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Oil price fluctuations and employment in Kern County: A Vector Error Correction approach

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HIGHLIGHTS

- Kern County is California's largest oil producing region.
- Historical data has shown increased employment during periods of high oil prices.
- We study the short- and long run effects of oil prices on employment in Kern County.
- Results suggest long run causality running from WTI and Brent to employment.
- No causality is detected in the short run.

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ABSTRACT

Kern County is one of the country's largest oil producing regions, in which the oil industry employs a significant fraction of the labor force in the county. In this study, the short- and long-run effects of oil price fluctuations on employment in Kern County are investigated using a Vector Error Correction model (VECM). Empirical results over the period 1990:01 to 2015:03 suggest long-run causality running from both WTI and Brent oil prices to employment. No causality is detected in the short-run. Kern County should formulate appropriate policies, which take into account the fact that changes in oil prices have long-term effects on employment rather than short term.

1. Introduction

Kern County is home to some of the most productive oil fields in California (California Division of Oil Gas and Geothermal Resources, 2013). An estimated 10,300 people work in oil and gas extraction, which along with related positions in the refineries and transport sector, account for nearly seven percent of all jobs in the region (California Employment Development Department, 2015). As a result, changes in the oil sector have the potential to affect other sectors of Kern County's economy. High oil prices spur production and exploratory activities which can potentially boost employment in the oil industry. They can also increase employment in the agricultural sector due to increased food prices or, potentially, reduce employment if the costs of production increase. Other industries which may experience growth due to oil price fluctuations are substitutes for oil, such as natural gas and renewables. It has also been argued that increased oil prices spur the construction and housing market, as people relocate or build new homes in areas that have experienced growth due to a vibrant oil economy. The service sector may also experience significant growth. The reverse can take place – some studies have found that high oil prices exacerbate unemployment and cause reverse economic growth. A report by the U.S. Energy Information Administration (2006) found that a 10 percent increase in oil prices reduces GDP by 0.2 percent. Higher oil prices feed through the

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economy reducing aggregate expenditure on goods causing unemployment due to shortages in aggregate supply.

Although many studies have looked at the oil price – unemployment interconnection (Carruth et al., 1998; Christiano and Fitzgerald, 2003; Ewing and Thompson, 2007; Lescaroux and Mignon, 2008), there is a scarcity in papers looking at the employment and oil price nexus, and none looking at oil production in Kern County. This is important, as Kern County produces nearly 386 million barrels of oil per day, accounting for nearly five percent of total daily production in the United States (Drillinginfo, 2015). The lack of explicit evidence for the relationship between changes in oil prices and employment create a gap that may affect policy making in energy and employment. Most existing studies tend to group oil prices by boom and bust periods, muddying the inferences that can be drawn. It is important to investigate these effects, moreso in an area where a large fraction of the economy relies on oil. This study attempts to answer one fundamental question; do changes in oil prices affect employment in Kern County? If yes, do these changes affect each other in the short- or long-run? If oil prices affect employment, how long does it take before employment "shakes-off" the effect of shocks from oil prices?

This study will look at dynamic interactions among Brent and West Texas intermediate oil prices, and employment, using a Vector Error Correction model (VECM). It adds to the existing literature in the following ways. First, compared to other studies, we analyze the employment-oil price nexus at a regional level rather than a country level. Secondly, this study provides a more optimistic approach by studying the employment – oil price nexus, rather than using unemployment. Finally, by looking at both Brent and West Texas Intermediate (WTI) oil prices, estimates uncover which of the price indices has a greater effect on employment in Kern County.

The organization of this paper is as follows. Section 2 provides some background on the literature while Section 3 investigates the relationship between oil prices and employment in Kern County. Section 4 presents the empirical results while the Section 5 concludes the study and provides policy implications.

2. Literature review

Much research has focused on the relationship between oil prices and unemployment. Lescaroux and Mignon (2008) have found that, in the long-run, oil prices Granger cause unemployment. Similarly, Gearhart and Michieka (2015a) have found that, in several oil-producing regions of California, the Brent and WTI spot prices Granger cause unemployment. Ewing and Thompson (2007) found that crude oil prices are negatively correlated with the unemployment cycle that same period, hinting that there is little to no lagged relationship between the two. Carruth et al. (1998) found that the oil price spike associated with Iraq's invasion of Kuwait can explain the "mystery" recession in the United States. Paredes et al. (2015) note that studies that do not find much employment effect from natural resources may be due to the fact that gas exploration companies are often based outside the county where fracking occurs, diluting the total effect, though Keane and Prasad (1996) find that oil prices impact unemployment when the change in oil prices is long-lasting.

Also note that the education choices made by oil and gas extraction workers may affect unemployment, especially during the quite frequent boom–bust cycles for natural resources. Low educated workers may have little outside opportunities beyond their immediate careers. Gylfason et al. (1999) have found that school enrollment at every level tends to be inversely related to the abundance of natural resources in countries. Gylfason (2001) finds that about half of the effect of lowered economic growth due to natural resource wealth is attributed to reduced educational attainment in these countries. He suggests that natural-resource-based industries are less high-skill labor intensive. If workers are released from these industries, they have relatively few alternative opportunities especially if they have minimal education. Thus, these workers benefit only during resource booms and are tremendously sensitive to the business cycle and resource price cycles. During bust cycles, these under-educated workers may constitute a majority of newly unemployed.

Looking at counties in the U.S., Black et al. (2005a, 2005b) found that a 10 percent increase in the earnings of low-skilled workers could decrease high school enrollment rates by as much as five to seven percent. Gearhart and Michieka (2015b) found lower estimates for oil field workers in California; they estimate that a 10 percent increase in oil incomes leads to more than a 2 percent increase in the high school dropout rate. Black et al. (2003) find that these long-term decisions by teenagers to drop out of high school can have significant effects if the natural resource boom dissipates. Black et al. (2003) find that, following the collapse of the steel and coal industries of the 1980's, there were significant increases in welfare expenditures for low-skilled workers. They also found that at least part of the decrease in welfare expenditures from the coal boom in the 1970's could be attributed to the large increase in wages for these low-skilled high school dropouts.

Deaton and Niman (2012) find that the massive short-term increase in wages in resource extraction areas during boom periods reduce poverty rates almost immediately. However, after the resource boom ends, with individuals that have lower human capital accumulation, they find that poverty rates again increase. This hints that lowered human capital accumulation retards the movement of these low-skilled, low-educated workers to move to other industries when the mining sector suffers, and that the higher wages are transitory. Emery et al. (2012), however, found that the timing of secondary schooling decisions by resource extraction workers was changed; during bust periods, these individuals went back to get their education, suffering no long-term harm.

There is a growing literature on the impact of fracking and resource mining, in boom and bust periods, and employment. Research has focused on the employment impacts of either natural resource extraction during boom periods in certain geographic areas, or on the impacts of finding significant new deposits of natural resources in these geographic areas. James and Aadland (2011) note that the resource curse occurs at not just the state and country level, but at the county level as well. Marchand notes that during two resource boom periods (1971–1981; 1996–2006), total employment in the energy extraction sector grew by 89.2 percent and 46.7 percent respectively. Fleming and Measham (2015) found that mining employment in boom periods increased 31 percent more in resource rich counties than in control counties. Maniloff and Mastromonaco (2014) found that, during resource boom periods, the number of wells drilled increased. They found that a doubling in the number of wells drilled raised energy extraction employment in a county by three percent. For resource rich counties, those in the top 25 percent of well growth, they had 26.4 percent higher employment than other counties.

Employment in the energy extraction sector will not be the only industry to show employment increases. During resource booms, the resource extraction workers have more money to spend, and this money trickles down through other industries and leads to a boom in other industries, as entrepreneurs want to capture their portion of the resource boom rents. Corden and Neary (1982) note that theoretical models point out that there should be positive employment spillovers from a booming