



How do U.S. state residents form opinions about ‘fracking’ in social contexts? A multilevel analysis



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ABSTRACT

Increased hydraulic fracturing operations (also known as ‘fracking’) in the U.S. have introduced a larger portion of the public to new and more extensive risks and benefits: from concerns of impacts on water quality and human health to benefits from increased oil and gas production and local economic development. As most policy affecting fracking occurs at the state-level, it is important to understand how citizens’ support for the technology is shaped by their states’ industrial, environmental, and socioeconomic experiences. Using a nationally representative survey, we construct a multilevel model to understand how individuals’ support for fracking varies as a function of both individual- and state-level characteristics. At the state-level, we find that people residing in states with a higher poverty rate and higher ground water use for public drinking supply are more likely to support fracking. At the individual level, the relationships between risk/benefit perceptions and support vary as a function of the state people live in. Additionally, the positive relationship between conservatism and support for fracking is stronger for people residing in states with a higher poverty rate. Based on these findings, we discuss the dynamics of public opinion in social contexts and implications on energy policymaking.

1. Introduction

Hydraulic fracturing, or “fracking,” is one step in unconventional oil and gas production. It involves injecting a mixture of water, sand, and chemicals into a well under high pressure to fracture the oil- and gas-rich shale rock layers as deep as a mile below the surface (Clarke et al., 2015). Industry has used fracking for oil and gas development for decades, but operations expanded rapidly in the past twenty years. From 2003 to 2013, total natural gas and oil production in the U.S. increased approximately 30%, largely because of a dramatic growth of fracking operations (International Energy Agency, 2014; U.S. Energy Information Administration, 2015a). As a result, the U.S. has become a major world natural gas producer and natural gas has replaced coal as the dominant energy source for electricity production in the U.S. (U.S. Energy Information Administration, 2014a, 2014b).

The rapid expansion of fracking has raised widespread concerns, however, regarding its potential environmental, economic, and societal implications (Boudet et al., 2014; Clarke et al., 2015; Davis and Fisk,

2014). Proponents argue that fracking has created job opportunities while facilitating a rapid transition to low-carbon energy (Bomberg, 2013; U.S. Energy Information Administration, 2015a). Opponents, in contrast, are concerned about potential adverse social, environmental, and public health impacts on communities close to the fracking sites, including risk of contaminated groundwater, inflation, increased traffic, and strain on community resources (Goldman et al., 2013; Gosman, 2013).

The vast majority of regulation addressing fracking operations exists at the state level, in part because the 2005 Energy Bill excluded fracking from Environmental Protection Agency regulation (Garmezy, 2013; Gosman, 2013; United States Statutes at Large, 2005). Therefore, although specific costs and benefits can be unevenly spread within each state, it is important to understand how individuals’ opinions might be shaped by a state’s overall experiences and concerns because of the implications state-wide opinion and experience could have for shaping policy. Although many studies have focused on national opinion of fracking or on opinion within particular states or

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counties, very few studies have examined the differences in U.S. public opinion of fracking based on state-level differences across the U.S. In this study, our focus on the state as a unit of analysis allows us to identify policy-relevant factors that are involved in creating a social license for fracking at the state level and gives a more detailed picture of the variety within national public opinion on fracking.

Using a national representative survey (N=853) in combination with state-level data, we examine the respective effects of individual characteristics (e.g., political ideology, risk/benefit perceptions, demographics etc.) and state-level ones (e.g., groundwater usage, poverty rate, economic reliance on extractive industries, etc.) on support for fracking. We use a multilevel modeling approach that allows us to analyze potential interactive effects between some of the individual and state-level variables on levels of public support for fracking. These findings have important implications for understanding public opinion formation within particular geographical boundaries and ultimately for energy policymaking in the U.S.

1.1. State-level experiences and residents' support for fracking

Fracking has not only brought greater domestic energy production but also created economic growth in local communities across the U.S. (Boudet et al., 2014; Community and Regional Development Institute, 2011). The development of fracking often creates local jobs. In addition, landowners can gain supplemental income by leasing or selling their land to oil and gas companies (International Energy Agency, 2014; Theodori, 2009). The economic “booms,” however, come with worries about a future bust for many communities, including concerns of inflation, strain on infrastructure from increased trucking traffic, and new costs on tax payers and agencies either from risks of environmental or health hazards or other increased burdens on communities (Boudet et al., 2014; International Energy Agency, 2014; Theodori, 2009). Landowners might lose value on their property from spills, blow-outs, or other hazards resulting from fracking operations (Radow, 2011), and rapid population growth accompanying increased fracking development can also bring increased crime rates and disrupt local residents' perception of the community's cohesion or character (Berger and Beckmann, 2010; Blevins et al., 2005; Boudet et al., 2014; Jacquet, 2014). With this mixture of risks, benefits, and uncertainty, most citizens were ambivalent about how they feel about fracking at the time of the 2014 survey used in this analysis, with approximately one third of the population unaware of the technology (Boudet et al., 2014; Clarke et al., 2015). Beginning in 2014, however, Pew Research Center polls found that national levels of support for fracking have been decreasing, with levels of support now lower than levels of opposition to increased use of fracking (Drake, 2015; Funk and Kennedy, 2016; Funk and Rainie, 2015). In 2012 and 2013, when Pew first included the question, support was higher than opposition, with approximately 50% of respondents in favor and fewer than 40% opposed (Pew Research Center, 2013a, 2013b, 2012). In 2014, those numbers reversed, with fewer than 40% in favor to increased fracking and slightly more than 50% against, and that trend held through 2015 and for the most recent survey released in May 2016 (Drake, 2015; Funk and Kennedy, 2016; Funk and Rainie, 2015; Pew Research Center, 2014). The number of respondents who indicated that they had no answer as to whether they were in favor or against increased use of fracking also decreased overtime, from more than 10% in 2014 to approximately 5% in 2016, suggesting that Americans overall have become more familiar with, or at least opinionated on, the issue. Supplementing national opinion data, research of support for fracking primarily at the county-level reveals that individuals' support can be closely related to local industrial, socioeconomic, and environmental experiences (e.g., Boudet et al., 2016; Kriesky et al., 2013). In this study, we focus on those experiences at the state-level and examine the impacts of states' 1) fracking activities and resource availability, 2) economic conditions, and 3) groundwater use on residents' support for fracking. We analyze

these factors and interactions to better understand what experiences, beyond county- or state-level familiarity with fracking, help explain both national public opinion and variations in opinion by state.

1.1.1. Fracking activity and resource availability

Previous studies suggest that residents of states with active fracking operations are more likely to have greater familiarity with fracking and tend to have different views of the risks and benefits involved (Boudet et al., 2016; Clarke et al., 2015; Kriesky et al., 2013; Rabe and Borick, 2011; Theodori, 2009). In Pennsylvania, for example, a survey of residents found that half followed fracking at least “somewhat” closely (Rabe and Borick, 2011). Additionally, residents in “high fracking activity” areas (e.g., Marcellus Shale in Pennsylvania and the Barnett Shale in Texas) were more supportive of oil and gas operations primarily because of the greater perceived economic benefits generated through the industry (Kriesky et al., 2013). National-scale research, however, found no relationship between residence in a county with active oil and gas production and support for fracking but did find that residence in shale plays, including both developed and undeveloped ones was significantly related to one's support (Boudet et al., 2016). This finding suggests that people in those areas might view fracking as an opportunity to create economic growth. With these considerations in mind, we propose hypotheses (H) regarding the relationship between the presence of active and potential shale plays in a state and its residents' support for fracking:

H1. Presence of active shale plays in a state is positively related to its residents' support for fracking.

H2. Presence of potential shale plays in a state is positively related to its residents' support for fracking.

We do not distinguish plays that produce predominantly natural gas from those that produce predominantly oil because wells often produce both fuel types (U.S. Energy Information Administration, 2013), and we did not find in the literature a reason separate the two.

1.1.2. Economic conditions

Not surprisingly, research finds that individuals living in regions that are economically dependent on extractive industries are likely to support fracking (Kriesky et al., 2013; Theodori, 2009). Individuals living in counties that have high employment levels in natural resource and mining industries and that have had a high increase in the number of jobs in those sectors from 2000 to 2012 were significantly more likely to favor fracking (Boudet et al., 2016). The economic impacts from fracking, however, extend far beyond the county where the drilling activity occurs. A 2015 National Bureau of Economic Research report found that impacts of fracking on wages and employment are more than three times greater at the regional and state levels than the county level (Feyrer et al., 2015). In order to understand the influence of a state's potential economic reliance on fracking on residents' acceptance, we include a measure of the extent to which a state is a “mining” state, using the mining location quotient (U.S. Bureau of Labor Statistics, 2015). It measures each state's relative GDP reliance on extractive industries compared to other states. An advantage of using location quotient instead of the percentage of a state's total GDP that comes from extractive industries is that the location quotient better captures overall reliance on those industries while controlling for differences in states' total GDP and in the total mix of industries that contribute to their GDPs. Location quotient also offers a way to account for states' overall extractive industry reliance, rather than just fracking-related activities, to capture whether a state's identity and experience as a “mining” state can relate to support for fracking in particular. This means the measure could help us understand public opinion in more states than just those with active fracking. To examine how individuals' acceptance might be influenced by their perceived economic benefits from extractive industries, we propose and test:

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