LOCAL IMPACT AND SPATIAL SPILLOVERS OF THE MARCELLUS SHALE BOOM ON COLLEGE ATTENDANCE

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Overview

Human capital is a key channel in the mechanism of resource curse. In regions where economic growth is driven by the resource sector, higher wages and more employment opportunities with low requirement of skills increase the opportunity cost of education, which in turn impedes the accumulation of human capital and the long-term growth of other sectors that employ a high-skilled labor force. A rich literature has assessed the short-term and long-term impact of the oil boom and the coal boom in the 1970s provides evidence that supports the presence of such mechanism (Douglas and Walker 2017; Kumar 2017; Black et al. 2005). More recently, the shale revolution has inspired a growing literature studying the potentially similar impact of booming unconventional oil and gas sector. Evidence from this literature suggests that the shale boom has contributed to decreasing educational attainment, lower high school enrollments, and wider gender gaps of high school dropout rates (Rickman et al. 2017; Zuo et al. 2019; Casio and Narayan, 2017).

Most studies in the current literature examine either the long-term effects of resource dependence on educational attainment or the short-term effects of a resource boom on high school enrollment. However, only focusing on high school students is unlikely to capture the full story of a resource curse for two main reasons. First, it is often said that college degree is now "the new high school diploma": national high school completion rate among all persons aged 25 and over has increased from 62.5% in 1975 to 88.4% in 2015 (NCES). Thus, the most affected low-skilled group on the margin may as well has changed. Second, the resource curse hypothesis draws on the impact of resource sector on the distribution of skills relative to that of the non-resource sector. It follows that empirically examine a range of skill groups is necessary for testing such hypothesis without making strong assumptions of the distributional effects.

Methods

In this paper, I explore the role of postsecondary schooling decisions as a potential channel of resource curse. To address this question, I examine whether enrollment in different types of postsecondary educational institutions respond to local oil and gas development. My empirical analysis focuses on Pennsylvania and New York, a pair of neighboring states with abundant oil and gas resources albeit distinctive approach of regulating unconventional techniques of extraction. I examine enrollment outcomes of postsecondary educational institutions to study whether high school graduates' decision of pursing more advanced education respond to local oil and gas development. Following previous studies, I use GIS to construct a spatial wells count to measure shale gas development, and use similar measures of conventional oil and gas which has not been accounted for in existing literature. I use institution-level data from IPEDS and county-level data from BEA and BLS to estimate variations of a fixed-effects model:

$$Enrol_{cst} = \delta OG_{cst} + X_{cst}\beta + \alpha_c + \gamma_{st} + \epsilon_{cst}$$

$Enrol_{cst}$ denotes the number of undergraduate students enrolled in each county, OG_{cst} denotes oil and gas development measured by the active well count, X_{cst} is a vector of control variables. α_c and γ_{st} denote the county and state-by-year fixed effect terms that control for time-invariant unobservable characteristics of the each county and state-specific shocks to all counties in each year, respectively. ϵ_{cst} is the remaining error.

Oil and gas development may be endogenous due to reverse causal mechanism: producers may drill more in the areas where the most compatible labor force is available at the lowest cost. Therefore, I follow Zuo et al (2019) to use GIS to calculate the share of county area that overlaps the formation and interact with national producer's price index of crude oil and natural gas as an instrumental variable for oil and gas development.

Results

Empirical evidence reveals that overall, oil and gas development has decreased enrollment in two-year colleges. IV estimates from the largest sample suggests that one-percent increase in nearby active oil and gas wells is associated

with 0.4 percent fewer students enrolled, which translates to approximately 1,442 predicted fewer students each year in the entire region. Restricting the sample to counties that have at least one two-year or four-year college leads to a estimate of approximately 1 percent change in enrollment in response to 1 percent change in oil and gas wells. Interacting OG with state dummies suggests that effects on 2-year colleges are not significantly different between New York and Pennsylvania. Institution-level analysis suggests the negative effects are driven by enrollment in smaller colleges that eventually closed down, and there is a small positive spillover effect on enrollment in the remaining two-year colleges in New York.

Conclusions

Unconventional oil and gas is seen as a driver of local economy as natural gas production from shale gas and tight oil plays now makes up about half of the entire United States (Annual Energy Outlook 2016). Shale gas development has triggered fierce public debate on the choice between foregoing the economic benefits, such as income and employment, and burdening the environmental costs, such as air emissions and water contamination. Those debates, however, are rarely centered on human capital among other important factors of long-term growth.

This study adds to the resource curse literature by providing the first evidence of postsecondary schooling decisions as a potential channel of resource curse. In the literature of resource boom, this study is the first that take both conventional and unconventional oil and gas into account. I find consistent evidence showing oil and gas development have negative but moderate effect on enrollment in two-year colleges, but not in four-year colleges. I find no evidence that these effects significantly vary by gender or change over time.

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