



Long-term effects of income specialization in oil and gas extraction: The U.S. West, 1980–2011



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ABSTRACT

The purpose of the study is to evaluate the relationships between oil and natural gas specialization and socioeconomic well-being during the period 1980 to 2011 in a large sample of counties within the six major oil- and gas-producing states in the interior U.S. West: Colorado, Montana, New Mexico, North Dakota, Utah, and Wyoming. The effects of participation in the early 1980s oil and gas boom and long-term specialization were considered as possible drivers of socioeconomic outcomes. Generalized estimating equations were used to regress 11 measures of economic growth and quality of life on oil and gas specialization while accounting for various confounding factors including degree of access to markets, initial socioeconomic conditions in 1980, and dependence on other economic sectors. Long-term oil and gas specialization is observed to have negative effects on change in per capita income, crime rate, and education rate. Participation in the early 1980s boom was positively associated with change in per capita income; however the positive effect decreases the longer counties remain specialized in oil and gas. Our findings contribute to a broader public dialogue about the consequences of resource specialization involving oil and natural gas and call into question the assumption that long-term oil and gas development confers economic advantages upon host communities.

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1. Introduction

The shale oil and gas boom has introduced a new phase of extractive commodity development to many different parts of the United States. Rapid drilling and related extensive industrial development are underway in parts of Pennsylvania, North Dakota, Texas, Louisiana, Oklahoma, Colorado, and New Mexico, while shale-rich states in regions from the Central Atlantic to the Midwest to the California Coast are anticipating the arrival of local shale booms.

The shale boom has been a source of jobs in a challenging economic period, but oil and gas drilling is not without their challenges for local areas. Residents of areas that host energy development often welcome the immediate employment associated with oil and gas development, and at the same time wonder about long-term tradeoffs related to the risk of negative impacts to local environmental amenities and quality of life, along with the direct economic risks of an eventual bust. Understanding and managing these tradeoffs for long-term community prosperity is a common goal of local government efforts. For example, a county commissioner from the Bakken region in North Dakota said in 2012, “A few years ago, [we] set a goal that Mountrail County would

be a better place to live and work as this oil play works itself out over the next 30 years.”¹

In this context, understanding the long-term social and economic impacts of oil and gas development on local economies has tremendous importance. The research described in this paper contributes to the body of literature concerning the influence of oil and gas activities on key measures of local socioeconomic well-being, such as income, education, and crime rates. While resource economists and sociologists have tackled these questions from different angles, results are mixed and inconclusive with regard to long-term outcomes.

This study uses a regional economic lens to address long-term trends. Specifically, our analysis uses a statistical approach to evaluate the relationships between oil and gas specialization and socioeconomic well-being during the period 1980 to 2011 in a large sample of counties within the six major oil- and gas-producing states in the U.S. West: Colorado, Montana, New Mexico, North Dakota, Utah, and Wyoming. This geographically contiguous cohort of states has hosted multiple episodes of significant oil and/or natural gas development activities, including high levels of participation in the oil and gas activity buildup

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¹ Commissioner Dave Hynek, quoted in, Oldham, J. 2012. “North Dakota's Oil Boom Strains its Infrastructure.” *Bloomberg Businessweek Magazine* Feb. 2, 2012. Accessed online 10/17/2013: <http://www.businessweek.com/magazine/north-dakotas-oil-boom-strains-its-infrastructure-02022012.html>.

during the energy boom of the late 1970s and early 1980s. Taken together, the latest available rankings show that this group of states produces more than 75% of crude oil and more than 95% of natural gas in the contiguous West (US EIA, 2013).

Our approach makes a concerted effort to control for and better understand the variety of factors that could lead to different experiences with energy development. We acknowledge the demands from econometricians for statistically robust approaches for evaluating differences in economic performance (Moretti, 2010). Our approach also responds to mining impact analyses that have emphasized the many contingencies affecting local experiences of energy development (Deller and Schreiber, 2012; Freudenburg and Wilson, 2002; Jacquet and Kay, 2014; Nord and Luloff, 1993; Wilson, 2004).

1.1. Conceptual framing and relevant literature

There is a large body of literature addressing the social and economic consequences of specialization in natural resource extraction. Both the rural sociology and resource economics disciplines have made contributions to this area of inquiry through consideration of the economic phenomenon known as the ‘resource curse’ and, in rural sociology, framings of boom–bust economies and the social disruption model. Regional economists have also recently begun to focus research on this topic (Court et al., 2012). Our approach uses a regional economics lens while also building on insights from resource economics and sociology.

As Weber’s recent summary of relevant literature in this journal observes, the resource curse—the empirical observation that resource dependence depresses long-term GDP growth relative to diversified economies—is well-established as a feature of many national economies (Frankel, 2012; Freudenburg, 1992; Weber, 2012) and has also been identified at the state and county-level in recent studies of the United States (James and Aadland, 2011; Papyrakis and Gerlagh, 2007; Zuo and Schieffer, 2013). At the national scale, the conceptual model focuses primarily on two related dynamics: 1) the tendency for specialization in commodities to undermine the competitiveness of non-commodity export sectors and 2) the influence of institutions on the degree of lost competitiveness and in mitigating other issues such as income disparity and political conflict. However, whether some version of a resource curse phenomenon has in the past been associated with or may still apply to oil and gas extraction at local scales in the United States, and if so, what might drive it, remain open questions.

Four recent econometric studies fail to find evidence of the resource curse in county-level economic indicators oil and gas development. Three are studies of the recent natural gas boom. Only one considers a longer-term perspective. Weber (2012) examines the relationship between natural gas production and county-level measures of economic performance in Colorado, Texas, and Wyoming during the natural gas boom of the 2000–2008 period. The study found that while natural gas production led to gains in employment and income, recent input-output based modeling efforts have significantly overestimated the number of jobs that can be attributed to shale gas production. Similar findings resulted in Weber’s second study of 362 non-metro counties in Oklahoma, Texas, Louisiana, and Arkansas during the period 2000–2010 as well as Brown’s inquiry into 647 non-metro counties in Oklahoma, Texas, Louisiana, Arkansas, New Mexico, Colorado and Wyoming for the period 2000–2011 (Weber, 2014; Brown, 2014). In the two latter studies, both Weber and Brown fail to find evidence of a crowding out effect in terms of the relationship between mining employment and other sectors including manufacturing. The only observable concern in terms of socioeconomic performance is Weber’s discovery of some evidence unequal distribution of the income benefits associated with the shale boom in his Colorado, Texas, and Wyoming 2000–2008 sample (Weber, 2012: 1586).

Michaels (2011) study of oil-abundant counties in the U.S. South over the period 1890–1990 estimates the relationship between oil abundance (in terms of geologically proven reserves) and a variety of

county-level economic metrics. This study finds a positive relationship between oil abundance and income, and between oil abundance and manufacturing density. Michaels argues that this is evidence of an agglomeration benefit to manufacturing industries associated with the presence of strong labor productivity, itself an offshoot of oil-related high per capita income levels. He also finds evidence of beneficial impacts of oil abundance on the presence of critical infrastructure such as airports. His study suggests some of the conditions under which fossil fuel abundance can be beneficial to regional development. A major feature of the region he studies (the oil-rich southern states) is the concentration of both extraction and refining activities there, a situation that could explain encourage the agglomeration effects he notes. In the American West, infrastructure is dispersed, and many oil and gas products are exported out of the region unrefined. Furthermore, manufacturing has had at best a minor role in economic growth trajectories in the non-metro U.S. West for the period 1980–2011. These differences suggest at minimum, the value of an inquiry unique to the Western region and a time period covering two major boom–bust cycles.

Standing in contrast to the recent regional econometric studies of the resource curse is the large body of sociological literature documenting negative socioeconomic effects as a result of specialization on resource extraction (see Peluso et al., 1994). However, most energy-focused analyses are detailed case studies of particular places and times, there were few detailed studies of energy industries and they yielded mixed results. Considering the period 1969–1985, Weber et al. (1977) found energy-related mining had positive impacts on employment growth and earnings, while metal mining had negative impacts. Nord and Luloff’s (1993) study suggested that the West did not show declines in employment and income as significant as other U.S. regions experienced in the energy bust of the 1980s. Black et al. (2005) considered the impact of the 1970s–1980s coal boom–bust cycle in the Appalachian coal region and observed that rapid job growth during the period exceeded losses during the bust, suggesting a net positive outcome. However, the study also found that any improvements in poverty rates associated with the boom were lost during the bust. The latter finding reinforces other studies of Appalachia that suggest that coal mining has lessened rather than improved total quality of life, particularly when health and educational metrics are considered (cf. Hendryx, 2011).

When Freudenburg and Wilson (2002) reviewed 301 quantitative studies about the socioeconomic performance of mining (including but not limited to coal and oil and gas extraction) areas as compared to non-mining areas in the United States, they concluded that available research did “not support the widespread expectation that mining can be expected to increase the prosperity of isolated rural communities” (ibid., 571). They noted evidence in the literature that economic problems in mining communities become increasingly pronounced over time, exacerbated by the volatility of commodity prices, the potential for cost–price squeeze, and “flickering,” or the periodic shut-downs in operations due to prices fluctuating below operations costs.

Our research approach is informed not only by studies on the impacts of resource specialization on economic performance, but also by sociological studies on impacts of oil and gas activities on metrics of social well-being, such as educational attainment and crime rates (Krannich and Luloff, 1991; Krannich et al., 1985). In this literature, the boomtown social disruption model has influenced interpretations of energy booms since it first emerged in the late 1970s (Gilmore, 1976; for summaries see Jacquet, 2009 and Jacquet and Kay, 2014). One concern about the social disruption literature is the challenge of putting the many observable negative boom impacts into longer-term context due to the failure to collect data before and after the boom. Brown’s repeat surveys in Delta, Utah, a major coal-mining area, suggested that a boom–bust–recovery cycle characterized social dynamics, at least in regard to community satisfaction and social integration in Delta (Brown et al., 2005).

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