

LABOR MARKET IMPACTS OF U.S. TIGHT OIL DEVELOPMENT: THE CASE OF THE BAKKEN

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Overview

There has been a recent boom in natural gas and oil production in the United States due to advances in hydraulic fracturing and horizontal drilling. High energy prices and technological innovation, including horizontal drilling and hydraulic fracturing, have changed the economics of tight oil and gas development over the last decade. Consequent development of formations has led to rapid economic, social, and environmental changes in predominantly rural, agricultural communities across the United States. The largest of these tight oil formations is the Bakken, located in the U.S. states of North Dakota and Montana, and Canadian province of Saskatchewan. Nearly all Bakken development to date has taken place in North Dakota due the geology of the formation which makes these fields more profitable.

While North Dakota oil production has increased significantly since 2005 with the development of Bakken formation, the impact on the rest of the economy including agriculture, historically the single most important industry in North Dakota, has received little attention. We econometrically test the impact of the oil boom in North Dakota caused by technical change on employment and wages in two main sectors of the state economy: agriculture and energy, alongside the rest of the state economy.

Methods

The theoretical model of the impacts of resource development on open economies is a variant of the classic model by Corden and Neary (1982). Given a fixed amount of labor, increased economic activity in a tradable energy sector results in an increase in the demand for labor and wages in that sector. With higher local incomes, the price of local, non-tradable goods, rise. At the same time, employment in other local, tradable sectors, like agriculture or manufacturing, suffer as higher wages reduce the profits of local firms. This impact is known as the resource curse or “Dutch disease” in reference to the negative economic impacts resulting from the development of the Groningen natural gas field in the Netherlands in the 1960’s.

Time series analysis is used to quantify the relationships among oil and gas, agriculture, and rest of the economy wages and employment. We use quarterly wage and employment data for the agriculture, oil and gas sectors and the rest of the economy from the Bureau of Economic Analysis to conduct the analysis. The analysis uses data from 1992 to 2014, which includes about a decade of pre- and post-boom data, from the Census of Employment and Wages as compiled by the Bureau of Labor Statistics, and Baker Hughes rig count data. Rig numbers were used as a proxy for technical change in oil and gas sector. All series were first tested for stationarity, and after the presence of unit roots was determined, Johansen cointegration tests were conducted, leading to three cointegrated vectors. A resulting Vector Error Correction Model (VEC) yielded very high adjusted R^2 in all six equations indicating good model specification.

Results

It was determined that the oil boom, as represented by the number of rigs in the state, led to an increase in both employment and wages in energy sector, as expected, but also in the rest of the economy. Oil development activity had no significant impact on agricultural wages. Both energy sector equations, employment and wage, suggest a relative independence of these variables from the movements in agriculture and the rest of the economy, and being impacted mostly by the changes in energy sector itself. Seasonality plays no role in energy sector employment and wages unlike in agriculture and the rest of the economy.

Conclusions

The analysis suggests that tight oil development activity impacts labor activity within the industry and on other sectors. The results are not consistent with the Corden-Neary Dutch disease hypothesis given a positive impact of the energy boom on employment in agriculture, the other major tradables sector, as well as the employment in the rest-of-the-economy, or the nontradables sector. Reasons for this outcome are unclear at the moment, but it could be speculated that high agricultural commodity prices, during the most of the period under consideration, have contributed to it.

References

Corden, W. Max, and Neary, J. Peter. (1982). Booming Sector and De-Industrialization in a Small Open Economy. *The Economic Journal* 92(368), pp. 825-848.