



Natural resource ownership, financial gains, and governance: The case of unconventional gas development in the UK and the US



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ABSTRACT

Who owns an area's natural resources affects the local financial gains from extraction and participation in resource governance. We develop a typology of ownership regimes using two dimensions of ownership, private versus public and local versus absentee, and apply it to unconventional natural gas development in the United Kingdom (UK) and the state of Pennsylvania in the United States. We find that local residents in Pennsylvania own 53% of the acreage leased for development and capture an estimated 8.5% of the value of production of the typical well, more than double what is expected from a well in the UK's public-absentee regime despite revenue-sharing policies. The dollar amount of local payments is also larger in Pennsylvania, with the difference reflecting policies and institutions, not differences in the value of production. The Pennsylvania case provides a benchmark for public-absentee owners considering policies to direct payments to communities hosting extraction: it gives the local payments corresponding to the case where subsurface owners voluntarily negotiate lease terms with energy firms and roughly half of ownership revenues accrue locally.

1. Introduction

Extracting natural gas or other natural resources can benefit regional and national economies, but also create discontent in communities where extraction occurs, with ample examples from both low and high-income countries (Hilson, 2002; Parlee, 2015). The discontent is often linked to few local financial gains from extraction and few opportunities to shape its terms to limit harm to local residents. We study the implications of resource ownership for the local financial gains from extraction and participation in resource governance. To frame our analysis, we create a typology of ownership regimes based on two dimensions of ownership, private versus public and local versus absentee. The two dimensions create four ownership regimes that can be observed for particular places and resources: public-absentee (subsurface resources in most countries), public-local (communal forests in Mexico), private-local (oil and gas deposits in parts of the northeastern United States), and private-absentee (oil and gas deposits in parts of the western United States).

We focus on unconventional natural gas development (UGD), which is the development of gas trapped in low-porous media (e.g. shale rock) that is generally only economical to extract using pressurized liquids to fracture the rock, a technique known as hydraulic fracturing. The

novelty and emerging scope of UGD make it a timely and broadly relevant case to consider. Most UGD has occurred in the United States (US), but other countries have commercial-scale development or the potential for it, including Argentina, Canada, China, Mexico, Russia, South Africa, and the United Kingdom (UK) (US EIA, 2015), which has led researchers to increasingly consider the implications of unconventional energy development outside the US (Corrigan and Murtazashvili, 2015; Hu and Xu, 2013; Mares, 2012; Murtazashvili, 2016). Expansion of development will raise policy questions related to resource ownership and the revenues associated with it. In particular, governments owning unconventional resources will likely face local skepticism about net benefits to communities and face pressure to share revenues from extraction with communities hosting development.

We focus on two places with starkly different subsurface ownership regimes—the UK and the US state of Pennsylvania. Subsurface rights in the UK are owned by a public entity (the “Crown”), which is a public-absentee owner from the perspective of communities where extraction is planned. Because of low public support for UGD, the government has proposed policies to direct financial benefits to local communities, which would otherwise be limited because of the lack of local subsurface ownership.¹ Pennsylvania, in contrast, is home to the Marcellus Shale, which has more subsurface ownership by local residents than any

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¹ Polls indicate that public support for UGD ranges from 18% to 43% in the UK (Andersson-Hudson et al., 2016; UK Department for Business Energy and Industrial Strategy, 2017; YouGov, 2015).

other major shale formation in the US (Brown et al., 2016). There, UGD has been less controversial, with support from more than half of state residents (Borick et al., 2014).

After reviewing literature on resource extraction and local well-being, we present a typology for understanding the diversity of ownership regimes and their implications for the financial benefits accruing to local communities and the ability of local residents to participate in resource governance. Focusing on UGD in the UK and Pennsylvania, we then estimate financial benefits accruing (or expected to accrue) to local communities through revenue sharing arrangements or direct ownership, and assess how the two ownership regimes affect the ability of residents to opt in or out of development and to influence the terms on which it occurs. Estimation of financial benefits in the UK depends on policy arrangements applied to production data from the Barnett Shale, which is comparable to the shale in the UK and has a long production history. Estimates for Pennsylvania draw from the productivity of existing wells and from a proprietary dataset of more than 50,000 parcel-level leases that provide the share of the value of production paid to the resource owner and the owner's address.

We find that local residents in Pennsylvania own 53% of the acreage leased for development and capture an estimated 8.5% of the value of production of the typical well, more than double what is expected from a well in the UK's public-absentee regime despite revenue-sharing policies. The dollar amount of local payments is also larger in Pennsylvania, with the difference reflecting policies and institutions, not differences in the value of production. Pennsylvania provides a useful benchmark to gauge revenue-sharing policies of public-absentee resource owners since it represents the scenario where subsurface owners voluntarily negotiate leases terms with energy firms and roughly half of ownership revenues accrue locally.

In addition, private-local subsurface ownership in Pennsylvania decentralizes resource governance, allowing individual resource owners to opt in or out of UGD and to negotiate parcel-specific terms of development through lease contracts with energy firms. Surface owners in the UK, in contrast, have less ability to preclude extraction or influence the terms of extraction, and therefore face a situation similar to surface owners in the US without subsurface rights.

2. Natural resource extraction: Why is it so contentious?

Natural resource extraction has supported economic development throughout history, with one example being the use of coal to fuel the machines of the industrial revolution. Despite providing the economy with key raw materials, extractive industries have often bred discontent in nearby communities. Studies from developing countries suggests that extraction has often generated costs for local residents and few financial benefits (Bridge, 2004; Hilson, 2002). Local financial benefits matter because they reduce the inequities in wellbeing that stem from costs imposed on residents. To be clear, policies or institutions that generate more financial benefits for residents may not improve economic inefficiency like taxes on pollution from the extractive industry. They can, however, affect equity, welfare, and attitudes towards extraction, which our discussion of the literature will show.

The BHP copper and gold mines near the head of the Ok Tedi River in Papua New Guinea are illustrative. The mines created a vast crater and had regular discharges of mineral and chemical tailings that collected in the river, undermining the livelihoods of many local residents while generating revenues for the national government, which owns the subsurface (Low and Gleeson, 1998). Communities near mining operations in Africa, South America, and Asia, where central governments own the vast majority of mineral resources, have experienced similar effects (Bridge, 2004; Haslam and Tanimoune, 2016; Jaskoski, 2014; Roopnarine, 2002).

The combination of negative externalities from resource extraction, limited financial benefits, and few opportunities for participation has often led to conflict and pitted local residents with limited property

rights against well-organized and politically influential firms (Bridge, 2004). In the case of Ok Tedi, community members were excluded from negotiations surrounding permitting and environmental management that occurred between BHP and the resource owner—the government of Papua New Guinea. The government also tried to bar villagers from seeking compensation through courts (James, 1997; Low and Gleeson, 1998). Research has found that discontent and conflict emerges precisely when communities have few opportunities to participate in permitting decisions or environmental assessments, or if their welfare has been damaged without appropriate compensation or recourse (Haslam and Tanimoune, 2016; Hilson, 2002; Jaskoski, 2014). Similarly, ambiguity over who owns the resource can create conflict, as occurred in the Philippines where the Indigenous Peoples Rights Act of 1997 recognized local ownership claims but only in a broad sense (Verbrugge, 2015).

Resource extraction and perceived inequities have also bred community discontent in developed countries. Parlee (2015) finds that communities near Canada's oil sands have experienced ecological and socioeconomic harm and few financial benefits. A central part of the grievance by indigenous communities is that land rights established by treaties with the national government have not been respected in subsequent laws that granted provincial governments authority over natural resources. In response, indigenous communities have turned to litigation to negotiate revenue sharing agreements with extractive firms. Less historically disadvantaged groups have also been dissatisfied with extraction in developed countries. The majority of residents living in areas experiencing development of coal seam gas projects in the Surat Basin of Australia reported concerns about the rising cost of living, effects on groundwater, and a general decline in quality of life (Phelan et al., 2017).

The prospect of unconventional oil and gas development in the US has led many local governments and a few state governments (New York, Vermont, and Maryland) to ban practices integral to UGD (Hagström and Berkman, 2015). The bans generally stem from concerns about effects on air and water quality. UGD involves injecting a mix of water and chemicals into the subsurface to fracture low-permeable formations containing oil and gas. Some of the fluid later resurfaces along with water found in the formation and can have high concentrations of salt and naturally occurring radioactive material. Researchers have documented cases where spills and leaks have contaminated water supplies (DiGiulio and Jackson, 2016; Lauer et al., 2016). In other cases, the migration of stray gases into groundwater has also contaminated private water supplies (Brantley et al., 2014; Jackson et al., 2013; Vengosh et al., 2013). Similarly, studies have documented air quality issues, finding elevated levels of volatile organic compounds near wells, some of which cause cancer (Colborn et al., 2014; Macey et al., 2014; McKenzie et al., 2012). Loomis and Haelele (2017) estimate that the greatest environmental cost of hydraulic fracturing stems from health damages from air pollution, which they estimate to be \$12 to \$42 billion.

In addition to the environmental and health problems that can occur near wells, UGD can bring other costs to communities. Heavy truck traffic has damaged roads and increased traffic accidents in Pennsylvania (Abramzon et al., 2014; Graham et al., 2015). An influx of industry workers can also bring social challenges such as increased crime and prostitution. Komarek and Cseh (2017), for example, find increased incidence of sexually transmitted disease near UGD, and James and Smith (2017) find that shale-rich boom towns experienced a rise in property and violent crimes.

Concerns about unconventional development have spread around the globe, including to the UK, where newly-formed grassroots organizations and larger environmental organizations have fervently opposed it. The opposition has asserted that the risks of development exceed the economic benefits and has worked to halt the industry at every turn (Institute of Directors, 2013). Despite low public support for UGD, over the last seven years the central government under the

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