, spill response, and moratorium extend beyond just employment. I also employ the QCEW to estimate the impacts of these events on the average quarterly wage in these counties and parishes. Table 4 presents the results for models (1) – (3) for the average wage. As evident above in the discussion of employment, the average treatment effect for the Gulf Coast counties as a whole is not statistically different from zero (the 95 percent confidence interval is about $\pm 1\%$). The Louisiana oil parishes experience a statistically significant increase in wages of about 2 percent. Likewise, the Alabama coastal counties appear to have higher wages, with a statistically significant estimate of about 4 percent. The non-oil Louisiana coastal parishes experience a statistically significant 2.5 percent decline in wages. Florida and Mississippi experience small and statistically insignificant wage impacts during the oil spill.

5. Robustness and External Validity

5.1 Robustness of Empirical Strategy

I undertook an array of robustness checks of the base econometric model by permitting variation accounting for seasonality and in some of the geographic assumptions in identifying treatment and control counties.

Seasonality

To address the concern that the results presented above reflect regular seasonal variations in labor markets, I expanded the analyses to include longer panels (the 2010 base panel, a 2009-2010 panel, and a 2008-2010 panel) and allowed for month (quarter) fixed effects to vary between coastal and non-coastal regions. Table 5 presents the employment impacts for these robustness checks and includes model 3a from Table 3 for reference.

While the oil parishes exhibit a statistically significant employment increase of 1.2 percent in the 2010 panel (3a), the longer panels show fairly precise zeroes for the oil parishes. These results highlight a question for this kind of analysis (and is common to all reduced-form differences-in-differences empirical models) – when should the panel start? The panel could start as early as January 1990 (given the construction of the public domain QCEW dataset) or as late as April 2010. A longer panel provides more power to estimate parameters, but if omitted time-varying factors affect a subset of counties or parishes, then lengthening the panel could affect the estimation of county/parish fixed effects and the treatment effects. For example, the increase in oil prices over 2003-2008, including the sharp run-up in spring and summer of 2008, could have spurred greater drilling activity and associated support activity employment in the oil parishes than in 2010. Alternatively, a longer panel could permit an estimation of seasonal trends in employment that may explain some of the variation evident in a 2010-only panel. Allowing for seasonal effects to vary between coastal and non-coastal counties yields a larger oil parish employment increase of 2.2% in the 2010 panel, but again statistical insignificant, small, positive effects in the longer panels (3b, 3c, 3e, 3f).

Alabama coastal counties enjoy a statistically significant employment increase of 1.3 to 1.7% in the 2010 panel (3a, 3d), but small, positive, statistically insignificant effects in the longer panels. Florida Gulf Coast counties experience a statistically significant employment decline of 1.1 – 1.8% in four of the six specifications presented in Table 5 (3a – 3d). With longer panels, Texas coastal counties appear to experience statistically significant employment gains ranging between 1.4 and 2.0 percent for the 2009-2010 and 2008-2010 panels, respectively (3b, 3c, 3e, 3f).

Table 6 presents the seasonality robustness checks for the wage impacts. In five of the six specifications, Louisiana oil parish wages are statistically significant and higher than control wages by 2.0 – 2.7%. Likewise, in five of the six specifications, Alabama coastal county wages are about 4 – 6% higher and statistically significant. In longer panels, Texas coastal county wages appear to be about 1.5 – 2.0% higher. The decline in non-oil Louisiana coastal parish wages only holds for the 2010 panels (3a, 3d). Florida and Mississippi experience small and statistically insignificant wage impacts during the oil spill.

National Controls

The primary empirical strategy in this paper rests on the assumption that the non-coastal counties and parishes in the Gulf Coast region are not impacted by the spill or moratorium and thus can serve as controls in the regressions. Given the close proximity many of these counties and parishes have to the treated coastal region, there may be a risk that the controls are affected by changes in economic activity in the treatment region. For example, if a worker lost her job in a treatment county and relocated to a control county where she took on a new job, then we would have a case in which the employment status of the individual is unchanged but this empirical framework would estimate a delta of -2 for employment (for treatment employment minus control employment during the treatment period). In a similar way, if a worker quits a job in a control county so he can move to a treatment county and

participate in spill response, then this approach would again show a change in employment (in this case a delta of +2) despite the fact that the employment status for the worker in question is unchanged.

To address this possible concern, I run the base regressions with a modified sample. I exclude all control counties and parishes in the Gulf States and I add all non-Gulf State counties in the United States. Thus, I use the non-Gulf Coast region as the control group for the treatment of the spill and moratorium on the Gulf Coast counties and parishes. This also permits an illustration of how employment trends in the Gulf Coast region compared with the rest of the nation during these events.

Table 7 shows the results for employing national controls. Across all three panels (columns 3g – 3i), Florida coastal counties have a statistically significant lower employment of 2 to 3 percent. Neither the Louisiana oil parishes nor the Alabama coastal counties show employment impacts statistically different from zero in each of the panels. While the non-oil Louisiana oil parishes and coastal counties of Mississippi and Texas appear to have statistically lower employment in the 2010 panel on the order of 1 to 1.5%, these results do not hold up in the longer panels.

Table 8 presents the results for wage impacts using the national sample. The Louisiana oil parishes have statistically significant higher wages ranging between 2.5 – 3.2% above the controls over the three panels. Likewise, Alabama has statistically higher wages in the 5 – 6% range. There is some evidence of statistically higher wages in Texas – up to 2% -- in the 2009-2010 and 2008-2010 panels. None of the other regions have wage impacts statistically different from zero.

Omit Texas

Texas counties represent about 48 percent of the sample in the Gulf State statistical analyses. Texas may not have experienced much of an impact from the oil spill, since it occurred southeast of the boot of Louisiana and the vast majority of the oil moved to the east and north from the leaking well. To address the concern that the Texas counties – coastal and inland – may not be appropriate for inclusion in these statistical analyses since the state, I have run the base regressions with a four-state Gulf sample that omits coastal and inland counties of Texas.

Table 7, columns 3j – 3l shows the results for the model runs with this modified sample. As before, the Louisiana oil parishes and the Alabama coastal counties have statistically higher employment in the 2010 panel, but not in the longer panels. The non-oil Louisiana parishes have statistically higher employment, ranging from about 0.7% to 1.7% in the 2010 and 2008-2010 panels, respectively. The Florida coastal counties have statistically lower employment of about 1.1% to 1.4% in the 2010 and 2009-2010 panels, respectively. Overall, these results are fairly similar to those specifications that include Texas counties in the regression model.

Excluding the Texas observations does not qualitatively alter the estimated wage impacts of the spill, response, and moratorium (Table 8, columns 3j – 3l). Louisiana oil parish wages experience a statistically significant 2.2 – 2.7% increase in the third quarter of 2010, and the Alabama counties enjoy statistically significant increases of 4 – 6% across all three panels as well. There is limited evidence of a statistically significant decline in the non-oil Louisiana coastal parish wages, as illustrated in the 2010 panel. None of the other state-specific coastal wage impacts are statistically different from zero in this “Omit Texas” framework.

Definition of Coastal

The base regressions employ the NOAA definition of a coastal county or parish in the Gulf States. I have also employed a more narrow definition that requires a county or parish to meaningfully border the Gulf of Mexico. In these analyses, I have dropped what I now define as “buffer” counties and parishes – those that NOAA identifies as coastal but do not appear to have meaningful coastline. This reduces the sample from 534 to 444 counties and it also eliminates those counties that may have experienced relatively weak “treatment,” when compared to those counties with significant coastline, and relatively stronger “treatment,” when compared to those counties further inland.

The Louisiana parishes – oil-intensive and non-oil – have statistically higher employment in the 2010 panel but not in the longer panels (Table 7, columns 3m – 3o). Interestingly, Alabama coastal counties (in this case, Baldwin and Mobile) have statistically higher employment of 1.4% to 2.7% across the three panels, while Florida coastal counties have statistically lower employment of 1.6% to 2.2% across the three panels. These results illustrate the robustness of the adverse employment impacts to Florida and potentially highlight the positive employment impacts to the two Alabama counties sitting on the Gulf Coast.

For wage effects under this alternative definition of coastal counties and parishes (Table 8, columns 3m – 3o), the oil-intensive Louisiana parishes have statistically significant higher wages that range between 1.9 and 2.2% in the three panels. Coastal counties in Florida and Mississippi appear to experience a statistically significant decline of about 1.5% in the 2010 and 2009-2010 panels. In addition, Alabama appears to benefit on the order of 1.5 – 2.0% in the average wage. There is no statistically significant impact of the spill on non-oil Louisiana coastal parishes in this framework.

5.2 External Validity Check: Sales Tax Revenues and Commercial Air Travel

Louisiana Sales Tax Revenues

To further corroborate the employment findings for Louisiana, I analyze parish-level sales tax data. The State of Louisiana reports sales tax revenues by parish for the state general sales tax on an annual basis for fiscal years that run from July to June. The state sales tax rate was 4 percent over the sample period and across all parishes.⁴ The revenue data are for fiscal years ending in June of a given calendar year (Louisiana Department of Revenue 2010, 2011). For this analysis, I conduct a standard differences-in-differences analysis that allows for comparisons across two time periods: (1) July 2009 – June 2010, and (2) July 2010 – June 2011; and comparisons across three groups: (1) non-oil Louisiana coastal parishes, (2) oil parishes, and (3) inland control parishes. Specifically, I estimate the following regression:

$$(4) \ln(\text{revenue}_{it}) = \alpha_i + \delta_t + \beta 1[2010/11]_t 1[\text{nonoil coast}]_i + \delta 1[2010/11]_t 1[\text{oil}]_i + \varepsilon_{it}$$

in which revenue represents total sales tax revenue for year t ; α represents county fixed effects; δ represents the fixed effect for the 2010/2011 year (the 2009/2010 year fixed effect is omitted); the indicator function $1[2010/11]$ takes the value of 1 for the 2010/2011 tax revenue year; and the other indicator functions were defined above.

⁴ Technically, the 4 percent state general sales tax consists of a 3.97% state sales tax and a 0.03% Louisiana Tourism Promotion District sales tax. The revenue data presented covers only the state sales tax; it does not include parish or city-established sales tax revenues.

The oil parishes experienced an increase in sales tax revenues for the July 2010 – June 2011 period relative to the previous twelve months. This increase in tax revenues differs significantly from the non-oil coastal parishes and the inland parishes, each of which experienced no meaningful change in the level of revenues. The differences-in-differences estimator using parish-level data to compare the before and after time periods yields a statistically significant 11 percent increase in sales tax revenue for the oil parishes relative to the inland parishes.

Commercial Air Travel

The labor market impacts presented above suggest that tourism may have been adversely impacted by the oil spill, especially in Florida. To further investigate these impacts, I employ data compiled by the Bureau of Transportation Statistics (n.d.), which tracks commercial air travel, including number of passenger arrivals by airport by quarter. According to the BTS, there were 115 airports in the five Gulf States receiving commercial air passengers in the second quarter of 2010. For this analysis, I limit the sample of airports to those with at least 50,000 passenger arrivals per quarter, which corresponds to about four daily arrivals of a Boeing 737-sized aircraft. This restriction drops a number of military installations that occasionally receive civilian arrivals and very small airports. The resulting sample includes 32 airports that received more than 97 percent of all commercial air passengers in these five states in the second quarter of 2010. Coastal counties and parishes host 15 of these airports.

To evaluate the potential impacts of the oil spill on commercial air travel, I estimate the following regressions:

$$(5) \ln(passengers_{it}) = \alpha_i + \delta_t + \beta 1[spill]_t 1[coastal]_i + \varepsilon_{it}$$

$$(6) \ln(passengers_{it}) = \alpha_i + \delta_t + \beta 1[spill]_t 1[FL\ coast]_i + \delta 1[spill]_t 1[NonFL\ coast]_i + \varepsilon_{it}$$

in which passengers represents the total number of arrivals for airport i in quarter t ; α represents airport fixed effects, δ represents quarter-year fixed effects; the indicator function $1[spill]$ takes the value of 1 for the third quarter of 2010; the indicator functions $1[coastal]$, $1[FL\ coast]$, and $1[NonFL\ coast]$ take the value of 1 for airports in NOAA-classified Gulf Coast counties and parishes, airports in Florida coastal counties, and airports in non-Florida Gulf Coast counties, respectively. I estimate the models with varying lengths of panels, ranging from 2008:Q1 through 2010:Q3 to only the first three quarters of the 2010 calendar year. The standard errors are clustered by airport.

Table 9 shows the results for regression models (5) and (6) with the varying-length panels. For the specifications of model (5), there is a relatively small but statistically insignificant reduction in commercial air travel passengers for the oil spill quarter. By estimating differential impacts for Florida versus non-Florida coastal airports, there is some weak evidence that Florida airports are adversely impacted by the oil spill. With the 2010 panel, I estimate a 17 percent decline in Florida coastal airport passenger arrivals, although this estimate cannot be statistically distinguished from zero. Using the 2007-2010, panel I estimate a similar 15 percent decline that is statistically different from zero at the 10 percent level.

5.3 External Validity: Program Participation

Spill Response Labor Mobilization

The unprecedented mobilization of spill response resources – including more than 800 specialized skimmers, 120 aircraft, 8,000 vessels, and nearly 50,000 responders (White House 2011) – provided employment opportunities that could counter the potential adverse effects of the spill and the moratorium. While many of these responders represented workers relocating temporarily to address the spill, some were local displaced workers. For example, some of the fishermen who faced closed state and federal fisheries during the spill participated in the Vessels of Opportunity program. Through this program BP paid \$1,200 - \$3,000 per day per vessel for skimming, booming, and related response operations (National Commission 2010).

BP Economic Damage Compensation and Clean-up Expenditures

The clean-up activities and compensation for economic damages provided by BP could counter the impacts of lost income on economic activity. BP's expenditures in the Gulf States for damage compensation and clean-up were quite significant. By June 1, 2010, BP reported spending nearly a billion dollars for clean-up, and the clean-up tab had increased to more than \$3 billion by July 5. On September 17, BP reported clean-up spending of nearly \$10 billion. BP reported compensation for damage claims of \$40 million through June 1, \$147 million through July 5, and nearly \$400 million through August 23, when BP turned over the claims process to the independent claims facility created as a part of the June 16 agreement with the White House.

Rig Worker Assistance Fund

On June 16, 2010, as a part of a larger agreement, the White House and BP agreed that BP would set aside \$100 million for a Rig Workers Assistance Fund (RWAFF) to benefit any rig workers laid off as a result of the drilling moratorium. BP allocated the \$100 million to the Baton Rouge Area Foundation, which was responsible for designing and implementing the assistance fund.

The RWAFF limited eligibility for grants that ranged from \$3,000 to \$30,000 to individuals who had been working on deepwater drilling rigs as of May 6, 2010 and had lost their jobs. The RWAFF took a first round of applications in September 2010 and paid out grants totaling \$5.6 million to 347 workers. To put these claims for lost jobs in context, 347 rigworkers would staff less than one-and-a-half deepwater drilling rigs like the *Deepwater Horizon*.

The RWAFF opened a second round in the Spring of 2011 to provide grants to those individuals who lost their jobs in a position that supported deepwater drilling rigs, such as shipyard workers, caterers, drilling support operations, etc. In this second round, the RWAFF paid out about \$5.8 million to 408 workers. These relatively modest claims for displaced rig support workers are consistent with the evidence that few rigs left the Gulf of Mexico: only five of the 46 rigs operating on April 20, 2010 had left the region as of September 10, 2010 (Interagency Economic Report 2010). Anecdotal evidence indicates that "oil companies used the enforced suspension to service and upgrade their drilling equipment, keeping shipyards and service companies busy" (Broder and Krauss 2010).

6. Conclusions

The April 20, 2010 explosion on the Deepwater Horizon drilling rig precipitated several economic shocks to the Gulf Coast region: an unprecedented U.S. oil spill, an unprecedented mobilization of spill response resources, and an unprecedented moratorium on deepwater drilling. This paper has investigated the impact of these shocks on employment and wages in the Gulf Coast region.

The analysis of employment – in aggregate and within specific industries likely to be impacted by the spill and/or drilling moratorium – shows little adverse impact in Louisiana, the state closest to the leaking well in the Macondo Prospect of the Gulf of Mexico. The various statistical models illustrate either statistically significant increases in employment in the oil parishes (2010 panel) and the non-oil coastal parishes (2008-2010 panel) or small effects (point estimates $< |0.5\%|$) that are statistically indistinguishable from zero. Figure 7 presents the estimates for each coastal region based on model 3a, which shows the significant adverse impacts in Florida in contrast with the rest of the Gulf Coast region. The Louisiana oil parishes also enjoyed a statistically significant increase in the average wage across all panels. Complementary analyses of sales tax revenues in Louisiana indicate that the oil parishes enjoyed greater levels of economic activity during the spill, spill response, and moratorium than non-oil coastal parishes and inland parishes in Louisiana.

There are consistent results across panels and including various robustness checks showing that overall employment along the Florida Gulf Coast was lower during the oil spill. The analysis for the accommodations industry provides some additional evidence of the adverse impact of the spill on Florida coastal employment. The evaluation of commercial air passenger arrivals also provides some suggestive evidence of a decline in tourism in the Florida coast as a result of the spill.

The results of these statistical analyses for the Louisiana oil parishes differ significantly from the predictions made with various state and regional multiplier models employed to assess the impacts of the drilling moratorium. Figure 8 presents the estimate based on model 3a in this paper and contrasts the modestly higher employment relative to the inland control counties with the large, negative impacts predicted in 2010. The dramatic overestimate of the employment losses in the ex ante multiplier losses, in comparison to the ex post statistical analysis – and for that matter, simple graphical analysis in Figure 1 – suggests several shortcomings of the multiplier tools. First, the *ceteris paribus* assumption made in the drilling moratorium multiplier analyses did not appropriately represent the economic environment in the Gulf Coast region during the summer of 2010. Everything else was not equal; a significant influx of spill response resources provided a source of income and employment for at least some of those displaced by the spill and the moratorium. Second, these multiplier models operated as if a significant number of drilling rigs would relocate to other regions and layoff a significant number of workers. This did not pan out, perhaps in part resulting from the uncertainty about future government regulation – including the length of the moratorium – in the Gulf of Mexico.

These results yield several policy implications. First, a significant pulse of resources in spill response appears to offset much of the adverse impacts of the spill. This is not a determination that the optimal level of spill response was pursued, but to simply note that the spill response delivers an array of immediate and longer-term economic and environmental benefits. Second, the ambiguity about the length of the drilling moratorium may have mitigated some of the adverse impacts of the drilling moratorium. Throughout what was originally billed as a 6-month moratorium, Department of Interior officials noted that it could end early (and in fact, the moratorium ended more than one month early). This uncertainty may have created an incentive for rig owners to wait, not unlike how uncertainty associated with an irreversible investment can create value in waiting for new information. And third,

multiplier analyses that do not characterize the complexity and temporal attributes of an economic shock may be uninformative and potentially misleading for policy deliberations.

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Tables

Table 1. Ex Ante Estimates of the Employment Impacts of the Offshore Drilling Moratorium

Estimated Job Loss	Region	Source
8,169	Gulf States	Mason 2010
9,462	Louisiana	Dismukes 2010
17,464	Louisiana	Richardson 2010
23,247	Not specified	Department of the Interior (Power and Eaton 2010)
30,000	Louisiana	Louisiana Mid-Continent Oil and Gas Association
50,000	Not specified	Quote by John Hofmeister, former CEO, Shell (Desel 2010)
200,000 – 1,000,000	Not specified	Kotok 2010

Table 2. Number of Counties and Average County Employment, Gulf States

State	Number of Counties		Employment (1000s)	
	Coastal	Inland	Coastal	Inland
Gulf Coast States	139	395	56 (181)	35 (121)
Alabama	8	59	34 (53)	26 (50)
Florida	40	27	65 (110)	162 (241)
Louisiana	38	26	39 (56)	14 (25)
Oil Parish	5		56 (39)	
Non-Oil Parish	33		36 (58)	
Mississippi	12	70	18 (24)	12 (18)
Texas	41	213	80 (307)	32 (127)

Notes: Standard deviations presented in parentheses

Table 3. Estimated Employment Impacts, All Industries and Industry-Specific, Gulf Coast States, 2010

Industry	(1a) Total	(2a) Total	(3a) Total	(3a) Oil and Gas 211	(3a) Mining Support 213	(3a) Accommodation 721
Gulf Coast	-0.0032 (0.0020)	-0.0034 (0.0021)				
Gulf Coast ex Oil Parishes		0.012** (0.0040)	0.012** (0.0040)			
Oil Parishes			0.0026 (0.0025)	0.032** (0.0099)	-0.059** (0.0017)	0.049* (0.024)
LA Coast ex Oil Parishes			0.013* (0.0061)	-0.017* (0.0082)	0.0050 (0.012)	0.012 (0.016)
AL Coast			-0.018** (0.0036)	—	-0.12** (0.0060)	0.027 (0.040)
FL Coast			-0.0016 (0.0054)	—	-0.048** (0.0060)	-0.031* (0.015)
MS Coast			0.0026 (0.0029)	—	-0.075** (0.0060)	-0.046** (0.014)
TX Coast			2010	-0.0038 (0.0074)	0.0093 (0.0089)	-0.024* (0.012)
Sample Period	2010	2010	5,340	2010	2010	2010
N(counties)	534	534		62	134	257
N	5,340	5,340		620	1,340	2,570

Notes: The natural logarithm of employment is the dependent variable. Robust standard errors clustered by county. All models include fixed effects by county and month. **, * denote statistical significance at the 1, 5 percent levels.

Table 4. Estimated Wage Impacts, All Industries, Gulf Coast States, 2010

	(1a)	(2a)	(3a)
Gulf Coast	-0.0016 (0.0051)		
Gulf Coast ex Oil Parishes		-0.0024 (0.0052)	
Oil Parishes		0.021** (0.0044)	0.020** (0.0043)
LA Coast ex Oil Parishes			-0.025* (0.012)
AL Coast			0.038* (0.016)
FL Coast			-0.0049 (0.0084)
MS Coast			-0.015 (0.016)
TX Coast			-0.0022 (0.0066)
Sample	2010	2010	2010
N	1,602	1,602	1,602

Notes: The natural logarithm of the weekly wage is the dependent variable. Robust standard errors clustered by county. All models include fixed effects by county and quarter. Each sample includes 534 counties/parishes. **, * denote statistical significance at the 1, 5 percent levels.

Table 5. Estimated Employment Impacts, All Industries, Gulf Coast States, Seasonality Robustness Checks

	(3a)	(3b)	(3c)	(3d)	(3e)	(3f)
Oil Parishes	0.012** (0.0040)	0.0030 (0.0054)	-0.0021 (0.0074)	0.022** (0.0048)	0.0089 (0.0057)	0.0030 (0.0076)
LA Coast ex Oil Parishes	0.0026 (0.0025)	0.0050 (0.0039)	0.012* (0.0051)	0.0064* (0.0030)	0.0099* (0.0045)	0.016** (0.0055)
AL Coast	0.013** (0.0061)	0.018 (0.015)	0.0022 (0.021)	0.017** (0.0063)	0.023 (0.016)	0.0061 (0.021)
FL Coast	-0.018** (0.0036)	-0.011* (0.0043)	-0.014* (0.0057)	-0.014** (0.0039)	-0.0057 (0.0046)	-0.0075 (0.0060)
MS Coast	-0.0016 (0.0054)	-0.0017 (0.0074)	-0.0053 (0.013)	0.0022 (0.0056)	0.0032 (0.0080)	-0.0014 (0.0013)
TX Coast	0.0026 (0.0029)	0.014** (0.0039)	0.016** (0.0053)	0.0064 (0.0035)	0.019** (0.0047)	0.020** (0.0057)
Sample Period	2010	2009-2010	2008-2010	2010	2009-2010	2008-2010
Season Effects by Coastal Identifier	No	No	No	Yes	Yes	Yes
N	5,340	11,748	18,156	5,340	11,748	18,156

Notes: The natural logarithm of employment is the dependent variable. Robust standard errors clustered by county. All models include fixed effects by county and month or county and month-year. Each sample includes 534 counties/parishes. **, * denote statistical significance at the 1, 5 percent levels.

Table 6. Estimated Wage Impacts, All Industries, Gulf Coast States, Seasonality Robustness Checks

	(3a)	(3b)	(3c)	(3d)	(3e)	(3f)
Oil Parishes	0.020** (0.0043)	0.023** (0.0080)	0.020** (0.0087)	0.0083 (0.0095)	0.027** (0.0083)	0.025** (0.0088)
LA Coast ex Oil Parishes	-0.025* (0.012)	-0.0060 (0.077)	-0.0032 (0.0083)	-0.038** (0.013)	-0.0056 (0.0077)	-0.0020 (0.0081)
AL Coast	0.038* (0.016)	0.049** (0.013)	0.058** (0.012)	0.026 (0.018)	0.053** (0.013)	0.063** (0.012)
FL Coast	-0.0049 (0.0084)	-0.0049 (0.0057)	0.00062 (0.0056)	-0.017 (0.012)	-0.0012 (0.0053)	0.0055 (0.0051)
MS Coast	-0.015 (0.016)	-0.0074 (0.014)	-0.0051 (0.014)	-0.027 (0.018)	-0.0037 (0.014)	-0.00026 (0.014)
TX Coast	-0.0022 (0.0066)	0.015* (0.0060)	0.014** (0.0051)	-0.014 (0.010)	0.019** (0.0064)	0.019** (0.0051)
Sample	2010	2009-2010	2008-2010	2010	2009-2010	2008-2010
Season Effects by Coastal Identifier	No	No	No	Yes	Yes	Yes
N	1,602	3,738	5,874	1,602	3,738	5,874

Notes: The natural logarithm of weekly wage is the dependent variable. Robust standard errors clustered by county. All models include fixed effects by county and quarter or county and quarter-year. Each sample includes 534 counties/parishes. **, * denote statistical significance at the 1, 5 percent levels.

Table 7. Estimated Employment Impacts, All Industries, Gulf Coast States, Geographic Robustness Checks

	(3g)	(3h)	(3i)	(3j)	(3k)	(3l)	(3m)	(3n)	(3o)
Oil Parishes	-0.0054 (0.0039)	-0.0084 (0.0053)	-0.011 (0.0072)	0.022** (0.0044)	0.044 (0.0057)	0.0035 (0.0077)	0.0097* (0.0040)	-0.0064 (0.0055)	-0.010 (0.0075)
LA Coast ex Oil Parishes	-0.0095** (0.0024)	-0.0052 (0.0038)	0.0038 (0.0049)	0.0072** (0.028)	0.0051 (0.0043)	0.017** (0.056)	0.014** (0.0050)	0.017 (0.013)	0.024 (0.019)
AL Coast	0.0011 (0.0061)	0.0081 (0.015)	-0.0060 (0.021)	0.018** (0.0062)	0.018 (0.015)	0.0071 (0.021)	0.027* (0.013)	0.022** (0.0081)	0.014* (0.0066)
FL Coast	-0.030** (0.0035)	-0.021** (0.0043)	-0.020** (0.0056)	-0.014** (0.0038)	-0.011* (0.0047)	-0.0065 (0.0062)	-0.016** (0.0054)	-0.018** (0.0059)	-0.022** (0.0073)
MS Coast	-0.014** (0.0053)	-0.012 (0.0073)	-0.014 (0.013)	0.0029 (0.055)	-0.0017 (0.0076)	-0.00032 (0.013)	0.0084 (0.082)	0.0060 (0.013)	0.012 (0.015)
TX Coast	-0.0095** (0.0029)	0.0035 (0.0039)	0.0081 (0.0052)	–	–	–	-0.00036 (0.0044)	0.011 (0.010)	0.014 (0.014)
Fixed Effects	Month, year, county			Month-year, county			Month-year, county		
Sample Region	National			Gulf States excluding Texas			Gulf States excluding buffer counties		
Sample Time	2010	2009-2010	2008-2010	2010	2009-2010	2008-2010	2010	2009-2010	2008-2010
N(counties)	2,872	2,872	2,874	280	280	280	444	444	444
N	28,718	63,182	97,640	2,800	6,160	9,520	4,440	9,768	15,096

Notes: The natural logarithm of employment is the dependent variable. Robust standard errors clustered by county. **, * denote statistical significance at the 1, 5 percent levels.

Table 8. Estimated Wage Impacts, All Industries, Gulf Coast States, Geographic Robustness Checks

	(3g)	(3h)	(3i)	(3j)	(3k)	(3l)	(3m)	(3n)	(3o)
Oil Parishes	0.032** (0.0035)	0.031** (0.0078)	0.025** (0.0085)	0.022** (0.0044)	0.027** (0.0080)	0.022* (0.0088)	0.022** (0.0044)	0.022** (0.0080)	0.019* (0.0088)
LA Coast ex Oil Parishes	-0.022 (0.012)	-0.0046 (0.0075)	-0.0048 (0.082)	-0.036** (0.012)	-0.0082 (0.0077)	-0.0066 (0.0082)	-0.034 (0.028)	-0.031 (0.030)	-0.037 (0.032)
AL Coast	0.050** (0.015)	0.057** (0.013)	0.063** (0.012)	0.040* (0.016)	0.053** (0.013)	0.061** (0.012)	0.020 (0.011)	0.015** (0.0053)	0.019* (0.0087)
FL Coast	0.0065 (0.0080)	0.0030 (0.0055)	0.0054 (0.0054)	-0.0031 (0.0087)	-0.0013 (0.0057)	0.0028 (0.0056)	-0.015* (0.0067)	-0.012* (0.0057)	-0.0083 (0.0061)
MS Coast	-0.0033 (0.016)	0.00047 (0.014)	-0.00038 (0.014)	-0.013 (0.016)	-0.0038 (0.014)	-0.0030 (0.014)	-0.015** (0.0052)	-0.016** (0.0061)	-0.0096 (0.0072)
TX Coast	0.0092 (0.061)	0.023** (0.0059)	0.019** (0.0050)	–	–	–	-0.012 (0.013)	0.015 (0.013)	0.012 (0.010)
Fixed Effects	Quarter, year, county			Quarter-year, county			Quarter-year, county		
Sample Region	National			Gulf States excluding Texas			Gulf States excluding buffer counties		
Sample Time	2010	2009-2010	2008-2010	2010	2009-2010	2008-2010	2010	2009-2010	2008-2010
N(counties)	2,869	2,869	2,869	280	280	280	444	444	444
N	8,607	20,083	31,559	840	1,960	3,080	1,332	3,108	4,884

Notes: The natural logarithm of employment is the dependent variable. Robust standard errors clustered by county. **, * denote statistical significance at the 1, 5 percent levels.

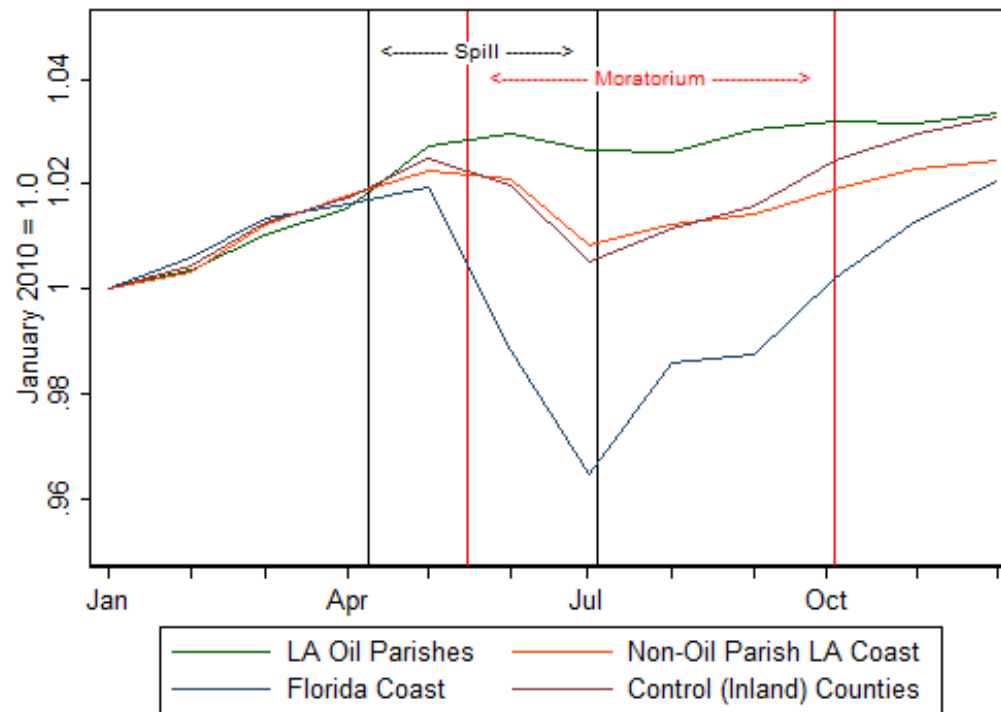
Table 9. Estimated Passenger Departure Impacts, Gulf Coast Airports, 2010 and 2007-2010 Samples

	(1)	(2)	(3)	(4)
Gulf Coast	-0.056 (0.071)		-0.043 (0.050)	
Florida Coast		-0.17 (0.12)		-0.15 (0.077)
Gulf Coast ex Florida		0.022 (0.047)		0.026 (0.039)
Time Period	2010	2010	2007-2010	2007-2010
N	96	96	480	480
N (Airports)	32	32	32	32

Notes: Robust standard errors clustered by airport. All regressions include fixed effects by airport and quarter (for 2010 sample) or quarter-year (for 2007-2010 sample).

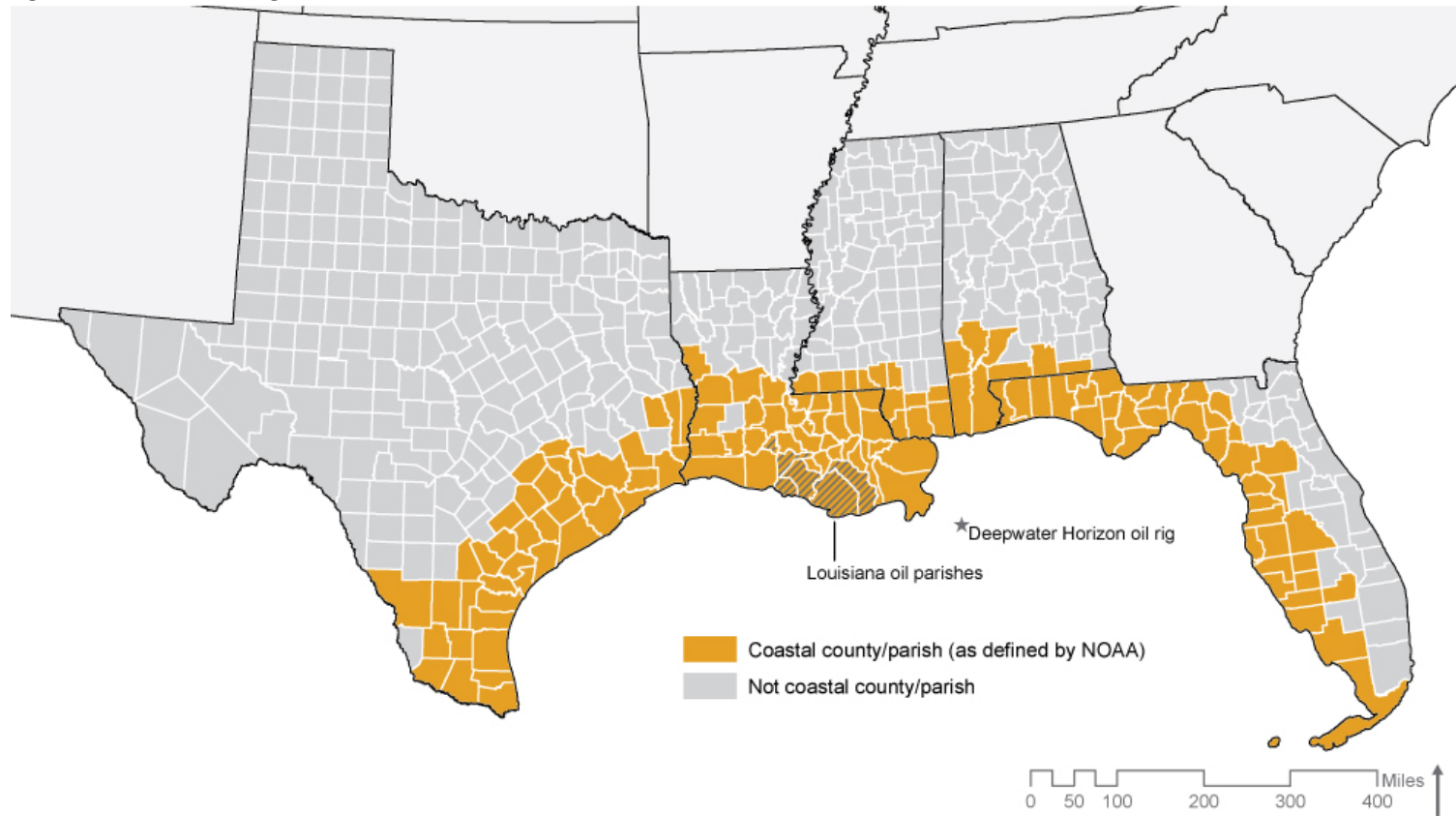
Figures

Figure 1. 2010 Employment for Oil Parishes, Non-Oil Coastal Parishes, Florida Coastal Counties, Control (Inland) Counties



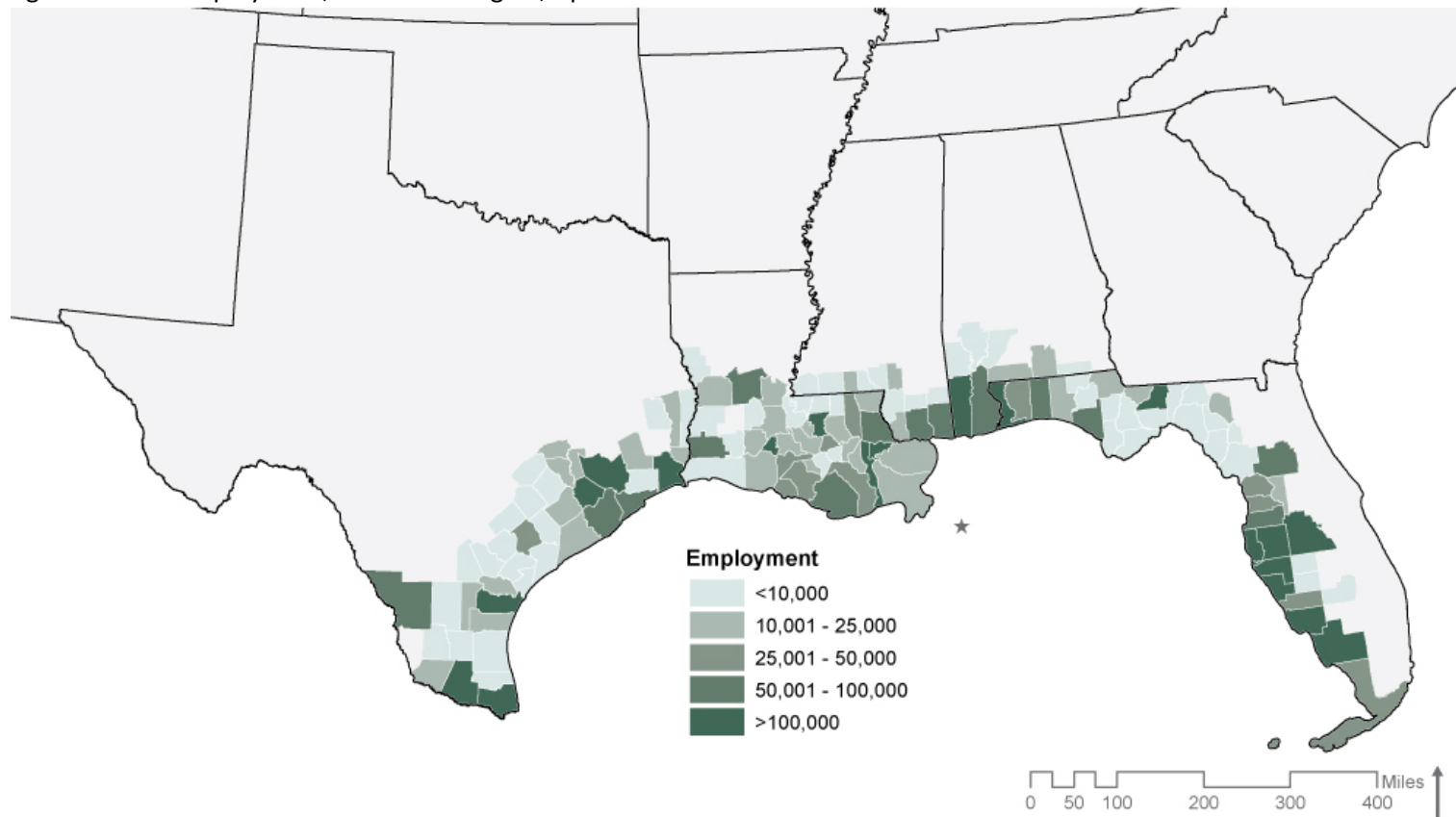
Source: Constructed by author using QCEW employment data for total covered employment across all industries.

Figure 2. Gulf Coast Region, Coastal Counties and Parishes, and the Louisiana Oil Parishes



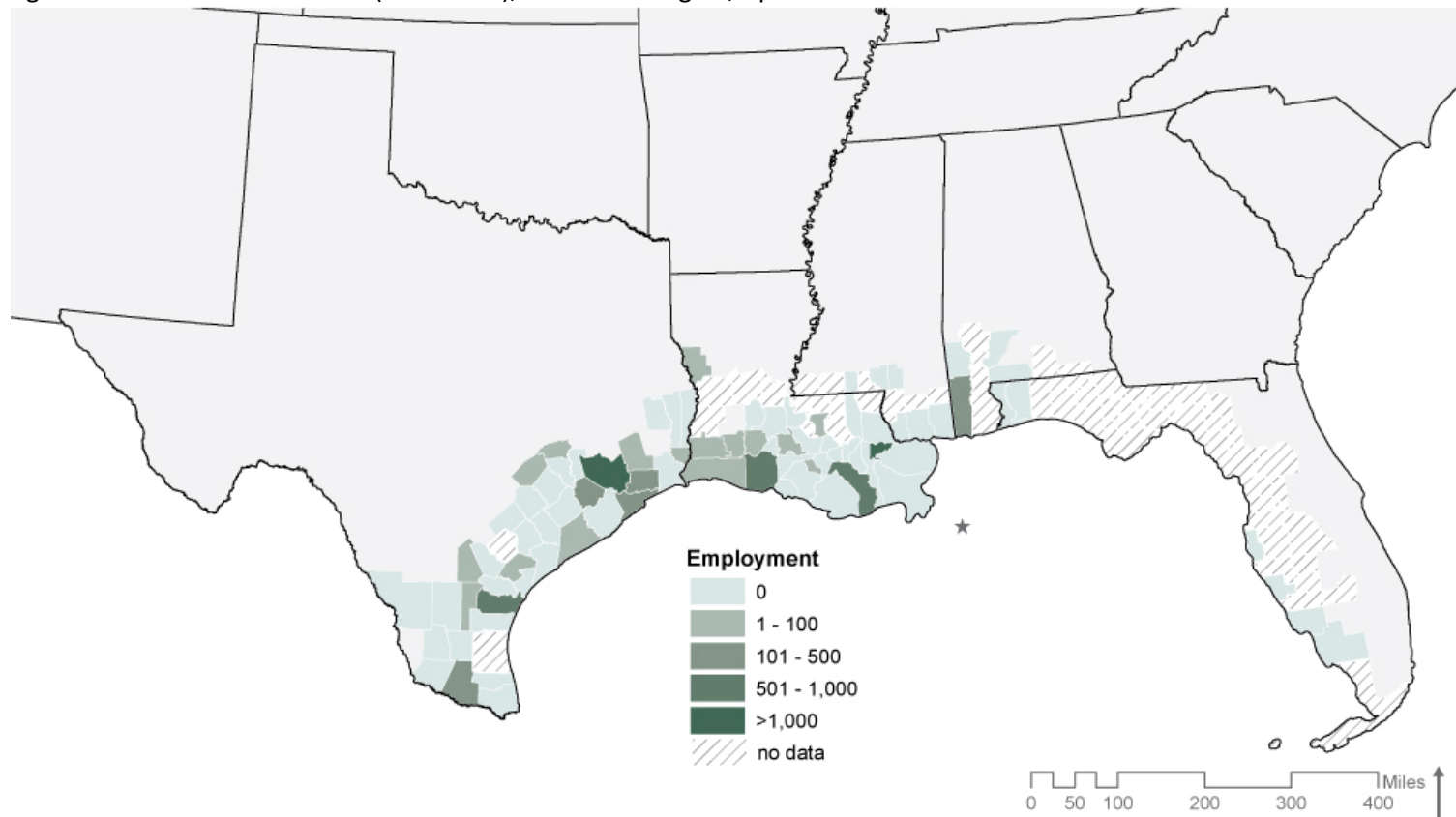
Source: NOAA Coastal Counties Source.

Figure 3. Total Employment, Gulf Coast Region, April 2010



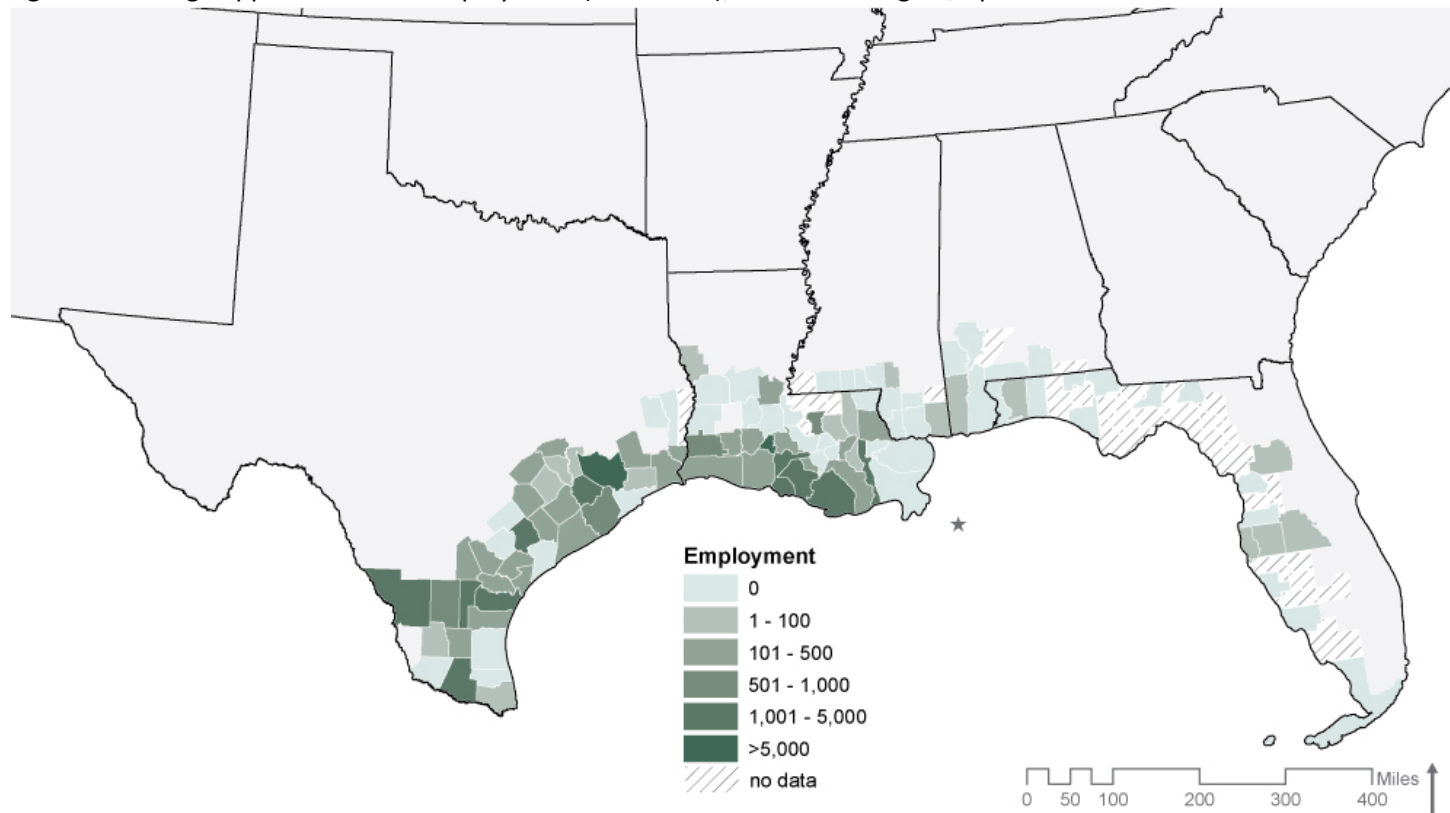
Source: QCEW

Figure 4. Oil and Gas Extraction (NAICS 211), Gulf Coast Region, April 2010



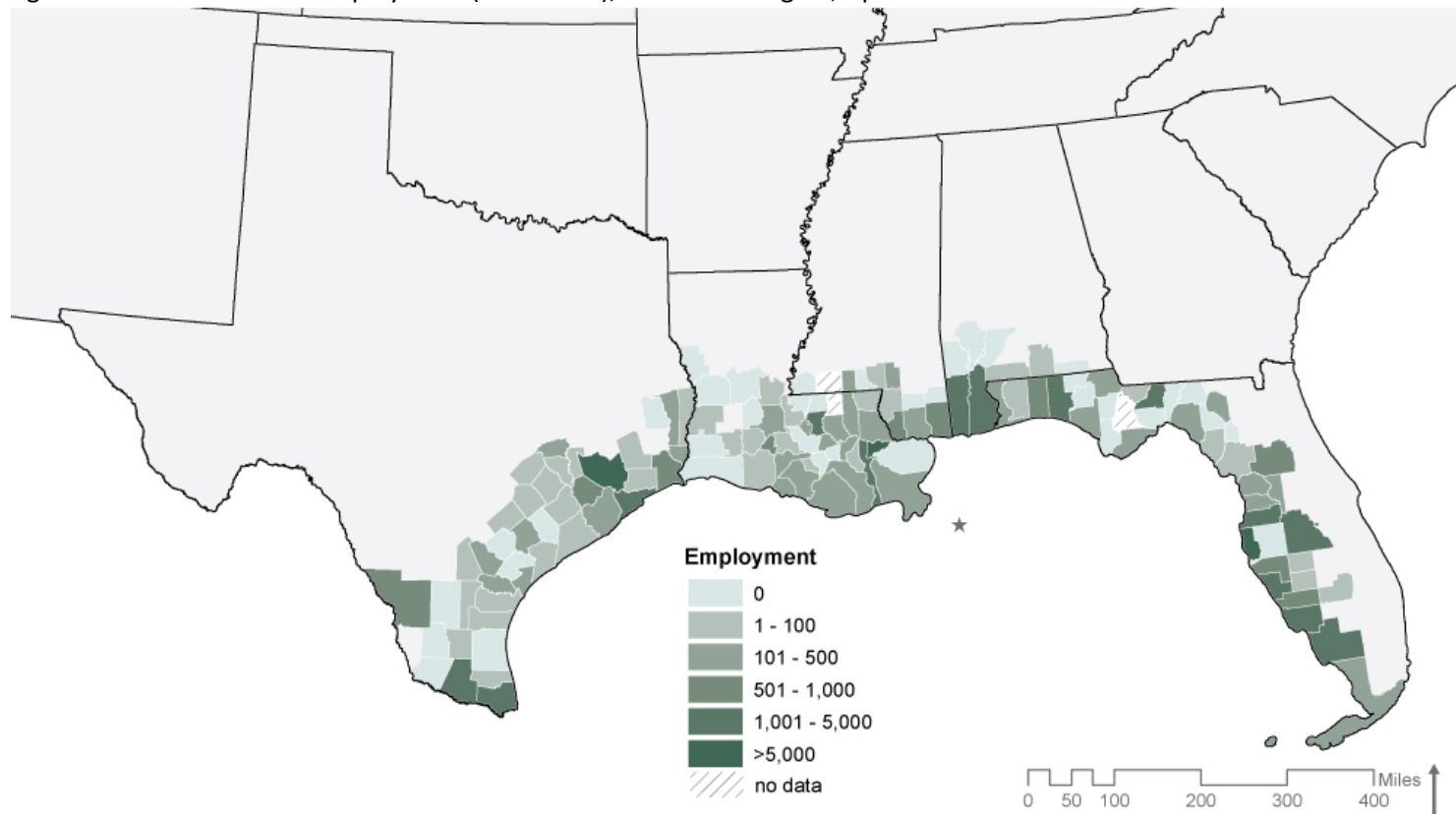
Source: QCEW

Figure 5. Mining Support Activities Employment (NAICS 213), Gulf Coast Region, April 2010



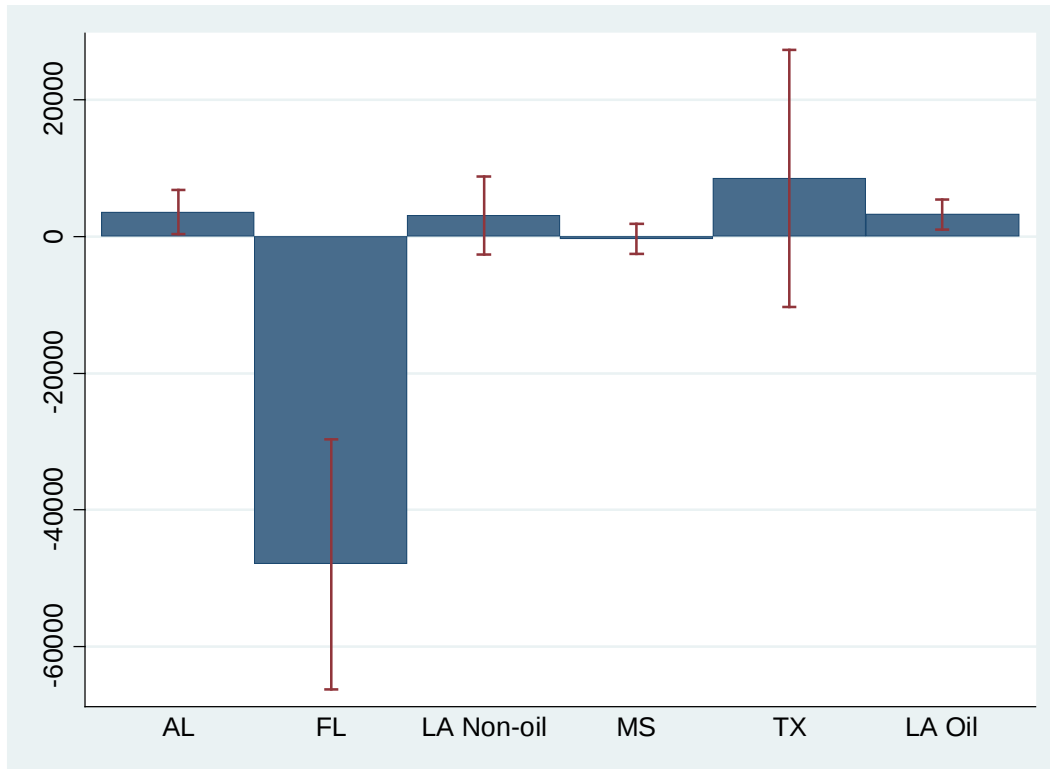
Source: QCEW

Figure 6. Accommodation Employment (NAICS 721), Gulf Coast Region, April 2010



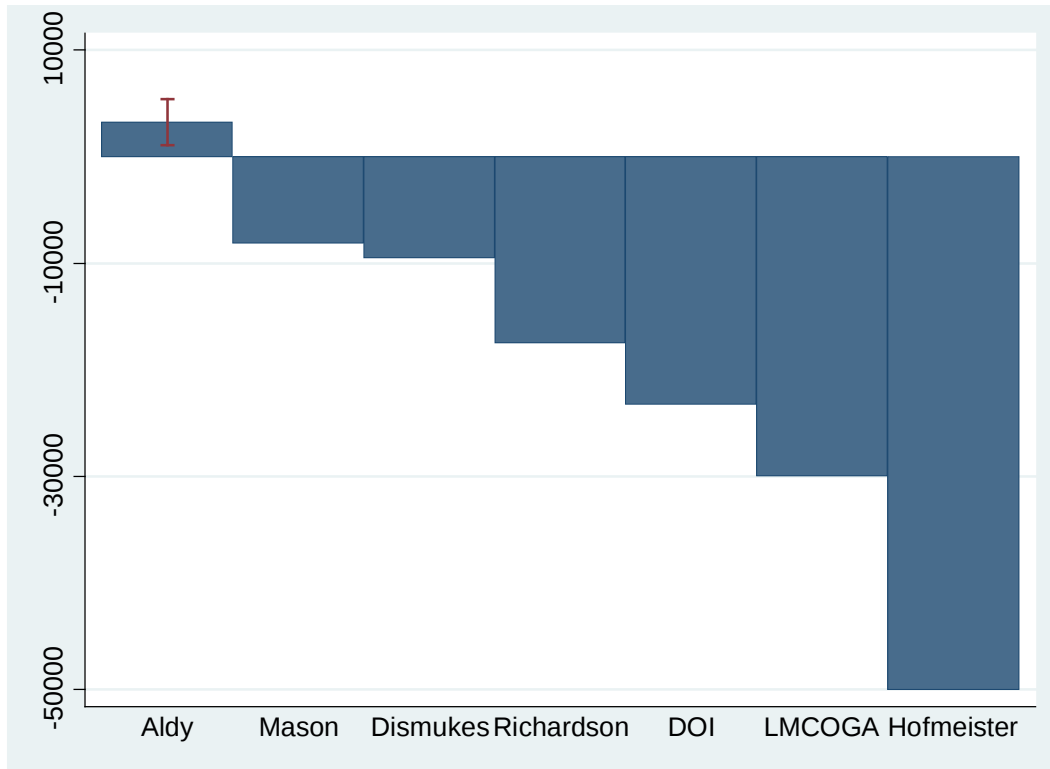
Source: QCEW

Figure 7. Estimated Employment Impacts by Coastal Region



Notes: The employment estimates are based on t model 3a. The 95 percent confidence interval are presented as error bars.

Figure 8. Estimated Employment Impacts in Louisiana Oil Parishes (Aldy) and Ex Ante Predicted Employment Impacts from 2010 (from Table 1)



Notes: Aldy estimate is based on the estimated employment impact from model 3a. The 95 percent confidence interval is presented for the Aldy estimate. Confidence intervals or other representations of the distribution around the central estimates are available from the sources published in 2010.