Abstract

A growing area of research has addressed public perception of unconventional oil and natural gas development via hydraulic fracturing ("fracking"). We extend this research by examining how geographic proximity to such extraction interacts with political ideology to influence issue support. Regression analysis of data from a fall 2013 national telephone survey of United States residents reveals that as respondents' geographic distance from areas experiencing significant development increases, political ideology becomes more strongly associated with issue support, with the liberal-partisan divide widening. Our findings support construal level theory's central premise: that people use more abstract considerations (like political ideology) the more geographically removed they are from an issue. We discuss implications for studying public opinion of energy development as well as for risk communication.

Keywords: unconventional oil and gas development; hydraulic fracturing; proximity; construal level theory; risk communication; public perception.

1. Introduction

In recent years, advances in horizontal drilling and hydraulic fracturing ("fracking") technology[1] have led to increased unconventional oil and natural gas development (UOGD)[2] in many countries. Various health, environmental, economic, and social impacts have garnered considerable controversy (Colborn et al., 2011; Jacquet, 2014; Jemielita et al, 2015; Kinnaman, 2011; Moore et al., 2014; Newell & Raimi, 2014; Souther et al., 2014; Vengosh et al., 2014), and some countries, U.S. states, and U.S. communities have enacted moratoria or bans in response to public opposition (Coin, 2015; New York State Department of Environmental Conservation, 2015). Scholars have therefore examined public opinion toward UOGD, including how issue support and attitudes potentially differ depending on psychological factors (i.e., political ideology) as well as geographic distance to areas of development (Boudet et al., 2014, 2016; Davis & Fisk, 2014; Jacquet, 2012). However, existing research on the relationship between geographic distance and support for energy development has yielded mixed results (Jacquet, 2012; Swofford & Slattery, 2010). While these studies suggest that this relationship depends on experiences with different impacts, the nature of local issue discourse, salient values, and other elements, they often treat distance as a distinct predictor rather than examining how it conditions the effect of these elements on issue support.

In this article, we propose that the ways in which people perceive distance – that is, the extent UOGD is seen as "near" or "far" away – determines the social-psychological factors that are brought to bear when forming issue judgments, with implications for patterns of acceptance or opposition at different geographic scales (Evensen & Stedman, 2016; Gravelle & Lachapelle, 2015; van der Horst, 2007). Specifically, we argue that geographic distance to areas of significant UOGD interacts with political ideology to influence support among a nationally

representative sample of U.S. adults. We expect that the liberal-conservative divide in support (Boudet et al., 2014) will widen as distance from these areas increases. Our study extends similar research on other contentious issues by focusing not on distance to a particular entity like an oil pipeline (Gravelle & Lachapelle, 2015) or an international border (Branton et al., 2007) but instead to numerous energy extraction areas that vary in discourse surrounding potential impacts, regulation, and other characteristics. It also draws on a theoretical framework – construal level theory (Trope & Liberman, 2010) - to understand the dynamics of this interaction and its implications for public opinion research and risk communication.

2. Political Ideology and Public Perception of UOGD

Political ideology is "a set of beliefs about the role of government that shapes responses to a wide range of specific policy issues" (Abramowitz & Saunders, 2006, p. 177). Individuals for whom political ideology is salient are more likely to perceive issues and evaluate information in a manner that reflects and reinforces those dispositions (Hart et al., 2015a). Partisan differences in issue awareness, concern, and other dimensions can arise in such situations and have been observed for a number of contentious issues (McCright & Dunlap, 2011), although some scholars have questioned the magnitude of such polarization (Fiorina & Abrams, 2008).

Controversy surrounding UOGD reflects ideological disputes across a variety of issues, including property rights, economic development, environmental protection, and government regulation (Davis & Fisk, 2014). Therefore, there is a noticeable ideological and party gap in issue support in the U.S. (Boudet et al., 2014; Cama, 2015; Foran, 2014). Conservatives often support it because of the promise of jobs as well as belief in the merits of free enterprise and economic development predicated on cheap fossil fuel energy (McCright & Dunlap, 2011). Conversely, liberals often oppose it because of environmental risks such as landscape

degradation and water contamination (see Souther et al., 2014; Vengosh et al., 2014) that they view as unacceptable. This polarization, moreover, can be amplified as people selectively attend to cues provided by political elites that resonate with their ideological values (Brulle et al., 2012). Zaller (1992, p. 6) defined elites as "persons who devote themselves…to some aspect of politics of public affairs [such as] politicians, higher-level government officials, journalists, [and] activists." Zaller argued that patterns of elite consensus or conflict on an issue can filter down to citizens for whom political ideology is salient and who pay attention to issue discourse, leading to greater partisan divisions when elite disagreement is high. Indeed, the Republican Party emphasizes the economic benefits of expanded domestic oil and natural gas production (Republican National Committee, n.d.) in contrast to the Democratic Party, which is more supportive of renewable energy (Democratic National Committee, n.d.).

Overall, given that UOGD touches on politically controversial issues along with the likelihood of elite disagreement when it comes to issue support, we expect that political ideology will be associated with support as follows:

- H1: Political conservatives will be more supportive of UOGD than political liberals.

3. Distance and Perception of UOGD

Much of the research on geographic distance as it relates to public perception of energy development speaks to the NIMBY phenomenon (Not In My Backyard), which posits a consistently negative relationship between distance and public support because people are confronted with adverse impacts in their "backyard" (Krause et al., 2014). However, the association between distance and public perception is inconsistent across studies (Batel & Devine-Wright, 2015; Smith, 2002). In the case of UOGD in particular, some studies find no relationship (Jacquet, 2012), while others have found that closer distance is associated with

more, not less, support (Boudet et al., 2016). The NIMBY designation in general has also been criticized for a number of reasons (Jacquet, 2012). Some scholars, moreover, have also argued that because distance is often a proxy for social-psychological factors and broader social and political characteristics of an issue (Gravelle & Lachapelle, 2015), its relationship with public opinion toward energy development is inherently variable depending on local experiences, local discourse, salient ideological values, and other considerations (Swofford & Slattery, 2010; van der Horst, 2007).

4. Distance, Political Ideology, and Public Perception of UOGD

In this article, we view distance not as an objective measure of location or a substitute for the aforementioned psychological factors in models of public opinion. Instead, we believe that it conditions the effect of these factors on issue support/opposition. The ways in which people perceive distance – that is, the extent UOGD is seen as "near" or "far" away – determines the social-psychological factors that are brought to bear when forming issue judgments, with implications for patterns of acceptance or opposition at different geographic scales (Evensen & Stedman, 2016; Gravelle & Lachapelle, 2015). In particular, we examine how geographic distance to areas of UOGD interacts with political ideology to influence support. We expect that the liberal-conservative divide in support (Boudet et al., 2014) will widen as distance from these areas increases. Indeed, recent research on other contentious issues supports this premise. Gravelle and Lachapelle (2015) found that the association between political ideology and support for the controversial Keystone XL oil pipeline strengthened as respondents' geographic distance to the proposed pipeline route increased. While conservatives supported the pipeline irrespective of distance, support among liberals declined as distance increased, which further widened the partisan gap. Furthermore, Branton et al.'s (2007) found that partisan gaps in Republican-

Democratic support for anti-illegal immigration ballot initiatives widened as distance from the U.S-Mexican border increased, with Republicans supportive irrespective of distance but Democrats less supportive at greater distances.

Our article extends this work in two ways. First, we focus not on distance to a particular entity like an oil pipeline or international border but instead to numerous area of energy development that vary in discourse surrounding potential impacts, regulation, and other characteristics. Second, we offer theory-informed insight, using construal level theory, to explain why geographic distance and political ideology interact in the manner we described.

Construal level theory (Trope & Liberman, 2010) examines the association among physical distance from an object or issue, perceived psychological distance, and how the object/issue is mentally represented or construed. Issues or objects of varying geographic distances from oneself are perceived as psychologically close or far (Fujita et al., 2006). Psychological distance reflects "the perception of *when* an event occurs, *where* it occurs, to *whom* it occurs, and *whether* it occurs" (Trope & Liberman, p. 442, emphasis original) and is a "subjective experience that something is close or far away from the self, here and now" (p. 440). Moreover, objects and issues seen as psychologically "closer" are construed in a more concrete manner that "preserve[s] the object in minute detail for immediate use" (p. 448)" and "highlight[s] its…context-specific features" (Zwickle & Wilson, 2014, p. 2). Conversely, those seen as psychologically distant are construed in an abstract manner that helps "conserve the essential, invariant properties of the referent object" (Trope & Liberman, p. 448) and "causes an individual to focus more on [an object's] central features or those features that remain unchanged from one context to the next "(Zwickle & Wilson, p. 2). The level of construal, moreover, has implications for behavior and information processing (Hart et al., 2015b).

In the context of UOGD, we believe that a variety of cues help make this issue important and salient, including first-hand experience with localized impacts (i.e., water contamination, jobs, etc), local media coverage, and interpersonal discussion. Based on construal level theory, we expect that as geographic distance to areas of significant UOGD increases, these cues will become less prominent (Branton et al., 2007; Gravelle & Lachapelle, 2015). As a result, people will view the issue as psychologically distant and will construe it more abstractly. One manifestation of abstract construal is that political ideology will become *more* strongly associated with issue support. As a fundamental disposition that is "abstract and decontextualized nature," it "will be more readily applied to and guide [decisions] for psychologically distant situations" (Trope & Liberman, 2010, p. 453). Indeed, ideology is argued to be especially influential in shaping issue perceptions when people lack relevant knowledge or experience (McCright & Dunlap, 2011). We therefore expect that political ideology will be more strongly associated with UOGD support at greater distances from areas of significant unconventional energy development. More specifically:

- H2: As geographic distance from areas of areas of significant UOGD increases, the partisan gap in support among conservatives and opposition among liberals will increase.

For this article, we define "significant" areas as those ranking in the top 7 in terms of unconventional oil and natural gas production. These areas accounted for 95% of the growth in U.S. oil production and 100% of the growth in natural gas production from 2011 to 2013 (see USEIA, 2015a, 2015b). It is in these areas, home to large numbers of wells and other development-related activities, that we suspect experiences with potential impacts and other information cues will be most salient (see Schafft et al., 2013).

5. Methods

Our data source is the 2013 Cornell National Social Survey: a national random-digit dial omnibus telephone survey of 1,000 American adults within the continental United States that is fielded each fall by Cornell University. The survey had a response rate of 21% and a cooperation rate of 70% (Cornell University Survey Research Institute, 2013). Sample demographics were as follows: 81% age 18-64 (M = 46.88 years, median = 47 years, SD = 18 years), 50.2% female, and 43% with a 4-year college degree or above. Our UOGD questions were part of a split ballot experimental design, with approximately 500 people assigned to read questions with the phrase "hydraulic fracturing or fracking" and the remaining 500 people reading questions with the phrase "shale oil or gas development." Wording was otherwise identical across questions, and the design was part of a separate study that examined whether minor variations in terminology impact public perception of this issue (see AUTHOR). Therefore, in describing our questions below, we note any significant differences in responses as a function of terminology.

3.1. Independent, Dependent, and Moderator Variables

Our dependent variable was support/opposition regarding UOGD, which we measured on a 4-point scale from 1 (strongly oppose) to 4 (strongly support). Respondents were more supportive of the issue when it was phrased as "shale oil or gas development" (M = 2.75, SD = 1.03) compared to "hydraulic fracturing or fracking" (M = 2.35, SD = 1.1), t(482) = -4.3, $p = < 0.001$, $d = 0.37$).

Our independent variable was political ideology related to "social issues" (1 = extremely liberal; 7 = extremely conservative; M = 4.0, SD = 1.6).

Our moderating variable was geographic distance in kilometers from the respondent's location (identified through latitude/longitude coordinates) to the boundary of distinct shale plays.[3] The latitude/longitude coordinates represent the centroid, or the mean position of all the

points in all of the coordinate directions, of the respondents' counties of residence. Shale plays, moreover, are areas in the continental United States that have discovered, undiscovered, or potential unconventional oil and/or natural gas reserves exhibiting similar geological and geological characteristics (see Figure 1; United States Department of Energy, n.d.). Data defining shale play boundaries were produced using the ESRI ArcGIS software program and drew on U.S. Energy Information Administration (USEIA) shapefiles that outlined current plays in the U.S. as of April 2012. For this analysis, only the shale play shapefile was used. USEIA provides the dataset in a geographic coordinate system of North American Datum 1983, which we projected to the Albers Equal Area Conic projection because of its appropriateness for east-west orientations, country-size scale, and middle latitudes (ESRI, 2013). Centroid locations were projected to the same coordinate system to ensure accurate distance measures.[4] We used the "near" tool in ArcGIS to measure the distance between the center of each respondent's county of residence and the border of the nearest shale play in the contiguous U.S. that ranks in the top 7 in oil or natural gas production (USEIA, 2015b). Respondents located within these plays were assigned a distance of 0 (M = 385 km, SD = 354 km; range = 0 to 1328 km).

Latitude-longitude coordinates were taken from county centroids derived from the 2014 United States Census Tiger/Line file. According to the U.S. Census Bureau, the TIGER/Line Shapefiles are extracts of selected geographic and cartographic information from the U.S. Census Bureau's Master Address File/Topologically Integrated Geographic Encoding and Referencing (MAF/TIGER) database. The shapefiles include information for the fifty states, the District of Columbia, Puerto Rico, and the Island areas (American Samoa, the Commonwealth of the Northern Mariana Islands, Guam, and the United States Virgin Islands). Our distance measurement is a Euclidean distance between a respondent and the nearest shale oil or gas play,

represented in kilometers. A subsample of the distance measures were checked for face validity at the time the data were generated. Measures appeared to be what should be expected (i.e., individuals near or in shale plays had short or 0 distance measure). We checked each measurement by state, which provided secondary confirmation of the accuracy of the measures. For additional detail on this technique in studies of public opinion on unconventional energy development, see Boudet et al. (2016).

As a final step, we added a value of 1 to all the distance scores and took their base-10 logged transformation (M = 2.18, SD = 0.87; range 0-3.12). It is likely that the relationship between distance and issue perceptions may not be linear but rather logarithmic. We are not referencing the potential effect of distance on issue support, which depending on the study may be linear, non-linear, or have no discernible pattern. Rather, we believe that how people perceive psychological distance regarding UOGD may not be uniform across geographic distance. Moving from 10 to 20 km away from UOGD may be experienced as a larger "jump" in geographic (and thus psychological) distance compared to moving from 1,000 to 1,100 km away. Research on other contentious energy topics have used logged-transformed distance measures for similar reasons (Gravelle & Lachapelle, 2015).

3.2. Covariates

We included additional covariates in our analysis, including respondent age; gender (1 = female; 0 = male), education (1 = a 4-year college degree or other advanced degree, 0 = other educational attainments short of a 4-year degree), issue familiarity, risk-benefit perceptions, and an indicator variable denoting whether the respondent answered questions with the phrase "shale oil or gas development" (coded as 1; 510/1000 respondents) or "hydraulic fracturing or fracking" (coded as 0; 490/1000 respondents).

Issue familiarity measured how much respondents heard or read about UOGD (0 = not at all; 3 = a lot). Responses did not significantly differ when answering questions with "hydraulic fracturing or fracking" (M = 1.44, D = 1.2) or "shale oil and gas development" (M = 1.44, SD = 1.07), t (818) = -0.001, $p = 0.99$). Risk-benefit perceptions consisted of two questions. The first asked about effects on overall quality of life in communities where UOGD is occurring (1 = increase greatly; 5 = decrease greatly), while the second was an overall assessment of benefits and risks (1 = risks far outweigh benefits; 5 = benefits far outweigh risks). We reverse-coded the first question and averaged the two together to create a scale, with higher values denoting greater perceived benefits than risks. Respondents who answered the question with "shale oil or gas development" perceived greater benefits than risks (M = 3.01, SD = 1.23; $\alpha = 0.81$) than those who saw questions with "hydraulic fracturing or fracturing" (M = 2.67, SD = 1.31; $\alpha = 0.85$), t(531) = -3.3, $p = 0.001$, $d = 0.27$).

3.3. Analysis

We used the PROCESS macro for SPSS (Hayes, 2013, 2014) to run an unweighted [4] OLS regression model with political ideology, log-transformed distance, the interaction between these two variables, and the covariates predicting issue support. PROCESS automatically mean-centered both ideology and logged distance and probed significant interactions using Johnson-Neymann regions of significance. These regions represent values of logged geographic distance in which the relationship between political ideology and issue support is statistically significant.

We also note that our final sample size was 524 rather than the original 1,000-person sample. We omitted individuals who, when answering the 4-point support-oppose question, indicated "don't know/no opinion" (n = 467) or simply did not answer (n = 3). A further 6 individuals did

not answer all of the other UOGD questions. As PROCESS can only address missing data with listwise deletion, these 476 individuals were excluded from the analysis.

Low public familiarity with UOGD, especially in the U.S., has long been documented, with many people willing to indicate they don't know if given that option in a survey (Graham et al., 2015). Although our sample was only modestly familiar with this topic overall (M = 1.37, SD = 1.13 on a 0-3 scale, with no differences by issue wording as noted above), those who indicated they did know whether they supported or opposed it where less familiar with it (M = 0.44, SD = 0.75) than those who provided a response (M = 1.95, SD = 0.93), t(804) = 26.1, $p < 0.001$, d = 1.8). We note, however, that the difference seems less meaningful from a practical perspective, as it involved those who said they had heard somewhere between "not at all" and "a little" versus those who had heard "some." We also believe that including a "don't know" option appropriately screens out people who, if forced to indicate support or opposition, may select a response not indicative of their (uncertain) sentiments. Nonetheless, we acknowledge that our reduced sample was more familiar with this topic than perhaps the broader U.S. population.

6. Results

Before discussing results of the PROCESS analysis, we note the bivariate correlations between the independent variables and dependent variable (issue support) presented in Table 1. In particular, conservative political ideology was associated with greater support (r = 0.49, $p <$ 0.001). Also, although we did not hypothesize a relationship between logged geographic distance to areas of significant UOGD and issue support, greater distance was associated with slightly more support (r = 0.1, $p = 0.02$).

PROCESS model output is presented in Table 2. In support of H1, and consistent with previous research (Boudet et al., 2014), conservative political ideology was associated with issue

support (b = 0.09; $p < 0.001$). We also identified a significant political ideology X logged distance interaction (b = 0.05, $p = 0.002$). Probing this interaction using Johnson-Neymann regions of significance revealed that – in support of H2 - the greater the logged geographic distance from a top-producing shale oil or shale play, the stronger the association between political ideology and support. This relationship became statistically significant at a mean-centered logged distance value of -0.59 (b = 0.05, $p = 0.03$) and strengthened until reaching the value (0.96) corresponding to the greatest mean-centered logged distance (b = 0.14, $p < 0.001$). Overall, 84.35% of the 524-person sample used in the analysis fell within this range of statistical significance, which corresponded to approximately 442 individuals.

This interaction is visually represented in Figure 2 by plotting unstandardized model predicted values of support against logged geographic distance by political ideology.[6] To simplify the display, we collapsed our 7-point measure of political ideology into three groups: liberals (somewhat or very liberal; n = 114), moderate (slightly liberal, moderate, or slightly conservative; n = 278), and conservative (somewhat or very conservative; n = 132 respondents).

Levels of support among all 3 groups diverged irrespective of distance, with conservatives and moderates more supportive than liberals. Moreover, this gap widened as distance increased, with moderates and conservatives becoming more supportive and liberal unchanged in comparative opposition.

7. Discussion

UOGD remains a politically controversial issue in the U.S. (Boudet et al., 2014; Graham et al., 2015). We used high-quality data in the form of a nationally representative survey of U.S. residents to examine the interplay of geographic distance, political ideology, and issue support. Extending existing research on the relationship between geographic distance and public

perception of energy development, we suggested that the ways in which people perceive distance – that is, the extent UOGD is seen as "near" or "far" away – determines the social-psychological factors that are brought to bear when forming issue judgments, with implications for patterns of acceptance or opposition at different geographic scales (Evensen & Stedman, 2016; Gravelle & Lachapelle, 2015; van der Horst, 2007).

We found that political ideology was more strongly associated with issue support at increasing distance from areas of significant unconventional energy extraction (see USEIA, 2015b). In particular, as distance increased, the gap between conservative support and liberal opposition widened. This finding mirrors studies of other contentious issues (Branton et al, 2007; Gravelle & Lachapelle, 2015) and is also broadly consistent with what construal level theory predicts. That is, as geographic distance from areas of significant UOGD increases, so too does perceived psychological distance. The issue is seen as "farther" away due to the absence lack of cues such as experience with impacts, local media coverage, and interpersonal discussion (Branton et al., 2007; Gravelle & Lachapelle, 2015). Therefore, it is construed in a more abstract manner, and one manifestation of abstract construal is that people rely on ideological dispositions when deciding whether they support it (Trope & Liberman, 2010).

In this study, we focused on respondents' geographic distance to the boundaries of areas where significant unconventional energy development in shale formations is occurring. There are, of course, other ways to measure distance, including residing in a state or county where UOGD is occurring (Davis & Fisk, 2014; Smith, 2002). We believe, though, that such indicators are less ideal than geographic distance. From a theoretical standpoint, residing in a county or state provides less detail on terms of how far away unconventional energy development actually is, especially in large states like Texas or Colorado where respondents in major cities may be

considerably removed from energy extraction occurring in more suburban or rural areas. Decisions about whether energy development is "near" and "far" using these indicators are therefore arbitrary and, as Gravelle and Lachapelle (2015, p. 102) noted, "imply a significant loss of information in reducing spatial distance, which is by definition continuous, to a far coarser categorical measure." Methodologically, a continuous distance measure that acknowledges the potential logarithmic relationship between geographic and psychological distance allows for a more detailed description of the geographic distance range where political ideology is particularly influential in shaping issue support – a key element of our theoretical framework.

While we believe that our study serves as an important first step in applying relevant theory to understanding the dynamics of public perception surrounding UOGD, we also acknowledge several conceptual and measurement limitations that present opportunities for future research.

First, although our use of geographic distance is preferable to other geographic indicators, there is still room for improving the precision with which this measure estimates exact respondent location relative to UOGD activities. Examples include distance to specific oil or natural gas wells. It is possible that some respondents were close to a specific shale play boundary but comparatively further away from where extraction was occurring, or vice versa. In our defense, however, if we assume that our measure of geographic distance is a conservative indicator of location relative to energy development, then the interaction we observed involving geographic distance and political ideology on issue support would be expected to increase in magnitude if these more precise distance measures were used. Work is indeed underway to obtain these measures, but the process is challenging. While many states maintain records on the location of oil and natural gas wells within their borders (i.e., Pennsylvania Department of Environmental Protection, 2015), and several organizations have developed databases showing

well locations throughout the U.S. (FracTracker Alliance, 2014), these records vary by public accessibility and whether unconventional wells are differentiated from their conventional counterparts.

Second, our conceptual framework, informed by construal level theory, provides insight into why geographic distance and political ideology interact in the manner we describe. This framework involves closer geographic distance affecting the salience of issue cues (such as experience with impacts) and, as a result, psychological distance. Psychological distance, in turn, impacts issue construal, represented by how strongly political ideology is associated with UOGD support. The present study is the first step to more fully examine this framework, and we acknowledge the need to obtain measures of issue cues and psychological distance. While survey measures of the aforementioned cues can be adapted from other studies on public perception of UOGD (Kriesky et al., 2013; Schafft et al., 2013), questions pertaining to psychological distance are challenging. This concept involves a number of related dimensions (i.e., perceived social, temporal, and geographic distance), and in much of the research on construal level theory, it is not directly measured (see Spence & Pidgeon, 2010). Fortunately, a few studies on other contentious topics like climate change have developed potentially useful survey measures (Spence et al., 2012). These include perceived geographic distance (i.e., whether UOGD impacts are affecting one's community as opposed to the U.S. in general) and social distance (i.e., the extent UOGD is affecting people like oneself or those in faraway places).

Third, with these additional measures in hand, future research could more specifically probe (1) how geographic distance influences psychological distance and (2) how psychological distance interacts with other psychological factors to influence support for UOGD. For example, we argue that geographically closer objects are more psychologically proximate (i.e., within the

realm of personal experience and relevance), and greater psychological proximity leads to more concrete issue construal. One potential manifestation of concrete construal is that context-specific perceptions, such as the importance of UOGD impacts on the local level, would more strongly influence issue support under these conditions (Evensen & Stedman, 2016). If these local impacts are seen as positive (i.e., the promise of local jobs in a community), we would expect people in these areas to be more supportive. Conversely, if local impacts are seen as negative, such as water contamination or other adverse effects, opposition may carry the day (see Gravelle & Lachapelle, 2015).

Moreover, psychological distance may also interact both with political ideology and perceived impacts in interesting ways. In particular, our study results differed from Gravelle and Lachapelle's (2015) study of the Keystone XL pipeline; they found that the gap in liberal opposition and conservative support for the pipeline widened as distance from the proposed route increased but that there was little polarization at relatively close distances. In our case, though, conservatives supported and liberals opposed UOGD even at close distances to areas of significant unconventional energy development, and this divide widened as distance increased. Perhaps at relatively close psychological distances, political ideology serves as a filter through which localized impacts are understood. As liberals and conservatives may value health/environmental and economic impacts respectively, they may selectively focus on such issues in making decisions about this topic. Also, as psychological distance increases, political ideology may shape how people view broader impacts such as climate change implications. The ideological divisiveness of climate change in the U.S. has long been documented, with conservatives more skeptical of its existence and seriousness as well as the need for policy solutions to address it (McCright & Dunlap, 2011).

Fourth, the survey vendor (Cornell University) provided a measure of political ideology specific to "social issues." A preferable approach would have been to delineate economic from social issues, as people may have different leanings depending on issue context (Treier & Hillygus, 2009) and because UOGD involves economic impacts like job creation that are often vigorously debated. We note, however, that our use of the social ideology measure still produced a statistically significant, albeit small, interaction with geographic distance on issue support. It would be reasonable to expect that an economic ideology measure would only strengthen the magnitude of this interaction.

Finally, the interplay of political ideology, geographic distance, and support for UOGD may also depend on location characteristics that we were unable to examine. These include respondent perceptions of the amount of influence the energy industry has in their communities (Boudet et al., 2016); whether respondents perceive that UOGD impacts have occurred in their communities and, if so, how positive or negative those impacts have been; and the political dynamics of states within which energy extraction policies are debated (Davis, 2012; Opsal & Shelley, 2014; Stedman et al,. 2012; Wright & Boudet, 2012). Ideological polarization may not be as pronounced in some locations regardless of psychological distance if the energy industry has a large presence in a community as a major source of employment and economic benefit (Boudet et al., 2016) or if ideological cues on the part of elites *within* a political party are mixed. Foran (2014, p. 1) noted that some Democrats, especially those from energy producing states, have bucked their party's opposition to UOGD on environmental grounds and "embraced fracking and natural gas as a job creator and a 'bridge fuel' to power the country during a transition from coal to carbon-free sources." Perhaps conflicting cues among Democratic elites such that some are in line with Republican elite discourse could lead to greater agreement among

ideologically-minded citizens regarding support for UOGD (see Zaller, 1992) and lend credence to arguments that political polarization surrounding contentious issues may not be widespread (Fiorina & Abrams, 2008).

8. Policy Implications and Conclusion

Public acceptance will help determine whether UOGD occurs, how it is regulated, and how potential impacts are managed. Crucial challenges exist for communicating the magnitude and severity of these impacts (AUTHOR; Evensen et al., 2014). One potential strategy involves decreasing the psychological distance with which people perceive this issue by bringing it closer to the realm of personal relevance (Zwickle & Wilson, 2014). For instance, some media coverage has involved compelling stories about how communities in North Dakota (Rao, 2014), Pennsylvania (Brady, 2015), and elsewhere are experiencing impacts associated with UOGD. Such narrative-based risk communication may help people think about this issue in a more concrete manner, such as how one's own community – or other communities - might be affected by such impacts. However, it is important to account for nuanced geographic, cultural, and social variations across locations where UOGD is occurring. Moreover, some impacts like water contamination may more readily translate into a story about local impacts than others, perhaps because they offer iconic imagery (i.e., water faucets on fire allegedly as a result of natural gas drilling, made famous by films such as *Gasland*; see Vasi et al,. 2015).

Also, while this approach may help raise awareness of potential impacts, it is less clear whether it would attenuate political polarization. As noted earlier, people likely evaluate the importance, likelihood and severity of impacts through the lens of their ideological dispositions. Narrative-based strategies describing these impacts may meet with resistance or skepticism if they conflict with those dispositions. For instance, stories describing environmental hardships

communities are experiencing may fail to resonate with conservative audiences who tend to value the economic benefits UOGD provides. Conversely, stories of economic benefits may fail to resonate with liberal audiences concerned about environmental effects.

Notes

1. Hydraulic fracturing involves pumping water, sand, and chemicals underground "to enhance subsurface fracture systems [and] allow oil or natural gas to move more freely from the rock pores to production wells that bring the oil or gas to the surface" (United States Environmental Protection Agency, 2012).

2. *Conventional* oil and natural gas are "produced by a well drilled into a geologic formation in which the reservoir and fluid characteristics permit the oil and natural gas to readily flow to the wellbore" (USEIA, n.d.). *Unconventional* production focuses on oil and gas in sandstone, siltstones, and shale that do not flow freely through these rock types. USEIA notes that "what has qualified as 'unconventional' at any particular time is a complex interactive function of resource characteristics, the available exploration and production technologies, the current economic environment, and the scale, frequency, and duration of production from the resource" (p. 1). What is unconventional today may become conventional in the future.

3. We focus on proximity to shale gas and oil formations – as opposed to other unconventional fossil fuel types, such as tight oil and coalbed methane (see Alberta Energy Regulator, 2015) – because of shale energy's increasing role in U.S. domestic energy production. Shale gas and shale oil are expected to drive much of the increase in domestic U.S. natural gas and oil production respectively over the next two decades (USEIA, 2016), although estimates vary based on resource recovery, available technology, productions costs, policy, consumption patterns, and other factors.

4. The PROCESS macro provides a superior way for probing statistical interactions (by way of the Johnson-Neymann technique) compared to other approaches. However, it cannot accommodate variable weights. While our sample was fairly representative of the U.S. population in terms of age and gender, it overrepresented individuals with a college education (see Cornell University Survey Research Institute, 2013). Fortunately, PROCESS output is equivalent to running a standard OLS linear regression in with listwise deletion, which can accommodate variable weights. We therefore used the PROCESS output in reporting our results, but we also ran a companion regression model with the data weighted to reflect the educational attainment of the U.S. population. As shown in the Supplemental Table, the results were very similar to the PROCESS model, including a statistically significant interaction between logged geographic distance and political ideology on UOGD support. Also, the visual display of this interaction in Figure 2 was the same irrespective of whether the unweighted or weighted data were used. For this reason, we elected to keep the PROCESS output for probing the interaction but used the weighted OLS regression results to generate the unstandardized predicted values used in graphing the interaction.

One could also argue that our 4-point UOGD support/opposition scale represents an ordinal rather than interval variable, with response categories having a meaningful rank order but with the semantic gaps between each category not uniformly equal. We believe, however, that the semantic gaps can be considered sufficiently equal and that OLS regression using PROCESS provides a uniquely insightful way to probe statistically significant interactions. However, we also ran an ordinal regression model using the same variables as the PROCESS model, with both weighted and unweighted data. The results were very similar to the PROCESS model, including a statistically significant interaction between logged geographic distance and political ideology on UOGD support for both the weighted and unweighted data. Please see the Supplemental Table for full output.

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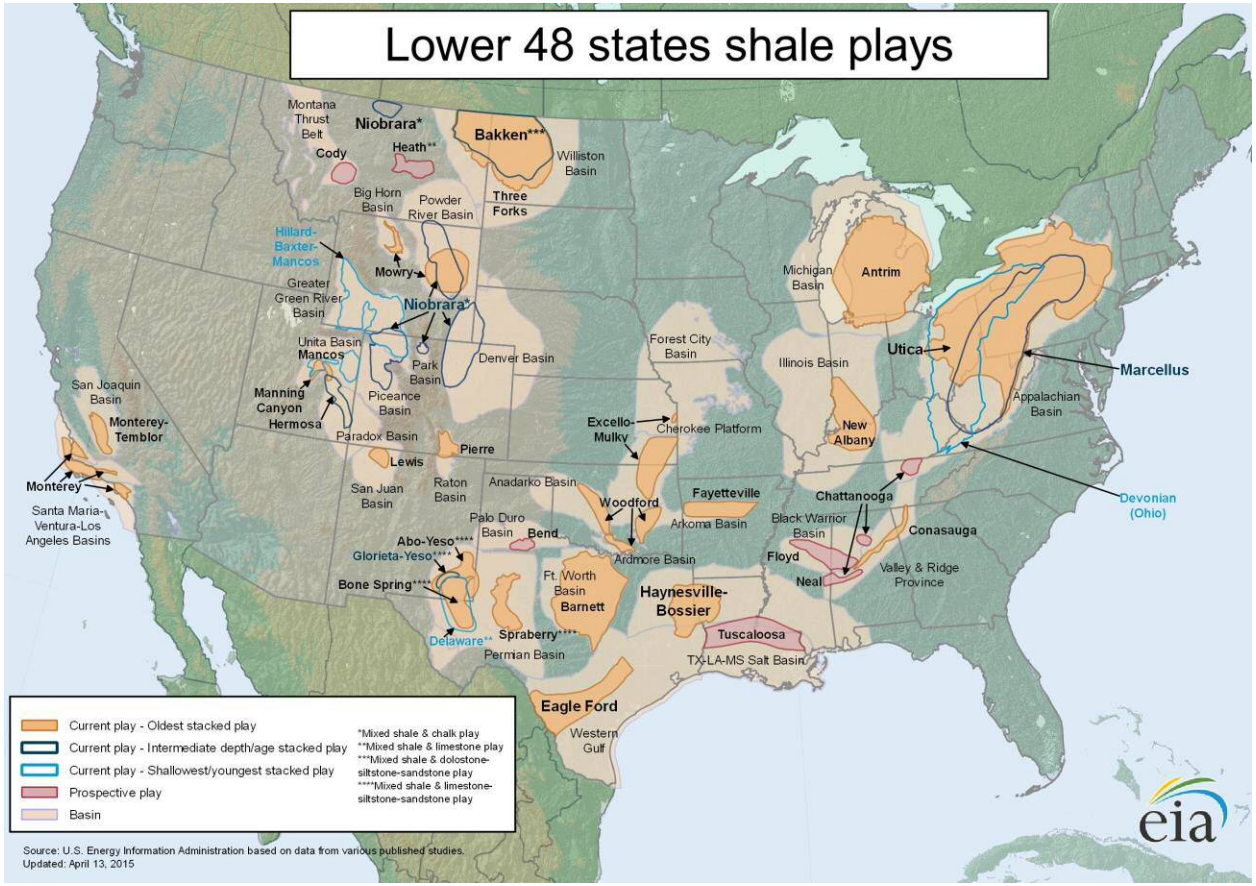
Figure 1: Shale Gas and Oil Plays, Lower 48 (U.S.) States



Note: Data courtesy of USEIA (https://www.eia.gov/pub/oil_gas/natural_gas/analysis_publications/maps/maps.htm). Data current as of 13 April 2015

Table 1: Pearson Bivariate Correlations between the Independent and Dependent Variables

Independent variable	**Bivariate correlation with dependent variable** – support for unconventional oil and natural gas development (UOGD)
Perceptions of risk/benefit ("benefits far outweigh risks" coded high)	**0.75*** **
Political ideology ("very conservative" coded high)	**0.49*** **
Age	**0.21*** **
Education (1 = college graduate or greater; 0 = attended college or less)	-0.02 (p = 0.62) [1]
Gender (1 = Female; 0 = Male)	**-0.24*** ** [1]
Framing condition (1 = shale oil and gas development; 0 = fracking)	**0.18*** ** [1]
Issue familiarity ("a lot" coded high)	0.03 (p = 0.55)
Political party affiliation ("strong Republican" coded high)	**0.4*** **
Logged (base-10) distance to areas of significant UOGD	**0.1***

[1] Denotes point-biserial correlation.

Note: Statistically significant coefficients are **bolded**

* p < 0.05 ** p < 0.01 *** p<0.001

Table 2: OLS Multiple Regression Output from the SPSS PROCESS Macro

Variable	**b**	**SE**	**t**	**p**
Perceptions of risk/benefit ("benefits far outweigh risks" coded high)	**0.55**	0.03	20.96	***
Political ideology ("very conservative" coded high)	**0.09**	0.02	3.63	***
Age	0.001	0.002	0.65	0.51
Education (1 = college graduate or greater; 0 = attended college or less)	0.03	0.06	0.61	0.54
Gender (1 = Female; 0 = Male)	-0.06	0.06	-0.98	0.32
Framing condition (1 = shale oil and gas development; 0 = fracking)	**0.18**	0.06	3.07	**
Issue familiarity ("a lot" coded high)	0.02	0.03	0.67	0.5
Political party affiliation ("strong Republican" coded high)	0.03	0.02	1.53	0.12
Logged distance to nearest major shale oil/gas play	**0.08**	0.03	2.4	*
Logged distance X political ideology	**0.05**	0.02	3.1	**
R^2 = 0.65	---			
F (10, 513) = 96.47* **	**---**			
N	**524**			

Notes: Political ideology and logged distance were mean-centered prior to model estimation. All regression coefficients are unstandardized, and statistically significant coefficients are **bolded**. Cases with missing values were omitted via listwise deletion.

* $p < 0.05$ ** $p < 0.01$ *** $p<0.001$

Figure 2: The Relationship Between Logged Geographic Distance from a Major Shale Oil/Gas Play and Model-Predicted UOGD Issue Support among Liberals, Moderates, and Conservatives (N = 524)