



# Labor market dynamics and the unconventional natural gas boom: Evidence from the Marcellus region



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## ABSTRACT

The energy extraction boom of the mid 2000s impacted local economies in areas with substantial shale oil and gas reserves. I examine the impact of the energy boom on the labor market by exploiting a natural experiment in the Marcellus region. In particular, I compare counties with fracking activity in Pennsylvania, Ohio and West Virginia to the control group of counties in New York, which imposed a moratorium and later ban on fracking. I look at how the benefits to the labor demand shock are shared between industries as well as how employment and wages in related industries adjust over the course of the resource boom. The results suggest total employment and wages per job increase by 7% and 11% respectively above pre-boom levels in the three years after the boom, but decline after 4 years or more. The results also show significant positive spillovers to related sectors, such as construction, transportation, retail trade and accommodations. However, there is no evidence of the so called 'resource curse' crowding out employment or increasing wages in manufacturing.

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## 1. Introduction

In the late 2000s the United States experienced a surge in oil and natural gas production. The energy production boom was largely due to technological change in extraction methods. In particular, the combination of horizontal drilling and hydraulic fracturing<sup>1</sup> (a.k.a. fracking) has made it possible to unlock large quantities of shale oil and gas that were previously unprofitable to extract. Fig. 1 displays the real price and production of natural gas in the U.S. from 1997 to 2013. It shows the dramatic increase in production starting in 2006, which continued through 2013 despite the real natural gas price falling. The rising production was able to continue because the fracking boom was driven by technological advancement. While the fracking boom is not completely insulated from price changes, nonetheless it differs from the previous price-induced energy boom and bust in the 1970s and 1980s (Black et al., 2005a; Jacobsen and Parker, 2014).

The energy boom will likely benefit many consumers if it reduces volatility and drives down prices. It will also likely have a localized impact on labor markets in communities, or 'boomtowns,' in shale areas where extraction takes place. Economic models typically differentiate between short-run benefits to other industries through the multiplier process (e.g., income and jobs) and long-run issues that include agglomeration effects as supply chains are established and infrastructure created

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<sup>1</sup> See Fitzgerald (2013) for a non-technical description and Brown (2014) for a brief history of hydraulic fracturing.

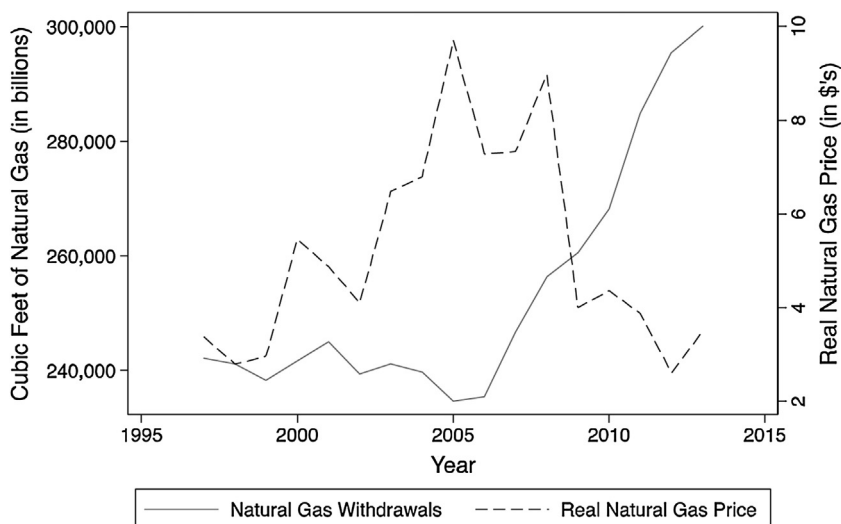


Fig. 1. United States natural gas production and price 1997–2013.

Source: Energy Information Administration. Natural gas prices are the Henry Hub Spot price in dollars per million Btu and adjusted into real terms using the consumer price index from the Bureau of Labor Statistics.

along with the so-called ‘resource curse.’ The resource curse argues that some industries and residents could be harmed over time through the extraction industry bidding up factor prices, which has been labeled as Dutch disease, among other issues (Corden and Neary, 1982; Sachs and Warner 2001; Jacobsen and Parker, 2014).

There is a growing literature on the role of resource extraction in the U.S. on economic growth and the labor market (Flemming et al., 2015). The previous work on spillovers to other sectors of the economy outside of resource extraction often use an instrumental variables identification strategy and focus on long-run effects, e.g. differences over a decade or more (Weber, 2014; Brown, 2014; Maniloff and Mastro Monaco, 2014; Weinstein, 2014; Allcott and Keniston, 2014). These studies use different geographic locations and largely find positive total employment and wages effects, but little evidence of Dutch disease in the form of crowding-out in the traded sector (e.g., manufacturing).<sup>2</sup> Allcott and Keniston (2014) use restricted-access data from the Census of Manufacturers and show that manufacturing can actually grow in resource boom communities as firms supply inputs to the extraction sector.

Cosgrove et al. (2015) and Paredes et al. (2015) provide notable departures from the aforementioned identification strategy. Both studies use differences in state policy toward fracking in the Marcellus shale region. Paredes et al. (2015) find little evidence of total employment and total income effects in the region using propensity score matching and panel data techniques. On the other hand, Cosgrove et al. (2015) compare counties in New York and Pennsylvania and find some evidence positive employment effects in resource extraction and construction as well as crowding-out in manufacturing.

In this paper I examine the effect of a labor demand shock from fracking activity, which increased the demand for high-wage jobs for relatively low-skilled men,<sup>3</sup> on the local labor market. I address how the benefits to the labor demand shock are shared between industries as well as how employment and wages in related industries adjust over the course of the resource boom. To examine these issues I use county-level panel data from 2001 to 2013. My identification strategy exploits a natural experiment in the Marcellus and Utica shale region displayed in Fig. 2. The state of New York imposed a moratorium and later a ban on fracking due to environmental concerns. On the other hand, Pennsylvania, Ohio and West Virginia allowed fracking techniques to be used. Each of these states overlaps the Marcellus and Utica shale, where hydraulic fracturing techniques became popular in the mid 2000s. The natural experiment provides an arguably exogenous shock to labor demand in the extraction sector due to the variation in state policy regimes. In this light, I consider all of the counties in the four state region as well as compare counties with fracking activity to the control group of those in New York. Furthermore, I take advantage of the panel nature of the data and use various fixed effect techniques to control for unobserved heterogeneity that might confound the causal effect of fracking on labor market outcomes.

This study contributes to the literature on labor market effects of the shale gas revolution in several ways. First, it is one of the few studies on labor market impacts for resource extraction that utilize the differing policies between New York and the rest of the Marcellus region (e.g., Paredes et al., 2015; Cosgrove et al., 2015). Second, I expand the areas impacted by the natural gas boom to also include those in Ohio and West Virginia, while Cosgrove et al. (2015) only compares selected New York counties with selected boom areas in Pennsylvania. Third, in contrast to Cosgrove et al. (2015) I use the temporal

<sup>2</sup> Only Brown (2014) and Weber (2014) explicitly look at the effect of the fracking boom on manufacturing employment, while others looked at the traded sector in general.

<sup>3</sup> In this context, low-skilled refers to the fact that extraction workers are often men with low formal education.

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