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# A Drill by Any Other Name: Social Representations, Framing, and Legacies of Natural Resource Extraction in the Fracking Industry

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## Abstract

How do people interpret ambiguous and uncertain events? This study explores this question in the context of unconventional oil and gas development, or “fracking”, with implications for natural resource extraction generally. Drawing on the theories of social representations and framing, we test the hypothesis that legacies of natural resource extraction—conceptualized here as collective schemata of interpretation—shape perceptions and actions toward new forms of energy development. Based on an analysis of survey data from the “Twin Tiers” regions of New York and Pennsylvania (n=590), we find that negatively perceived legacies of past resource dependence, net of other factors, lead to opposition and political behaviors related to unconventional oil and gas development. Our findings suggest that regional legacies of natural resource extraction act as a sense making tool, working to translate the ambiguous, novel phenomenon of unconventional oil and gas development into something understandable in light of past experiences.

## 1. Introduction

Social scientists have long been interested in how individuals and groups come to understand ambiguous, novel events (Asch 1946). This is embodied in theories of framing (Benford and Snow 2000; Goffman 1974) and social representations (Moscovici 1981). According to both approaches, meaning is created when an object, event, or issue is connected via social processes (e.g. interpersonal communication, mass media coverage) to pre-existing mental constructs already held by an individual, group, or community (Moscovici 1981, 1988; Wagner and Hayes 2005). When faced with an ambiguous or complex event, residents of a particular community can lean on historical, cultural, and social processes to generate an understanding of the unfamiliar event based on things that are perceived as similar along some criteria (Moscovici and Duveen 2000). In doing so, the ambiguous is transformed into the definite; the abstract into the concrete. Individuals, groups, or communities are then able to form beliefs and attitudes toward the novel event, and may ultimately take individual or collective action in support or opposition, though action is not inevitable.

This disambiguating process may be particularly relevant for researchers interested in energy development, particularly unconventional oil and gas development (UOGD), or what is frequently labeled with catch-all terms such as “fracking” (Evensen et al. 2014). Since its rapid expansion in the early 2000’s, social scientists have produced research on a number of aspects of UOGD. These include studies on regulation and policy (Davis 2012), support and opposition (Boudet et al. 2014), knowledge (Rabe and Borick 2011), the leasing process, (Bugden et al., 2016), activism (Simonelli 2014), perceptions of risks and benefits (Ladd 2013), communication (Evensen, Clarke, and Stedman 2014), environmental justice (Malin and Demaster, 2016), perceptions of risks and benefits (Schafft, Borlu, and Glenna 2013; Wynveen 2011), collective

resource management (Jacquet and Stedman 2011), “boomtown” impacts (Jacquet and Kay 2014), and, to a lesser extent, civic action (Theodori 2013).

Much of the social science directly addressing UOGD has focused on public perceptions. Many factors have been suggested to explain how public perceptions of UOGD are formed, including sociodemographic attributes (Boudet et al. 2014), proximity (Clarke et al. 2016), industry-related activities (Boudet et al. 2016), and social psychological factors such as risk and trust (Davis and Fisk 2014; Kreuze, Schelly, and Norman, 2016). These explanations are scattershot, however; little work has been done to reconcile them, or to provide a common theoretical lens by which to understand their effects on perceptions of energy development. What *is* clear about UOGD, however, is that it is a novel event and inherently ambiguous. It requires social processes to define it and give it meaning in the minds of individuals and/or communities. Previous studies of public perceptions have all *implicitly* worked from this stance, including several that have explicitly examined how the framing of UOGD influences understanding (Lozano-Maya, 2016; Evensen, 2016).

We argue that theories of framing and social representations—taken together—provide a social psychological framework that makes explicit how individuals and communities may come to understand new or ambiguous events. We demonstrate the value of this framework empirically in an examination of local UOGD, suggesting that experience with similar extractive industries is one of the most salient past experiences from which individuals, groups, and communities may draw. These legacies of resource extraction act as a schema, or a frame of reference, to which new events are anchored and subsequently understood. To evaluate this argument, we examine, through a general population mail survey of the Twin Tiers region of NY and PA, the effect of

perceptions of natural resource extraction industry legacies in two non-oil or gas sectors (timber and mining) on (1) support/opposition for UOGD, and (2) political behaviors related to UOGD.

## 2.) Literature review

### 2.1. Framing Theory and Social Representations Theory

Perceived outcomes of previous natural resource extraction act as a frame of reference, or an organizing knowledge structure through which new information is filtered and given meaning. While research on various frame concepts is often convoluted—a product of framing’s multiple disciplinary applications (Borah 2011; D’Angelo 2002; Entman 1993)—we focus here on two core concepts: the frame in thought, or “schemata of interpretation” described by Goffman (1974), and collective action frames, or the strategic ways in which social movement actors attempt to make sense of public issues (Benford and Snow 2000). What these approaches share conceptually is: 1) the frame concept is central to understanding how ambiguous situations are interpreted; and 2) that no situation, issue, or object is inevitably understood in any given way, suggesting that social processes are central to creating individual or collective meaning.

Goffman writes that frames in thought “help in making an otherwise meaningless succession of events into something meaningful” (1974, pg. 21). To make sense of our world, we use activated knowledge structures to filter information, incorporating it into our understanding of the world. The schematic model represents a top-down approach in cognitive psychology, with schemas representing broad forms of knowledge that provide meaning to component parts (Brewer and Nakamura, 1984; Markus and Zajonc, 1985). A frame in thought can be thought of as a subjective theory of how some aspect of the world operates. They are not bound to a particular

place or time, but represent a general understanding that can then be applied to a specific situation.

Frames in thought help us explain why people see the same “objective” situation in different ways; we have learned to interpret certain events in certain ways, focusing on some aspects of the situation and not others. This is what Goffman (1974) refers to as a “strip”, or “any arbitrary slice or cut from the stream of ongoing activity, including here sequences of happenings, real or fictive, as seen from the perspective of those subjectively involved in sustaining an interest in them.” (pg. 10). He further argues that frames in thought allow us to live by inference (Barsalou and Hale, 1993). That is, we use our frames in thought to fill in the gaps of our cognitive interpretation of the environment. Goffman (1974) writes, “we can hardly glance at anything without applying a framework, thereby forming conjectures as to what occurred before and expectations as to what is likely to happen now” (pg. 38). We live by inference because of the cognitive burden of applying a thorough analytical lens to every situation we find ourselves in. Frames in thought are highly useful, arguably necessary, cognitive tools, but they can limit one’s scope of understanding. Frames can be too rigid to integrate unusual or highly novel events or information (Wilensky, 1986).

A close cousin to research on framing, social representations theory posits that new experiences are interpreted in light of past experiences through the process of ‘anchoring’, where novel experiences are construed in part through their association with memories of previous experience (Moscovici 1981; Moscovici and Duveen 2000; Wagner and Hayes 2005). For something to be interpretable, it must be intelligible in light of what an individual or community already knows and believes (Newell 1994). This allows for the integration of pre-existing knowledge and beliefs about the world with novel experiences. In the process, people transform complex or ambiguous

ideas into something more accessible and interpretable. This process is similar to the anchoring and adjustment heuristic, as detailed in psychological literature on heuristic processing (Gilovich, Griffin, and Kahneman 2002), except that the anchoring occurs primarily via social influences and processes (as opposed to dominantly individual ones) – due to communal discourse, social structure, institutional actions, and shared history and culture.

In our study, the complex object or process being translated in light of past experiences is UOGD, i.e. leasing, site preparation, drilling, transporting, and processing the fossil fuels, and the myriad environmental, economic, or social impacts of these processes. When searching for ways to interpret this emerging industry, residents of affected communities turn to familiar schema to help make a new, complex, and often ambiguous phenomenon accessible. This may mean turning to understandings of regional natural resource extraction legacies. ‘Anchoring’ this new process to well-understood, previous industry activity helps residents form the beliefs and attitudes central to studies of public perceptions. The application of framing and social representations theory highlights—and provides a concrete mechanism for explaining—the importance of context in shaping perceptions and actions toward UOGD and natural resource extraction industry activity generally. It also points studies of local perceptions of UOGD in a new direction: toward more *social*, social-psychological considerations. Evaluations are based on shared communal experience, not merely aggregated individual cognitive and affective processes.

## 2.2. From Timber to Shale Gas: The Rural Legacy of Natural Resource Extraction

The extraction and processing of natural resources has a range of implications for communities, their residents, and the local and regional environment (Stedman, 2013). For the reasons described above, the legacy of these impacts may become crucial to public understanding of

emergent natural resource extraction, even long after the industry has disappeared from the region. For more than a half century scholars have examined socioeconomic and environmental effects across a range of extractive industries including fisheries (Hamilton and Seyfrit 1994), timber (Howze et al. 1993), mining (Nord and Luloff 1993), and agriculture (Goldschmidt 1978). Research on natural resource extraction industries focuses on how the presence and characteristics of a natural resource extraction industry influences social outcomes, including well-being (Kusel 2001) crime (Freudenburg and Jones 1991), social capital (Brown et al. 2011), and community stability (Beckley 1995). Communities with greater dependence on a single natural resource extraction industry tend to experience lower levels of well-being (Beckley, Parkins, and Stedman 2002; Freudenburg, Wilson, and O’Leary 1998; Parkins, Stedman, and Varghese 2001; Stedman, Patriquin, and Parkins 2011). Dependence, coupled with a lack of control over the resource, leads to uncertainty and fear over future economic prospects. This has been observed in the recent emergence of the unconventional oil and gas industry (Fry, Briggles, and Kincaid 2015; Jacquet and Stedman 2014; Malin, 2014; Willow 2014).

The socioeconomic outcomes of local dependence on natural resource extraction industries is also contingent on historical context (Lobao, Schulman, and Swanson 1993; Swanson 1988), background economic characteristics (Freudenburg and Gramling 1994), integration of the industry into the local political economy (Lobao 1990), the characteristics of the resource itself (Freudenburg 1997; Parkins, Stedman, and Beckley 2003; Stedman, Parkins, and Beckley 2004), and the pace of development, or what is labeled the “boomtown effect” (Freudenburg and Jones 1991; Jacquet and Kay 2014), as recently observed in the Bakken Shale region of North Dakota.

The legacy of a natural resource extraction industry can also be biophysical. Environmental impacts include land disturbances in the mining and timber industry that reduce local amenity



values (Chadwick, Highton, and Lindman 2013), surface and subsurface freshwater pollution in the oil, gas, and mining industries (Colborn et al. 2011; Dudka and Adriano 1997; Finkel and Law 2011; Mitka 2012; Osborn et al. 2011), local air pollution from the oil, gas, and mining industries (Clark et al. 2012; Howarth, Ingraffea, and Engelder 2011), and the destruction of wildlife habitat from nearly any type of natural resource extraction industry (Gillen and Kiviat 2012; Pond et al. 2008; Thomas et al. 1990).

Scholars have not only focused on the socioeconomic impacts of extractive industries, but also how those industries are perceived and responded to by local residents. Comparative research finds striking differences across cases (Freudenburg and Gramling 1994; Molotch, Freudenburg, and Paulsen 2000). In explaining this variation, scholars have pointed to local historical context, particularly the legacy of the industry in the region (Brown et al. 2011; Freudenburg and Gramling 1994; McAdam and Boudet 2012). Extractive industries leave legacies that contribute to the structural character of the local political economy and the perceptions of residents.

The perceived legacies of natural resource extraction industries are not hardwired to historical happenstance, however. Active interpretation and framing contributes strongly to perceived legacy. Research has shown that energy companies may actively frame the way their presence is perceived (Bell and Braun 2010; Bell and York 2010; Snow et al. 1986). Not only can residents come to depend on the industry, but their sense of its impacts can be actively constructed by industry to create a more positive image of the industry's impacts on the community. Bell and colleagues have shown how extractive energy industries successfully frame themselves as the "backbone of the community" (Bell and York 2010). This is one of the few instances of research that has looked at how sociological processes contribute to public perceptions of energy development, a point to which we return in our discussion.

### 2.3. Legacies of Natural Resource Extraction Industries and the UOGD Boom

Several studies raise the possibility that public perceptions and actions toward UOGD are being influenced by regional legacies of natural resource extraction industries. Brasier et al. (2011) examined perceptions of local leaders in four NY and PA counties affected by UOGD. Key informants in each county invoked the region's experience with the coal industry as shaping their opinions on existing and future UOGD. In short, the boom-and-bust cycle of the coal industry in the region acted as a filter through which informants anticipated potential impacts. In these regions, "experiences with extractive industries (rather than solely level of activity) are essential constructs for understanding how local, formal and informal, leaders perceive the impacts of extractive activity in their communities" (Brasier et al. 2011, pg. 53). Informants expressed concerns that, like the coal industry of the past, "the gas industry would not develop the Marcellus responsibly, but would instead extract the resource for profit and leave behind serious environmental problems for future generations" (Brasier et al. 2011, pg. 54).

In a review of newspaper coverage in the northern tier of Pennsylvania, Evensen et al. (2014) find further evidence for the import of previous experience with natural resource extraction industries. One journalist interviewed in the study noted that the focus and concern over environmental impacts from UOGD flowed from living "in a town and a region that is still very visibly environmentally scarred from a history of coal mining. It comes up here a lot that people are concerned about another environmental legacy like that one... there is a willingness to wait for some kind of assurance that there won't be long term environmental implications" (Evensen et al. 2014, pg. 73). These observations informed the journalist's reporting, which further circulated these ideas and sentiments within the region.

Stedman et al. (2012) found that New York residents were considerably more likely to oppose UOGD (30.7%) than Pennsylvania residents (18.5%). These differences remain even when controlling for key socio-demographic factors. The authors suggest—though do not explicitly test—that one plausible explanation for this difference is the legacy of resource extraction in Pennsylvania and its primacy in regional economic identity, stating (p.390):

“Communities that have extensive histories with such industries may have local history and identity bound up in these forms of economic development... positive outcomes, or at least awareness of the effects of resource extraction on communities, may be more emphasized in these areas. It is possible (perhaps likely) that the history of energy development in Pennsylvania, or what Bell (1997) calls “the ghosts of place,” has—on the whole—rendered residents less vocal in their concerns or more accepting of the impacts of such projects.”

By using past experiences as an interpretive mechanism, some individuals may support emerging UOGD, interpreting their community or region’s experience with natural resource extraction industry as positive, as suggested by both Stedman et al. (2012) and Silva and Crowe (2015). However, such views are not likely to reflect consensus. Other residents may judge the same events as largely negative, and thus seek to not repeat past mistakes, as suggested by Brasier (2011).

In short, a limited series of studies suggest that legacies of natural resource extraction industry may influence public perceptions toward new UOGD, particularly in PA and NY. Specifically, negative perceptions of past natural resource extraction industry activity appear to be associated with concern or opposition to UOGD. On the other hand, positive or at least neutral perceptions of past natural resource extraction industry activity are associated with support. This is generally

consistent with long-standing sociological research on natural resource dependent communities, as reviewed above.

## 2.4. Hypotheses

We explore whether perceived legacies act as a sense making tool, leading to UOGD-related attitudes and behavior. We test two hypotheses. The first hypothesis pertains to whether support and opposition toward UOGD varies according to legacies of regional natural resource extraction, and whether variables measuring perceived legacies exhibit independent effects on attitudes and actions net of frequently cited explanatory factors. If negatively perceived legacies are associated with opposition, independent of other commonly tested variables, we can infer that individuals are using legacies as a filter through which they interpret UOGD:

H<sub>1</sub>: Holding negative views of regional *mining or timber* industry legacies increases stated opposition toward UOGD.

Given the relative lack of research on determinants of political behavior associated with UOGD, as well as our desire to deepen our understanding of the effects of perceived legacies, we investigate whether evaluations of natural resource extraction industries influence political behaviors toward UOGD. As such, the following hypothesis is tested:

H<sub>2</sub>: Holding negative views of regional *mining or timber* industry legacies increases the occurrence of UOGD-related political behaviors.

## 2.5. Control Factors

We also include several control variables, for four reasons: 1) these factors consistently predict similar dependent variables in national and local studies and therefore are important controls for

our primary factor of interest, i.e. do these views predict attitudes and behavior *independent* of the most commonly cited factors; 2) they serve as a frame of reference for evaluating the *relative* effect of previous industry experience; 3) they control for the possibility of a spurious relationship between our primary independent variable and dependent variables; and 4) doing so allows us to compare our regional sample to previous national samples utilizing similar variables.

#### 2.5.1. Sociodemographic Factors

Socio-demographic attributes have been shown to affect perceptions of energy and non-energy technologies (Ho, Scheufele, and Corley, 2011). Men are more likely than women to support emerging technologies (Siegrist et al. 2007) or the siting of coal, natural gas, nuclear, and wind power facilities (Ansolabehere and Konisky, 2009), and UOGD itself (Boudet et al., 2014; Davis and Fisk, 2014; Quinnipiac University, 2012). Other sociodemographic factors of relevance here include age and education (Firestone and Kempton, 2007; Jacquet, 2012). At the national level, Boudet et al. (2014) find that older individuals and individuals with a bachelor's degree or higher are more likely to support UOGD while women are more likely than men to oppose it.

#### 2.5.2. Initial Associations

One way to capture complex perceptions is through the use of free response qualitative data that captures what an individual associates with a concept. These initial associations are “broadly construed to include sights, sounds, smells, ideas, and words, to which positive and negative affect or feeling states have become attached through learning and experience” (Slovic, MacGregor, and Peters 1998: 3). Use of initial associations then is a way to capture perceptions of risks and benefits associated with energy development (Lesbirel and Shaw 2005; Pidgeon and Demski 2012; Visschers and Siegrist 2013). Boudet et al. (2014) and Clarke et al. (2015) both

find that individuals who associate UOGD with environmental issues are more likely to oppose it, while individuals who associate development with economic issues such as jobs or energy security are more likely to support it. The environmental association may be operating much the same way as environmental concern, which has been shown to predict a range of attitudinal and behavioral factors (Fransson and Gärling, 1999). In short, individuals with a propensity to take environmental problems seriously exhibit greater environmental concern, either in their attitudes toward specific issues or events or in their behavior.

### 2.5.3. Political Ideology

Energy technologies that present potential risks to health or the environment, such as those used in UOGD, are interpreted differently according to political ideology (Rothman and Lichter 1987; Wildavsky and Dake 1990). Public opinion polling has shown that conservatism is a strong predictor of support for the development of available fossil fuel resources generally, with Republicans and conservatives more supportive of UOGD specifically (Boudet et al. 2014; Davis and Fisk 2014; Pew Research Center for the People and the Press 2012).

### 2.5.4. Media Use

Media coverage shapes how individuals perceive risk and support/opposition toward a new technology. It performs an agenda-setting function that helps to determine what topics and narratives are newsworthy, though the mechanisms by which this occurs vary greatly (Driedger 2007; Flynn et al. 1998; Iyengar 1991; Krinsky 2007; McCombs and Shaw 1972). Boudet et al. (2014) find that individuals who watch television news at least once a week are more likely to support UOGD, while individuals who receive news from newspapers at least once a week are more likely to oppose it.

### 2.5.5. Leasing Land for Development

In a study of landowners leasing their property for shale natural gas and wind development, Jacquet (2015) and Kriesky et al. (2013) find that lessor-landowners (those who lease land for natural gas development) were more likely to have positive attitudes toward natural gas development generally.

## 3. Data

Data for this study were drawn from the “Twin Tiers” region of Southern NY and Northern PA, which comprises 14 counties (seven in each state) spanning the boundary of the two states. The Twin Tiers region has a rich history of natural resource extraction. During the mid to late nineteenth century and into the twentieth century, the region was a raw materials exporter, particularly of lumber and agricultural products. The Northern Tier of PA supported a substantial coal industry in the nineteenth and early twentieth centuries. These include the Barclay deposit in Bradford County, the Bloss deposit in Tioga County, and the Bernice deposit in Sullivan County. However, just to the south, the PA coal region has a legacy as one of the most productive coal mining regions in U.S. history. The Northern Tier also has a productive stone mining industry, including sandstone and bluestone. The Southern Tier of NY has experienced relatively less natural resource extraction, though it has experience with early U.S. oil and gas extraction and has maintained a moderate timber industry. The Southern Tier also has a direct legacy of bluestone, clay, topsoil, and other industries.

For this survey, 34 municipalities in 10 of the Twin Tiers counties (six in NY [Broome, Chemung, Cortland, Delaware, Tioga, and Tompkins]; four in PA [Bradford, Lycoming, Susquehanna, and Wayne]) were sampled (see Figure 1 and Table 1 below for details on the

study region). These include municipalities ranging from populations of 443 to 47,107. Surveys were sent by four-wave mailing (i.e., survey, reminder, second survey, second reminder, with approximately 7-10 days between mailings) to 147 randomly-selected households in each municipality. A random sample of names, addresses, and telephone numbers for residents of these counties was purchased from MSG (Marketing Systems Group). Excluded from this sample were addresses belonging to seasonal residents, addresses which had been vacant for a period over 90 days, and delivery points that service more than one location. The first wave of surveys was mailed with a cover letter on 4 September 2013. The survey was mailed to 4,998 households; 629 surveys were returned as undeliverable (345 in NY and 284 in PA). With 1202 respondents (637 from NY and 565 from PA), the adjusted response rate for the entire sample was 28% (30% in NY and 26% in PA). The individual in the household with the closest upcoming birthday was asked to complete the questionnaire. Given the purpose of the study—to investigate the relationship between evaluations of past industry activity and new industry activity—we only include those individuals in this analysis who reported evaluations of both mining and timber activity, the two primary independent variables in our analysis. The remainder did not indicate having experience in a previous question asking, “How much experience has the area you live in had...” with each of the extractive industries.<sup>1</sup> All reported data is from the 590 respondents who answered these two questions.

#### Figure 1. Map of Study Region

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<sup>1</sup> “Experience” here is self-defined. We chose not to predetermine what was meant by experience, as respondents may view what is relevant experience this quite differently. Future research may focus on different types of experiences and how they differ in motivating support/opposition.





Table 1. Municipal Data for Study Region

Community name	County	State	Total population	Population density (/ sq. mi.)	Unemployment rate (%)	% with Bachelor's degree
Binghamton	Broome	NY	47,107	4,244	10.7	23.5
Fenton	Broome	NY	6,649	199	7.6	23.7
Sanford	Broome	NY	2,564	28	10.5	16.9
Windsor	Broome	NY	6,260	67	6.0	13.3
Elmira	Chemung	NY	29,173	3,839	11.2	13.2
Van Etten	Chemung	NY	1,528	37	13.1	13.4
Cortland	Cortland	NY	19,271	4,941	7.9	25.8
Harford & Virgil	Cortland	NY	3,231	45	4.0	22.2
Deposit	Delaware	NY	1,787	1,375	7.1	14.3
Tompkins & Masonville	Delaware	NY	2,701	17	10.2	14.0
Candor	Tioga	NY	5,296	56	6.0	14.6
Owego	Tioga	NY	3,891	1,441	8.4	29.1
Spencer	Tioga	NY	3,135	63	5.8	18.8
Caroline	Tompkins	NY	3,260	59	9.0	41.3
Dryden	Tompkins	NY	14,455	153	4.5	43.1
Groton	Tompkins	NY	5,945	120	6.9	16.1
Newfield	Tompkins	NY	5,192	88	12.6	23.9
Athens	Bradford	PA	3,369	1,872	4.2	20.0
Athens	Bradford	PA	5,234	116	5.3	22.0
Towanda	Bradford	PA	2,921	2,655	5.5	22.3

Troy	Bradford	PA	1,548	42	4.7	20.8
Wysox	Bradford	PA	1,570	68	6.8	18.3
Cogan House	Lycoming	PA	853	12	6.6	13.2
Cummings & McHenry	Lycoming	PA	443	3	10.0	12.1
Jersey Shore	Lycoming	PA	4,355	3,629	8.6	12.6
Mifflin	Lycoming	PA	1,093	39	6.4	11.2
Porter & Watson	Lycoming	PA	2,432	77	9.2	16.2
Williamsport	Lycoming	PA	29,441	3,099	12.6	18.0
Bridgewater & Brooklyn	Susquehanna	PA	3,615	55	4.4	17.4
Dimock & Springville	Susquehanna	PA	3,272	54	4.2	18.9
Montrose	Susquehanna	PA	1,794	1,380	11.8	19.4
Damascus	Wayne	PA	3,648	45	7.8	16.6
Honesdale	Wayne	PA	4,458	1,115	7.8	18.7
Manchester & Lebanon	Wayne	PA	1,372	25	7.7	14.2

A non-respondent follow-up telephone survey was conducted with 150 non-respondents, including 75 from both NY and PA. A subsample of 12 question, incorporating 29 individual variables, were asked. The questions in the follow-up survey measured key demographic characteristics, perspectives on major social representations of shale gas development, and support/opposition to shale development. While our non-respondent analysis did reveal slight differences in specific variables, a fully-weighted analysis revealed no significant differences in between the weighted and non-weighted findings. Therefore, for the sake of clarity, we have chosen to present only the non-weighted findings.<sup>2</sup> What's more, as our focus here is on the

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<sup>2</sup> To determine if any transformations to the data should be made before conducting further analysis, we weighted the data to account for population values and to compare these results with the results of non-weighted data. For the population values, we used the 2012 American Community Survey 5-year estimates from the US Census Bureau for age, sex, and education. These three variables correlated with support/opposition for shale gas development. I created two categories for each variable in each state: sex (male, female), age (18-44, 45 and over), education (less than bachelor's degree, bachelor's degree or greater). This produced 16 weights to apply to the respondents. Weights ranged from 0.30-4.16. For NY population values, we averaged the population across the six counties included in the survey (Broome, Chemung, Cortland, Delaware, Tioga, and Tompkins); for PA values, we averaged the population across the four counties in the survey (Bradford, Lycoming, Susquehanna, and Wayne). After weighting the data, we compared the results of the weighted data with the results of the non-weighted data to determine the degree to which the results from the survey respondents could be expected to approximate our non-

relationship between variables rather than on inferring characteristics of the general population, weighting the data is not necessary.

Pearson correlation coefficients were generated between each variable included in our models. In each case, correlations did not exceed .5, indicating an absence of multicollinearity concerns.<sup>3</sup> The variables for experience with “other mining” and “coal mining” are highly correlated ( $r = .706$ ), while experience with timber harvest is only marginally correlated with “coal mining” ( $r = .278$ ) and “other mining” ( $r = .399$ ). Consequently, we collapsed the mining categories into a composite variable labeled “mining.” Experience with timber harvest is included as a separate independent variable. We used listwise deletion for missing variables in each regression model, as this is best practice for large N analyses (Schafer and Graham, 2002).

For our first dependent variable—support/opposition—respondents were asked “Considering everything, do you support or oppose shale gas development in the following areas?” at each of three different geographical scales: “in your community”, “in your state”, and “in the USA”. Responses options included “strongly oppose”, “oppose”, “slightly oppose”, “slight support”, “support”, and “strongly support”. These responses were coded on a 1-6 scale, with larger numbers representing greater support. To test for general support/opposition, we created a

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respondent population when accounting for sex, age, and education. The variation in results was minimal for descriptive statistics, a factor analysis, and linear regressions. This indicates that deviation of the survey population from the general population in age, sex, and education did not affect the descriptive or multivariate results. In other words, in weighting the data to better reflect our non-respondents, we find little meaningful differences in our non-respondent and respondent groups.

<sup>3</sup> Pairwise correlation coefficients of .56 between mining and an oil/gas composite variable indicated potential multicollinearity problems. In order to avoid omitted variable bias or a type II error, we decided to exclude the oil and gas variables from the model. A second model including only oil and gas variables yielded a statistically significant ( $<.001$ ) and substantial standardized beta coefficient (.442) for the composite oil/gas variable. However, this variable is likely only representative of ongoing oil and gas development (this region has very little legacy of oil/gas development outside of early industrial era extraction that predates most living members of the community), not prior development, which is the focus of this study. Due to conceptual and statistical concerns over the interpretation of this variable, it is not a focus of our study.

composite variable of the three geographical scales. Factor and reliability analysis revealed high factor loadings and a subsequent Cronbach's alpha of .973. As a composite variable, it is effectively continuous in nature and is treated as such in our analysis.

For our second dependent variable—political behaviors related to UOGD—respondents were asked “How often have you engaged in the following, with a specific focus on shale gas development?” These behaviors included: attended a meeting or rally, joined a group, shared information with community members, signed a petition, voted for a particular politician, wrote to a politician, and wrote a “letter to the editor.” Response options included “never”, “once”, and “more than once.” We recoded these variables such that 0 represented “never”, while 1 represented any engagement, thus collapsing “once” and “more than once”. These options were collapsed due to the unequal semantic distance between the “once” and “more than once” options. These seven dichotomous items had a Cronbach's Alpha of .727, with no Alpha-if-deleted metric suggesting improvement for the deletion of any single item. Therefore, we utilize the composite variable incorporating each of the seven dichotomous items.

For our primary independent variable of interest—experience with extractive resource industries—respondents were prompted with the statement “We want to understand the history of natural resource use in your area” and then asked “If your area has experience, how positive or negative has this experience been?” These questions were applied to five categories of resource extraction: “natural gas drilling”, “oil drilling”, “coal mining”, “other mining”, and “timber harvesting”. Our focus in this analysis, however, is on the influence of the legacy of industry other than oil and gas. Response options included: “very negative”, “somewhat negative”, “somewhat positive” and “very positive”. Responses for experience with “coal mining” and “other mining” were also combined to form a “mining” variable. Experience with “timber

harvesting” was left in its original form. It is important to note that evaluations of coal, mining, and timber harvesting are largely temporally antecedent to UOGD. Coal mining in these regions is largely defunct, while mining and timber harvesting predate UOGD in the region by decades. This allows us to interpret these variables as impressions of the legacy of these natural resource extraction industries.

For the initial associations, respondents were asked “please write, as quickly as you can, any words or phrases that come to mind when you think of “shale gas development via hydraulic fracturing”” (Boudet et al. 2014). Answers were then coded into numerous non-mutually exclusive categories. For this analysis, responses coded as either being associated with environmental or economic issues are included.

Descriptions of all variables used in the analysis are included in Table 2 below.

Table 2. Description of variables (\*indicates dependent variable)

Variable label	Question wording	Response options	Descriptives
Support/opposition <sup>a</sup> N=526	Considering everything, do you support or oppose shale gas development in the following areas?	1 = Strongly oppose 2 = Oppose 3 = Slightly oppose 4 = Slightly support 5 = Support 6 = Strongly support	Mean = 3.8
Behaviors <sup>a4</sup> Meeting/rally (N=557) Joined group (N=553) Shared information (N=555) Signed petition (N=549) Voted for politician (N=552) Wrote to politician (N=551) Wrote letter to editor (N=554)	How often have you engaged in the following, with a specific focus on shale gas development?	Attended a meeting or rally; joined a group; shared information with community members; signed a petition; voted for a particular politician; wrote to a politician; wrote a “letter to the editor” 0 = Never	% who engaged in behavior: -Meeting/rally = 48.3 -Joined group = 24.7 -Shared information = 69.3 -Signed petition = 39.8 -Voted for politician = 57.3 -Wrote to politician = 29.7 -Wrote letter to editor = 8.3

<sup>4</sup> 14% of respondents engaged in zero behaviors; 14.9% of respondents engaged in one behavior; 19.6% of respondents engaged in two behaviors; 17.7% of respondents engaged in three behaviors; 14.3% of respondents engaged in four behaviors. 8.6% of respondents engaged in five behaviors. 7.6% of respondents engaged in six behaviors. 3.4% engaged in all seven behaviors.

		1 = Once or more than once	
Extractive industry experience Mining (N=590) Timber (N=590)	If your area has experience, how positive or negative has this experience been?	1 = Very negative 2 = Somewhat negative 3 = Somewhat positive 4 = Very positive	Mean (mining) = 2.5 Mean (timber) = 3.1
Leasing activity N=449	Do you have a gas or oil lease on your property?	0 = No 1 = Yes	0 = 60.1% 1 = 39.9%
Political views N=571	How would you describe your political views	1 = Very liberal 2-6 7 = Very conservative	Mean = 4.5
Education N=586	Please indicate your highest level of education attained	0 = Did not complete four-year degree 1 = Completed four-year degree	0 = 58.9% 1 = 41.1%
Sex N=583	Please indicate your sex.	0 = female 1 = male	0 = 44.6% 1 = 55.4%
Age N=569	In what year were you born?	Free response; recoded for age	Mean = 59
Information: local newspaper N=528	How often have you read or heard about this issue from each source?	1 = Never 2 = Occasionally 3 = Often	1 = 4.0% 2 = 36.5% 3 = 59.5%
Information: television N=519	How often have you read or heard about this issue from each source?	1 = Never 2 = Occasionally 3 = Often	1 = 10.1% 2 = 53.3% 3 = 36.6%
Initial associations Environment (N=522) Economic (N=522)	Please write, as quickly as you can, any words or phrases that come to mind when you think of “shale gas development via hydraulic fracturing”.	Free response. Answers coded by authors.	Environmental = 33.6% Economic = 23.6%
State N=590	State of residence	0 = NY 1 = PA	0 = 53.1% 1 = 46.9%

Note: <sup>a</sup> denotes dependent variable

## 4. Findings

### 4.1. Experience with Resource Extraction Industry

About half (53.4%) of respondents reported a somewhat or very negative experience with the mining industry, while the remaining 46.6% reported a somewhat or very positive experience.

Perceptions of timber harvest were much more positive: 18.7% reported negative experience while the remaining 81.3% reported a positive experience.

#### 4.2. Resource Extraction Industry Experience and Support/Opposition to UOGD (Hypothesis 1)

An ordinary least squares (OLS) regression model indicates that, net of other factors, perceived legacies of mining industry activity influences support/opposition for UOGD (Table 3).<sup>5</sup> As perceived legacies become more positive, support for UOGD increases. This relationship is not trivial. The standardized beta coefficient, which allows us to interpret relative stepwise movement in our dependent variable due to changes in our independent variables, indicates that perceived legacies have a larger effect on support/opposition than other variables included in our model which have previously been shown to predict support/opposition. These include political ideology, age, gender, education, and media consumption. Perceived legacy of timber harvest is not significantly related to support for UOGD. Thus, because we find an effect of mining legacies, but not timber harvest, we find partial support for our first hypothesis, which states:

H<sub>1</sub>: Holding negative views of regional *mining or timber* industry legacies increases stated opposition toward UOGD.

Table 3. OLS regression predicting support/opposition to unconventional oil and gas development (N = 341).

	Std. Beta	Unstd. Beta	Std. Error
Eval. Mining***	0.200	0.406	0.090
Eval. timber harvest	0.033	0.078	0.103
Leased land***	0.289	1.09	0.158
Conservative***	0.144	0.156	0.045
Education	-0.068	-0.259	0.155
Male***	0.118	0.454	0.154

<sup>5</sup> Ordinary least squares regression is used in this case because the dependent variable is a composite of three ordinal variables. In taking the average of the three, the composite creates a continuous measure with, in this case, 16 intervals, representing all computable values.

Age	0.037	0.005	0.005
Local newspaper	-0.011	-0.039	0.142
Local television	0.074	0.234	0.133
Envtl. Representations***	-0.284	-1.134	0.163
Econ. representations***	0.208	0.848	0.168
Living in PA***	0.112	0.418	0.155

\*\*\*p<.001

Adjusted R-squared = .51

While perceived legacies of timber harvest do not appear to impact support/opposition toward UOGD, it is possible that the effect of the timber harvest variable is attenuated by its negative skewness; the vast majority of respondents in this region view the industry favorably. In regions where the timber industry has a more significant and contentious legacy, similar studies may find different results.

Findings for the control variables included in our model are largely consistent with findings from prior literature, though some of these variables fail to predict support/opposition or do so only weakly. Environmental initial associations have a strong negative relationship with support, while economic initial associations have a strong positive relationship with support. Males, conservatives, and individuals who have leased land for development are also more likely to support UOGD. Given that our research takes place in a region directly affected by UOGD, it is not surprising that demographic and non-experiential factors have less of an effect on support/opposition. Residents of directly affected communities are simply more likely to interpret UOGD in ways characterized by the nature of their direct experience, including their evaluations of previous natural resource extraction industries.

#### 4.3. Beyond Support or Opposition: Civic Behaviors



While many studies have focused on how individual level factors shape stated support/opposition toward UOGD, few have focused on how these factors shape political or civic action. In our second analysis, we regressed a composite political behavior variable on the same set of independent variables as presented in Table 3. An OLS regression reveals that perceived legacies of the mining industry (there are no effects related to perceived legacies of the timber industry) predict general political behavior related to shale gas development. Results are presented in Table 4.

Of the twelve independent variables, three are associated with political behavior. Individuals who hold negative views of previous mining activity are more likely to take political action. Individuals with a college degree are more likely to take political action, as are those who more frequently get their news on shale gas development from the local newspaper.

Because we find an effect of mining legacies, but not timber harvest, our findings regarding political behaviors thus partially support our second hypothesis:

H<sub>2</sub>: Holding negative views of regional *mining or timber* industry legacies increases the occurrence of UOGD-related political behaviors.

Table 4. OLS regression predicting unconventional oil and gas development-related political behaviors (N=343)

	Std. Beta	Unstd. Beta	Std. Error
Eval. mining*	-0.132	-0.040	0.018
Eval. timber harvest	-0.030	-0.010	0.021
Leased land	0.058	0.032	0.032
Conservative	-0.022	-0.003	0.009
Education**	0.153	0.085	0.031
Male	-0.024	-0.014	0.031
Age	-0.002	-3.20E-05	0.001
Local newspaper***	0.254	0.128	0.028
Local television	-0.063	-0.029	0.027
Envtl. association	-0.073	-0.043	0.033

Econ. association	0.057	0.034	0.034
Living in PA	-0.106	-0.058	0.031

\*p< .05 \*\*p< .01 \*\*\*p<.001

Adjusted R-squared = .07

## 5. Discussion

Our results demonstrate that a particular frame —perceived legacies of natural resource extraction—significantly predicts both support/opposition and political behaviors related to shale gas development, net of a wide range of factors that have consistently predicted support/opposition in several other studies. In fact, as measured by its standardized beta coefficient, it is a robust predictor, associated with greater stepwise movement than all but three of the variables included in our analysis. Therefore, our findings have two primary implications: First, UOGD is likely to be understood in light of past regional extractive industry activity. While our study is limited to a small (albeit, important) region now experiencing UOGD, this finding is likely relevant for other resource dependent regions. Many areas experiencing UOGD have substantial natural resource extraction industry legacies. Given our findings, we suspect that interpretations of UOGD in those regions are interacting with legacies of resource extraction. We further suspect that interpretations of *any* emerging natural resource extraction industry interacts with past experiences with similar industries when such experiences are present. This may also include related efforts, including renewable energy technologies such as wind and solar. While we do not find timber harvest legacies to impact perceptions of UOGD, this is possibly due to the particulars of the regions timber industry. Unlike other parts of the country, timber harvest in the Twin Tiers is smaller in scale, occurs on private property, and is not a primary source of local employment. The dynamics related to timber harvest are likely to be quite different in Western states also experiencing UOGD.

Second, and most generally, our findings suggest that social construction processes, as described by theories of social representations and collective action framing, are likely to tap into pre-existing collective beliefs to actively construct how natural resource extraction is understood within a region or locality. While other studies have examined social psychological framing effects around issues of energy development (Toft, Schuitema, and Thøgersen, 2014; Walker, Wiersma, and Bailey, 2014; Edberg and Tarasova, 2016), we focus here on how social processes contribute to the framing process. Emergent development is inherently ambiguous for communities with little or no experience with the industry, a fact characteristic of many or most communities now experiencing UOGD. As reviewed earlier, theories of framing and social representations suggest that the resolution of this ambiguity is resolved primarily through *social processes* that link the new event with beliefs, experiences, and memories already held by individuals or the community. While we do not evaluate these processes directly, our findings do indicate that individuals in our study region have in fact connected past experience with extractive industries to new extractive industry activity; that this relationship is a powerful explanation for evaluations of the new industry; and that we can theoretically surmise that these connections occur via social processes.

Theories of framing and social representations provide guidance on how social processes link past events to new, ambiguous ones, and how future research may expand on our findings to construct a sociological model for public perceptions of energy development. Social representations theory points toward the importance of communal discourse, social structure, institutional actions, and shared history and culture. Research on framing points toward social movement activities and framing/counter-framing dynamics. For instance, industry efforts are likely to construct industry actions positively, in relation to local community context, as

proposed by Bell and colleagues (Bell and Braun 2010; Bell and York 2010). Matz and Renfrew (2015) identify the frames used by the natural gas industry in the Marcellus region through a content analysis of a key industry public relations initiative. They find that the industry relies on two approaches. On one hand, they attack opponents of development as “irrational obstructionists”. On the other hand, they connect development to issues of patriotism, environmental protection, and scientific capacity. Fitzgerald (2012) examines how the framing of “clean coal” was created and contested by a wide range of actors, including industry, government, and environmental groups.

Industry actors are likely not alone in attempting to create meaning around energy development. Social movement actors at various geographic scales are likely to engage in similar efforts to link emergent UOGD with appropriate schemata of interpretation. Recent research has begun to examine framing processes related to UOGD (Hilson 2015; Hudgins and Poole 2014; Williams et al. 2015), but no work has been done to understand how these efforts directly relate to individual perceptions and actions. Putting industry and social movement organizations together, scholars may focus on how the disambiguation process plays out in the framing/counter-framing processes described in research on framing contests (Ryan 1991).

An example of the analytical value of this approach may be found in attempts to explain observed differences in local and national studies of public perceptions. At the national level, political ideology is consistently the most robust predictor of support for UOGD. Our study and others point toward different drivers of local level perceptions. Clarke et al. (2016) show that political ideology in fact becomes a more powerful predictive force the further away from UOGD-related industrial activities respondents reside. We suggest that this is further evidence of the sociological framework suggested here. At the local level, social processes link development

to local issues, including legacies of natural resource extraction. At the national level, the issue is linked to broader constructs such as justice or security, a common refrain for social movement organizations (Gamson 1992). These broader, ideological connections are indicative of the lack of contextualized experiences that social movement organizations or industry can link public perceptions to at the national level. Yet, processes at both levels are still attempting to transform the ambiguous into the obvious, even though they rely on distinctly different schemata of interpretation.

Future studies may focus on at least two veins of research. First, further effort should be undertaken to understand the social processes described above, both in how they apply to UOGD but also to natural resource extraction activity generally. Second, scholars should explore the particular features of natural resource extraction industry legacies, including the context in which they play out, that individuals draw upon to form their assessments. While we focus on the valance of their evaluations, we do not study their specific content. That is, while residents' evaluations can be classified as positive and negative, the specific cognitions or meanings associated with those evaluations could vary greatly. One potential subject that may be at the heart of legacy-based opposition is water contamination. The issue of water has become a central feature of UOGD opposition, and how it has been framed in reference to UOGD at the local level (as well as its intersection with issues such as climate change) is an important subject for future research to consider.

Similarly, while we focus here on the legacy frame, this is not exhaustive of potentially critical frames of reference; rather, it is exemplary of the explanatory power of a frame approach to understanding perceptions of and actions toward energy development. There are certainly many cases where emergent UOGD is taking place in communities with no substantive legacy of

natural resource extraction. In these cases, the process described here is likely to engage quite different frames, such as environmental justice or economic opportunity, to name just a few. Likewise, future research may examine how the framing process interacts with sociodemographic factors, such as length of residence or social capital.

## 6. Conclusion

This study has demonstrated that legacies of natural resource extraction influence evaluations of UOGD in the Marcellus shale region. We argue that this effect is produced through a framing/anchoring process wherein social forces link past resource extraction to new resource extraction due in order to disambiguate the new event. Not only do evaluations of past resource extraction influence support/opposition for the new forms of resource extraction, but they also appear to influence political behaviors. The framing and anchoring process described here may help explain observed differences in local and national support for UOGD. More broadly, the processes described here may prove a useful analytical framework for sociological studies of energy acceptance. Future research may focus on the content of extraction legacies and how social actors frame past resource extraction and to what ends.

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