Attention to news media coverage of unconventional oil/gas development impacts

Attention to News Media Coverage of Unconventional Oil/Gas Development Impacts: Exploring Psychological Antecedents and Effects on Issue Support

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HIGHLIGHTS

- Research has examined media coverage of unconventional oil/gas development impacts.
- We study drivers/effects of attention to coverage of economic/environmental impacts
- Political ideology drives attention to coverage of environmental impacts.
- Attention to both impacts influences issue support
- UOGD news media discourse (and attention thereto) has energy policy implications.

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Research has examined media portrayals of unconventional oil and gas development's **(**UOGD) economic and environmental impacts. We examine how selective attention to media coverage of the impacts impact issue attitudes; the role of political ideology in driving such attention; and how this political divide emerges via selective attention to aforementioned content. We contribute to existing work on media attention antecedents and outcomes but with a hitherto unexplored focus on specific issue dimensions that have garnered media and public attention. We explore these relationships using U.S. national survey data (n = 700). We find that political ideology is not associated with attention to coverage of economic impacts, but such attention is predictive of higher UOGD support. Moreover, political ideology is associated with attention to coverage of environmental impacts (more conservative → less attention), and such attention predicts lower support. This indirect effect was also statistically meaningful. Overall, UOGD news media discourse (and attention thereto) has important energy policy implications.

Keywords: Hydraulic fracturing; shale gas; risk communication; media; political ideology

1. Introduction

Impacts of unconventional oil and gas development (UOGD) have attracted considerable interest over the past two-plus decades, with scholars examining news media discourse (Ashmoore et al., 2016; Evensen et al., 2014a; Habib & Hinojosa, 2016; Gearhart et al., 2019; Olive, 2016; Olive & Delshad, 2017) along with public attitudes and their social-psychological antecedents (Boudet et al., 2014; Thomas et al., 2017a). However, less is known about how news coverage influences attitudes and why people pay attention to it in the first place. Studies of other contentious issues have measured media attention in various ways while also exploring antecedents and/or outcomes (Besley & Shanahan, 2005; Besley & Oh, 2014; Cacciatore et al., 2012; Eveland, 2001; Ho et al., 2013; Scheufele & Lewenstein, 2005; Yeo et al., 2014; Zhao et al., 2011). Inspired by this work, we examine selective attention to media coverage of UOGD's economic and environmental impacts along with the effect on issue attitudes, namely support.

From a media effects perspective, since news media often portray UOGD's economic and environmental impacts in positive and negative terms, respectively (Ashmoore et al., 2016; Evensen et al., 2014a; Habib & Hinojosa, 2016; Gearhart et al., 2019; Olive & Delshad, 2017), we expect that attention to news coverage of the former will be associated with heightened issue support, while attention to the latter will lower it. Moreover, we explore how political ideology influences attention to such content given longstanding political divides on UOGD especially in the U.S., with political conservatives often more supportive and focused on economic effects, and liberals more opposed and focused on environmental effects (Boudet et al., 2014; Choma et al., 2016). Also, people often seek/evaluate information in a manner consistent with strongly held views (Druckman & McGrath, 2019). We expect that the more people identify as

conservative (on a liberal-conservative scale), the more attention they will pay to coverage of the economic impacts and the less attention they will pay to coverage of environmental impacts. Finally, our framework suggests pathways through which partisan divides in UOGD support emerge via selective attention to news coverage of these impacts. Overall, we contribute to existing work on media attention antecedents and outcomes associated with multifaceted issue content but with a hitherto unexplored focus on specific issue dimensions that have garnered media and public attention.

We test these relationships with data from a national sample of U.S. adults (n = 700) and discuss public opinion and energy policy implications.

2. UOGD background

UOGD broadly refers to oil and natural gas production that does not "meet the criteria for conventional production" (United States Energy Information Administration [USEIA, n.d.), with USEIA noting 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." Contemporary examples include oil and natural gas embedded in low-permeability rock formations like shale[1] that require two techniques to facilitate production: horizontal drilling, which allows access to a greater proportion of resource-bearing rock, and hydraulic fracturing or "fracking," which involves pumping water, sand, and chemicals underground at high pressure to "stimulate the flow of natural gas or oil [and increase] the volumes that can be recovered" (United States Environmental Protection Agency, 2018).

Reserves of UOGD are distributed worldwide (USEIA, 2015a; Wang et al., 2016), with a confluence of economic, technological, and political factors helping spur development in various countries beginning in the late 1990s (Bailey & Viscidi, 2016; Hongjun et al., 2016**;** McDonald, 2014; McGowan, 2014; USEIA, 2015b). In the United States, large reserves of unconventional oil and natural gas (USEIA, 2015a, 2021) helped it emerge as the world's largest producer of these two fuels, both from unconventional sources (USEIA, 2015b, 2016) as well as overall/all sources (USEIA, 2019a; BP, 2022). Indeed, unconventional sources currently account for a large majority of current overall U.S. oil and natural gas production (USEIA, 2019b, 2022a, 2022b). The latter has rebounded after a COVID-19 pandemic-triggered decrease (USEIA, 2022c**,** 2022d) albeit under a Biden administration focused on combatting climate change via reductions in U.S. greenhouse gas emissions and limits to fossil fuel extraction (The White House, 2021). Moreover, overall domestic oil and natural gas production is expected to to (modestly) increase over the next few decades, with UOGD accounting for a large majority of that production (USEIA, 2016, 2019b, 2022e).

UOGD's growth over the past two decades has spurred considerable interest in its myriad (potential) impacts (Boyle et al., 2015**;** DeSilva et al., 2016; Greiner et al., 2018**;** Haggerty et al., 2018; Jacquet et al., 2018; Newell & Raimi, 2014), especially related to the economy (e.g., potential effects on jobs and other economic conditions locally/regionally/nationally) and the environment (e.g., potential effects on ground/surface water tied to drilling, wastewater disposal, hydraulic fracturing, and other processes). Both have been the subject of scientific assessments (Paredes et al., 2015; Vengosh et al., 2014); news media coverage across various countries and media platforms (Ashmoore et al., 2016; Evensen et al., 2014a; Gearhart et al., 2019; Habib & Hinojosa, 2016; Hopke & Simis, 2017; Jaspal & Nerlich, 2014; Jaspal et al., 2014; Matthews &

Hansen, 2018; Olive, 2016; Olive & Delshad, 2017); and public attention, the latter as part of research into UOGD attitudes and social-psychological antecedents (Boudet et al., 2016, 2018; Clarke et al., 2015, 2016; Evensen et al., 2016; Stedman et al., 2016; Zanocco et al., 2019).

3. Literature Review

3.1.Defining news media attention

We define media attention as the amount of mental effort afforded to understanding news content beyond just mere exposure (Eveland, 2001; Ho et al., 2013). Our focus on media attention antecedents and outcomes in the context of UOGD speaks to existing research on the psychological motivations that drive it and the psychological outcomes that result across a variety of topics**.** Some studies have only explored media attention outcomes for topics including agricultural biotechnology (Besley & Shanahan, 2005), nuclear power (Besley & Oh**,** 2014; Yeo et al., 2014), nanotechnology (Scheufele & Lewenstein, 2005), and biofuels (Cacciatore et al., 2012), among others. Other studies have examined models that integrate both antecedent and outcomes, albeit with variation in media attention measures as well as other model components. For instance, the cognitive mediation model (Eveland, 2001) examines how various media use motivations influence media attention and, in turn, elaboration of news content ("the process of connecting new information with other pieces of information stored in memory; p. 573) and issue knowledge. Originally applied to politics, subsequent studies have extended it to other topics (see Ho et al., 2013). Moreover, the Orientation-Stimulus-Reasoning-Orientation-Response (O-S-R-O-R) model (Cho et al., 2009) explores how exposure to political advertising informs news media use (including attention, in this case also to politics) and, in turn, issue reasoning (e.g., interpersonal discussion) and outcomes (including political knowledge and

participation). Finally, two models specific to climate change elucidate media attention inputs and outputs. Binder (2010) explored how demographic and other social-psychological factors informed exposure/attention to news coverage of science and politics, which in turn influenced discussion of these topics and climate change issue salience. Similarly, Zhao et al. (2011) tested how political ideology and other elements drove attention to media coverage of science and politics, which in turn informed climate change beliefs, risk perception, and policy support.

Our framework draws on the aforementioned conceptual definition of media attention and the antecedent → media attention → effects structure present in the aforementioned models. It also embraces a more specific view of media content – about UOGD's economic and environmental impacts – that allow for more precise understanding of how people selectively attend to such content (with political ideology as a driver) and with what effect on issue attitudes (including support). We describe our framework in the following sections.

3.2.Attention to UOGD-related media coverage - Outcomes

Various theories explore direct effects of news media discourse on issue attitudes depending not only on whether issue-related content is encountered and for how long (Potter, 2014) but also how a topic is portrayed (Cacciatore et al., 2012). The latter depends on various considerations, including journalistic practices as well as efforts by issue advocates and others to strategically promote their viewpoints within news coverage (Brulle et al., 2012; Carmichael & Brulle, 2017; Carmichael et al., 2017). Studies exploring these effects, furthermore, have used various measures of attention to media discourse that fall into several categories**.** The first are studies that focus on attention to media platforms with no mention of the issue of interest. For example, Boudet at al. (2014) found that greater use of television for information about current news and

world events was associated with stronger UOGD support, while newspaper use predicted reduced support. Also, Andersson-Hudson et al. (2016) found that readers of left-leaning U.K. newspapers were less supportive of UOGD relative to those who read right-leaning newspapers.

The second category examines attention to broad topics within which issue-specific content is arguably imbedded. For example, Zhao et al.'s (2011) model found that attention to science/environmental news content, which they argued accurately portrays the scientific consensus on human-caused climate change, was associated with beliefs consistent with climate science and higher risk perception; in contrast**,** the opposite relationships emerged for attention to political news, which they argued portrays controversy and political conflict. However, Zhao et al.'s media attention measure did not explicitly focus on climate change.

The third category explores attention to broad topics that also include the specific issue of interest. For instance, Besley and Shanahan (2005) found that attention to entertainment and science-based television (including content specific to agricultural biotechnology) was associated with greater issue support, while attention to television news content was associated with decreased support. They suggested "the nature of television as a medium" as one potential explanation (p. 360) but acknowledged a "lack of specific research about the nature of biotechnology content on television" (p. 359). Also, Scheufele and Lewenstein (2005) found that attention to science and technology-related information in newspapers and on television (including about nanotechnology) predicted stronger issue support, which they attributed to the topic's positive portrayal within news discourse in terms of potential benefits.

A final category includes attention to news coverage of the specific issue in question. For example, Eveland's (2001) cognitive mediation model has identified consistent associations

between attention to news coverage of politics and news elaboration as well as political knowledge. The OSROR model (Cho et al., 2009) has identified similar pathways between politics-related news media use (including attention) and issue reasoning (e.g., interpersonal discussion) and, in turn, political knowledge/participation. Specific to UOGD, moreover, Vasi et al. (2015) examined how the documentary film *Gasland* and its focus on putative UOGD-related water contamination impacted information seeking via social media, mass media coverage, and anti-UOGD mobilization**.** In this case, though, the study assessed when and where the film was screened but did not specifically measure the extent of audience attention to film content.

While these studies offer valuable insight into media influence within their respective issue contexts, they offer less insight into how attention to news content describing different *facets* of an issue – in our case, UOGD's economic and environmental impacts **-** influences attitudes. Indeed, Sneegas (2016, p. 95) described news media as "a site where groups on opposing ends of the [UOGD] debate make, contest, and navigate claims regarding the risks and benefits." Moreover, while there is limited research on UOGD news coverage over time **(**with most multi-year studies only discussing aggregate patterns) and variation in coverage based on "geographic, economic, and political contexts" (Matthews & Hansen, 2018, p. 1; Hedding, 2017), economic and environmental impacts are often discussed positively (e.g., beneficial/good) and negatively (i.e., bad/risky), respectively **(**Ashmoore et al., 2016; Evensen et al., 2014a; Habib & Hinojosa, 2016; Gearhart et al., 2019; Olive, 2016; Olive & Delshad, 2017). We believe, consistent with aforementioned media effects theories, that such coverage influences support and beliefs about these impacts. Economic impacts tend to be seen as positive/beneficial and environmental impacts as negative/risky in line with news media discourse (Howell, 2018; Theodori, 2018; Thomas et al., 2017a), albeit with some variation based on the intensity of/experience with

proximate energy development (Schafft et al., 2013; Stedman et al., 2012). Overall, we agree with Zhao et al.'s (2011, p. 719) assessment: "the fact that issue coverage can vary in terms of different types of news [content] suggests that greater depth and sensitivity can be achieved in the assessment of news effects by taking into consideration news attention patterns." Specifically, we hypothesize the following (see Figure 1):

- **H1:** Greater attention to news media coverage of UOGD's economic impacts will be associated with (a) more support and (b) more positive assessments of these impacts.
- **H2:** Greater attention coverage of UOGD's environmental impacts will be associated with (a) less support and (b) less positive (more negative) assessments of these impacts**.**

3.3.Attention to UOGD-related media coverage - Antecedents

Drawing on a uses and gratification perspective whereby people seek and attend to news content that fulfill specific needs (Rubin, 2009), the cognitive mediation model, OSROR model, and similar frameworks have examined a variety of psychological antecedents that motivate media attention (Binder, 2010; Cho et al., 2009; Eveland, 2001; Ho et al., 2013; Zhao et al., 2011). In light of the political polarization surrounding UOGD attitudes especially in the U.S., we focus on political ideology as one such antecedent and explore how it drives selective attention to news coverage of UOGD's economic and environmental impacts**.**

Defined as "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), political ideology is often associated with perceptions of UOGD impacts (Choma et al., 2016) as well as support, both in the U.S. and elsewhere (Andersson-Hudson et al., 2016; Boudet et al., 2014). Similar

patterns have also been observed for political party affiliation in the U.S. (Brenan, 2021; Jones, 2022; Kennedy et al., 2022; Saad, 2021; Schaeffer, 2022; Swift, 2015, 2016; Tyson & Spencer, 2022; Tyson et al., 2022). Such polarization arises from the confluence of issue attributes with value, identity, personality, and other attributes of political partisanship (see Clarke & Evensen, 2019; Devine, 2015; Feldman & Johnston, 2014; Schwartz, 1994). For instance, higher levels of support and perceived economic benefit among political conservatives and Republicans arguably reflects their embrace of business, free market capitalism, and "traditional" forms of fossil fuel-energy. Conversely, more opposition and perceived environmental harm among political liberals and Democrats arguably reflects higher levels of environmental concern as well as a preference for social change embodied in a transition from fossil fuels to renewables (Choma et al., 2016; Davis & Fisk, 2014; Jost et al., 2003a; McCright et al., 2016a; Schwartz et al., 2014).

Additionally, polarization among political "elites" (especially elected officials), conveyed through news media, can lead to commensurate changes in public opinion (Brulle et al., 2012; Carmichael & Brulle, 2017; Zaller, 1992). At the federal level, Republican elected officials tend to support UOGD and tout its perceived economic benefits (U.S. House of Representatives Energy & Commerce Committee [Republicans], 2020)**,** while Democratic elected officials tend to be comparatively more opposed because of perceived environmental risks (Goldberg, 2020). However, this pattern masks more nuanced discourse based on time and location**.** For instance, UOGD support seemed more bipartisan earlier in its growth, with Democratic President Obama presiding over large increases in domestic oil and natural gas production tied to UOGD during his time in office (2009-2017) and touting the benefits of natural gas in lowering greenhouse gas emissions relative to coal (Richardson, 2018). Subsequent years, though, saw Democratic elected officials more opposed (Brady, 2020; Goldberg, 2020). Furthermore, discourse among officials

in states with ongoing UOGD may depart from national trends based on relevant experiences, with some Democrats in these locations more supportive than counterparts elsewhere given putative economic benefits (Hedden, 2020; Volcovici, 2021) and some Republicans more opposed than counterparts elsewhere due to putative environmental risks (Haines, 2021).

While we acknowledge UOGD's nuanced political dynamics in the U.S., we feel that existing empirical data point to a clear political divide on the national level on which we focus. Moreover, political ideology not only influences issue attitudes but also whether/how people (selectively) encounter and evaluate information**.** Motivated reasoning suggests that people's goals when evaluating information – including the desire to defend existing views about a topic (Druckman, 2012), especially those grounded in political partisanship (Dahlgren et al., 2019) - are associated with biased information seeking and processing (Druckman & McGrath, 2019; Hart et al., 2015; Kahan, 2016). These include selective exposure whereby people select media sources and content that reflect (political) predispositions (Iyengar & Hahn, 2009; Stroud, 2008, 2010). In other words, political ideology plays can play an important role in how people selective attend to issue-relevant news content, a premise that a few studies have explored. For instance, both Binder (2010) and Zhao et al. (2011)'s models included a pathway between political ideology and attention to news media coverage of politics and science topics or just science topics, respectively. These pathways featured media attention measures that differed from ours for reasons stated previously. Nonetheless, we expect that given longstanding political divides on UOGD in the U.S., aforementioned manifestations of motivated reasoning, and divergent ways UOGD's economic and environmental impacts are portrayed in news media discourse, liberals and conservatives will selectively pay attention to news coverage in a manner commensurate with existing views grounded in political partisanship. We therefore hypothesize (see Figure 1):

- **H3:** The more politically conservative people are on a liberal-conservative continuum, the more attention they will pay to news coverage of UOGD's economic impacts.

- **H4:** The more politically conservative people are on a liberal-conservative continuum, the less attention they will pay to news coverage of UOGD's environmental impacts.

The strength of these hypothesized associations is also worth considering. Some have argued that associations between issue attitudes and political partisanship may be so strong that measures of the former become, in effect, indicators of the latter (Druckman & McGrath, 2019; Kahan, 2015). As we noted earlier, UOGD support and perceptions of its impacts – and the political divide in these areas - are arguably tied to value and identity-based aspects of political ideology. Drawing on such insight, studies of other politically contentious issues have used policy views as indicators of liberal/conservative orientations (Feldman & Johnston, 2014). However, it is less clear whether this premise applies to attention to media coverage of UOGD impacts. Since existing models we have discussed view political ideology and media attention as separate constructs (e.g., as antecedent and outcome, respectively), our framework follow suit.

3.4.Indirect effects

Like other models from which we draw inspiration, our framework views attention to news coverage as a key mediator whereby relevant antecedents influence outcomes indirectly via one's level of media attention. These indirect effects have been explored/quantified for some models (Cho et al., 2009; Eveland, 2001) but not others (Binder, 2010; Zhao et al., 2011) – and in no cases with our measures of media attention. Such an analysis, in our case, would elucidate

pathways through which political ideology leads to partisan divides in UOGD support via selective attention to coverage of economic and environmental impacts.

We first propose two hypotheses for indirect effects involving attention to news coverage of *economic* impacts (see Figure 1). These pathways combine aforementioned direct effects of (1) political ideology on greater media attention as well as (2) greater media attention on higher issue support and the belief that these impacts have had a positive effect. We also add a direct effect of such perceptions on UOGD support; the more positive the perceived economic impact, the higher the support (O'Neill & Schneider, 2021).

- **H5**: Greater political conservatism on a liberal-conservative continuum will be indirectly associated with heightened UOGD support via higher levels of attention to news coverage of economic impacts. ([Conservative] political ideology → (+) media attention → (+) support).
- **H6**: Greater political conservatism on a liberal-conservative continuum will be indirectly associated with heightened UOGD support via higher levels of attention to news coverage of economic impacts and, in turn, the belief that these impacts have had a positive effect. ([Conservative] political ideology → (+) media attention → (+) perceived [positive] impacts → (+) support).

We next propose two hypotheses for indirect effects involving attention to news coverage of *environmental* impacts (see Figure 1). These pathways combine aforementioned direct effects of (1) political ideology on reduced media attention as well as (2) greater media attention on lower issue support and the belief that these impacts have had a less positive (more negative) effect.

We also add a direct effect of such perceptions on UOGD support; the more negative the perceived environmental impact, the lower the support (O'Neill & Schneider, 2021).

- **H7:** Greater political conservatism on a liberal-conservative continuum will be indirectly associated with heightened UOGD support via lower levels of attention to news coverage of environmental impacts. ([Conservative] political ideology → (-) media attention → (-) support).

- **H8**: Greater political conservatism on a liberal-conservative continuum will be indirectly associated with heightened UOGD support via lower levels of attention to news coverage of environmental impacts and, in turn, the belief that these impacts have had a positive effect. ([Conservative] political ideology → (-) media attention → (-) perceived [positive] impacts → (+) support).

[Figure 1 here]

4. Method

4.1. Sample

We tested our hypotheses with data from a national quota sample of U.S. adults (n=700) obtained in January 2016 through the survey vendor Qualtrics. These samples have been increasingly used to study public attitudes toward UOGD (Evensen & Stedman, 2016; Evensen et al., 2017; Evensen & Brown-Steiner, 2018; Stedman et al., 2016). Using e-mail invitations from market research panels and survey research companies along with self-enrollment through advertisements on web banners and social media, Qualtrics selected a sample with quotas designed to match Census-based values for gender (50-50 males/female split), education

(roughly a third of the sample with a 4-year college degree or greater), and geographic region (based on the percentage of respondents located in Northeastern, Western, Midwestern, and Southern states). The two demographic variables have emerged as predictors of UOGD support in past studies (Boudet et al., 2014), while region provides for a geographically diverse sample. As shown in Table 1, our quotas largely succeeded in comparison to relevant Census-derived population values, although our sample was younger and Whiter than the population overall.

Subjects participated in exchange for monetarily equivalent compensation redeemable on the Qualtrics platform, and the project received human subjects research approval from [affiliation removed for peer review].

[Table 1 here]

4.2.Survey measures

After giving informed consent, participants read a short introductory statement on UOGD: "We'd like to ask you a few questions about shale oil and gas development via hydraulic fracturing (or "fracking"). This issue refers to extracting oil and natural gas from shale rock underground. In the United States, a number of states have either begun - or are considering - doing so. Based on this information, please answer the following questions." [1] Table 2 provides measures of all relevant variables, many of which were adapted from previous research (Cacciatore et al, 2012; Clarke et al., 2015, 2016; Howell et al., 2017).[2]

[Table 2 here]

4.3.Data analysis

We used the PROCESS macro for SPSS (model #82; see Hayes, 2018) to run an OLS-based path analysis with our main variables of interest - political ideology (X), attention to news media coverage of UOGD's economic impacts (M1), beliefs about economic impacts (M2), attention to news media coverage of environmental impacts (M3), beliefs about environmental impacts (M4), and support (Y). We also included a several covariates, some part of our quota sampling (education and gender) and others found to be statistically significant predictors of UOGD support in other research (e.g., age, political party affiliation, and issue familiarity; Boudet et al., 2014). We calculated unstandardized point estimates and 95% bootstrapped confidence intervals for all hypothesized direct and indirect effects.

4.4. Data availability statement

All data supporting the findings of this study are available at osf.io/grdu4.

5. Results

5.1.Attention to UOGD news coverage - Outcomes (see Table 3 and Figure 2)

The more attention people paid to news media coverage of UOGD's economic impacts, the more supportive they were (b = 0.26, p = 0.004; 95% CI: 0.12, 0.41) and the more positively those impacts were viewed (b = 0.16, p = 0.014; 95% CI: 0.03, 0.29). Thus, H1a and H1b were supported.

Consistent with H2a, greater attention people paid to news media coverage of UOGD's environmental impacts was associated with less support (b = -0.27, p = 0.0004; 95% CI: -0.42, -

0.12). However, contrary to H2b, there was no association with beliefs about those impacts (b = 0.05 *p* = 0.47; 95% CI: -0.09**,** 0.2).

5.2.Attention to UOGD news coverage → Antecedents (see Table 3 and Figure 2)

H3 was not supported, with no significant relationship emerging between political ideology and attention to news coverage of UOGD's economic impacts (b = 0.01, *p* = 0.74; 95% CI: -0.05, 0.08). However, in support of H4, political ideology was associated with attention to news coverage of UOGD's environmental impacts (b = -0.08, *p* = 0.009; 95% CI: -0.15, -0.02); the more politically conservative people were, the less attention reported.

5.3.Indirect effects (see Table 3)

Neither of the indirect effects involving attention to news coverage of UOGD's economic impacts were supported. Specifically, there was no significant indirect effect of political ideology on support via (1) attention to news coverage of these impacts (H5; b = 0.003, 95% CI: -0.01, 0.02) or (2) attention to news coverage and, in turn**,** beliefs about those impacts (H6; b = 0.0008; 95% CI: -0.004, 0.006).

Findings for the indirect effects involving attention to news coverage of UOGD's environmental impacts were mixed. Specifically, as H7 predicted, we found a significant indirect effect of political ideology on support via attention to news coverage of these impacts (b = 0.02, 95% CI: 0.004, 0.05), such that greater political conservatism increased UOGD support via less attention. However, H8 was not supported, as there was no indirect effect of political ideology on support via attention to news coverage and, in turn, beliefs about those impacts (b = -0.002; 95% CI: -0.01, 0.004).

[Table 3 here]

[Figure 2 here]

6. Discussion

We examine antecedents and outcomes associated with attention to news media coverage of UOGD's economic and environmental impacts. Our work speaks to research on media attention antecedents and outcomes but with a focus on selective attention to specific issue dimensions largely missing from existing studies.

The first two indirect effects – of political ideology on support via (1) attention to news coverage of UOGD's economic impacts and (2) attention to news coverage and, in turn, beliefs about those impacts – did not emerge as predicted. Closer examination showed support for three of the four compositive pathways. As hypothesized, greater attention to coverage of economic impacts was associated with a more positive assessments of these impacts as well as heighted support overall. News coverage and public sentiment both tend to view these impacts in positive/beneficial terms, with jobs/economic activity perhaps the best example (Ashmoore et al., 2016; Evensen et al., 2014a; Howell, 2018; Gearhart et al., 2019; O'Connor & Fredericks, 2018; Olive & Delshad, 2017; Theodori, 2018; Thomas et al., 2017a). Moreover, media effects theories elucidate how news discourse can influence public attitudes (Cacciatore et al., 2012). In addition, while not hypothesized, the association between positive assessments of these impacts and support was consistent with existing research (O'Neill & Schneider, 2021).

However, political ideology's null association with attention to news media coverage of economic impacts was surprising. Compared to liberals, conservatives are much more supportive

of business and free market capitalism tied to "traditional" fossil fuel-energy (Choma et al., 2016; Jost et al., 2003a; McCright et al., 2016a; Schwartz et al., 2014). Moreover, both previous research (Choma et al., 2016) and our own results (see Supplemental Table A.1.) highlight politically divergent views on UOGD impacts, with greater conservatism associated with the perception that economic impacts have been positive overall. Coupled with people's motivation to attend to news content that reflects views grounded in political partisanship (Druckman & McGrath, 2019), we expected greater conservatism to be associated with higher media attention. Perhaps news media portrayals of economic impacts includes elite cues that resonate with both conservatives and liberals, which may attenuate rather than amplify UOGD's political divide and selective media attention. For instance, we earlier noted that Republican elected officials tend to uniformly tout UOGD's perceived economic benefits, but Democrat elected officials in states with ongoing development may also do so to a greater extent than their counterparts elsewhere (Friedman & Goldmacher, 2020; Hedden, 2020). Given these cues, liberals and conservatives may not be as divided on how these impacts are viewed as previously assumed and, thus, both inclined to pay attention to coverage of them.

The second set of indirect effects were mixed. As expected, political ideology (e.g., greater political conservatism) heightened support via less attention paid to news coverage of UOGD's environmental impacts**.** However, adding beliefs about those impacts as a second sequential mediator produced a null overall indirect effect. Closer examination showed support for three of the four compositive pathways. While not hypothesized, the association between negative assessments of these impacts and support reflected existing research (O'Neill & Schneider, 2021). Also, greater attention to such coverage was associated with a reduced support – a finding consistent with often-negative news media portrayal of these impacts (especially water

contamination) (Ashmoore et al., 2016; Evensen et al., 2014a; Habib & Hinojosa, 2016; Gearhart et al., 2019; Olive, 2016; Olive & Delshad, 2017) along with aforementioned media effect theories that elucidate how news discourse can influence public attitudes.

However, the null finding linking media attention with how people view environmental impacts was surprising. Both news media discourse and public sentiment tend to view them in negative terms with particular emphasis on potential water contamination (Ashmoore et al., 2016; Evensen et al., 2014a; Howell, 2018; Theodori, 2018; Thomas et al., 2017a). However, nearly 40% of our respondents thought they were "slightly," "moderately," or "very" positive. Perhaps media discourse on environmental impacts may not be as uniformly negative as assumed. One example involves the potential climate change implications of UOGD and accompanying natural gas consumption (Greiner et al., 2018; Newell & Raimi, 2014). Supporters view these implications favorably in terms of reduced greenhouse gas emissions relative to other fossil fuels and as a "bridge fuel" assisting in the transition to renewables energy, while opponents view them negatively in terms of higher emissions relative to renewable sources and the potential to reinforce reliance on fossil fuels Clarke et al., 2019). These debates have received news media coverage (Volcovici et al., 2020), albeit not to the extent of other impacts like putative water contamination (Ashmoore et al., 2016; Evensen et al., 2014a; Gearhart et al., 2019; Olive, 2016; Olive & Delshad, 2017). Nonetheless, perhaps these climate implications or other impacts with both positive and negative attributes are sufficiently prominent in news discourse to muddle people's views of UOGD's environmental impacts. Since our measures of media attention and perceived impacts did not focus on specific impacts, more precise measures are needed to examine this premise more fully.

Moreover, political ideology was associated with attention, such that the more politically conservative respondents were, the less attention paid to coverage of UOGD's environmental impacts. This finding is consistent with our expectations given often-negative portrayal of these impacts in news media discourse (Ashmoore et al., 2016; Evensen et al., 2014a; Habib & Hinojosa, 2016; Gearhart et al., 2019; Olive, 2016; Olive & Delshad, 2017); partisan divides in how UOGD's environmental impacts are viewed (Choma et al., 2016) as well environmental concern more broadly (Nawrotzki, 2012); and people's tendencies to attend to content that reflects existing views grounded in political partisanship (Dahlgren et al., 2019; Iyengar & Hahn, 2009; Stroud, 2008, 2010).

The weak relationships observed between political ideology and attention to news coverage of UOGD impacts (small but significant for environmental impacts; null for economic impacts) runs counter to the possibility, raised earlier, of relationships so strong that media attention could be a dimension of political partisanship. The two may be separate constructs consistent with research on selective exposure, but they are clearly not as correlated as expected. Earlier explanations aside, future research that includes specific media platforms within which content on UOGD's economic and environmental impacts are embedded would potentially strengthen the political ideology → media attention association by allowing us to examine partisan selective attention to content across specific platforms. UOGD coverage on cable television platforms (especially Fox News, MSNBC, and CNN) is one example. For politically contentious issues like climate change, immigration, and COVID-19, Fox News often emphasizes more politically conservative viewpoints relative to its counterparts (Feldman et al., 2012; Feldman, 2016; Hoewe et al., 2020; Simonov et al., 2020). This pattern also applies to UOGD, with Fox News more likely to cover economic benefits such as job growth, and CNN and MSNBC more likely

to cover negative environmental impacts such as water contamination (Gearhart et al., 2019). Moreover, conservatives/Republicans are much more likely to rely on and trust Fox News as an information source relative to liberals/Democrats; the latter, furthermore, are more likely to rely on and trust CNN and MSNBC, among others (Gramlich, 2020; Iyengar & Hahn, 2009; Mitchell et al., 2014; Mitchell, 2021). Coupled with the aforementioned portrayal of UOGD on these platforms, we would expect political conservatives (relative to liberals) to pay more attention to news coverage of economic impacts on Fox News. Conversely, liberals would be more likely to pay attention to coverage of environmental impacts on MSNBC or CNN.

Furthermore, focusing on attention to UOGD-specific content across these platforms also offers insight from a media effects perspective. Aforementioned cable television news discourse can shape public perception of these topics, with Fox News effects on Republicans/political conservatives especially prominent (Feldman et al., 2012; Feldman, 2016; Gustafson et al., 2019; Hoewe et al., 2020; Simonov et al., 2020). Coupled with the aforementioned portrayal of UOGD on these platforms, we would expect that greater attention to news coverage of economic impacts on Fox News would be associated with higher support relative to attention to coverage of environmental impacts on MSNBC or CNN. We are not aware of any studies examining these relationships, although Andersson-Hudson et al. (2016) found that reading left-leaning newspapers (compared to right-leaning) was associated with less UOGD support.

Finally, combining these media attention antecedents and outcomes suggests an indirect effect whereby the political divide in UOGD support emerges via selective attention to news coverage of economic and environmental impacts on these platforms.

7. Limitations and future research opportunities

This study has several limitations that present opportunities for future research.

First, while our cross-sectional survey data identified theory-informed associations among our variables of interest, we were not able to examine causal relationships among these elements or potential bidirectional, mutually reinforcing pathways. In particular, bidirectional pathways among political ideology, attention to media content, and associated effects (Dahlgren et al., 2019; Feldman, Myers, Hmielowski, & Leiserowitz, 2014; Slater, 2007) are plausible. For example, over time, liberals/conservatives attend to UOGD news content, which in turn influences issue support; such support, moreover, arguably reinforces political ideology salience given UOGD's political divisiveness as well as drives further media attention and associated effects. Longitudinal panel data can further examine these areas.

Second, our use of non-probability quota sampling limits our ability to generalize study findings to the U.S. population (Baker et al., 2013; Pew Research Center, n.d.; Yeager et al., 2011). However, our sample mirrored the U.S. population on two key demographic fronts while allowing us to test a number of theory-supported relationships – a key goal of survey research (Baker et al., 2013; Yeager et al., 2011). Also, we replicated several relationships (such as between political ideology and UOGD support; see Supplemental Table A.1.) that have emerged in studies with nationally representative samples (Boudet et al., 2014; Clarke et al., 2016). Therefore, we remain confident that these relationships manifest in the broader U.S. population.

Third, irrespective of sampling limitations, our study focused only on U.S. national-level public attitudes toward UOGD. While we felt that a U.S.-centric focus was justifiable given its

role as a global leader in natural gas and oil production both overall and from unconventional sources (USEIA, 2015b, 2016, 2019a; BP, 2022), we also believe that our approach is potentially applicable to localized settings in the U.S. as well as other countries with unconventional fossil fuel reserves and ongoing/planned development (USEIA, 2015a, 2015b). Comparative studies across countries may be especially fruitful (see Evensen et al., 2017; Stedman et al., 2016; Thomas et al., 2017a). We also acknowledge, though, that public attitudes and media discourse (along with their antecedents) may vary between and even within countries for a variety of reasons, including historical, economic, political, and geographic characteristics of an area; past experiences with energy development; and proximity to current development nearby (Boudet et al., 2016; Bugden et al., 2017; Clarke et al., 2019; Dokshin, 2021; Evensen & Stedman, 2016; Kriesky et al., 2013; Lachapelle et al., 2018; Schafft et al., 2013; Stedman et al., 2012; Truong et al., 2019). In some cases, these factors can shape the level of political polarization surrounding UOGD. For example, there is evidence that UOGD's political divide narrows the geographically closer people are to active development, perhaps because experience with impacts overshadows political ideology as a driver of attitudes (Clarke et al., 2016; Zanocco et al., 2020).

8. **Conclusion and policy implications**

High energy prices and instability in global energy markets due to the ongoing COVID-19 pandemic and Russian war in Ukraine have spurred renewed debate on expanding fossil fuel extraction including UOGD (Fisher, 2022; Pahwa, 2022). While it is cliché to say that UOGD-related policy decisions depend, at least in part, on the degree of public acceptance, there are nonetheless numerous avenues for public opinion to potentially inform decision-making. Examples include forming advocacy groups**,** participating in public hearing or other

deliberative/engagement activities, contacting elected officials to voice opinions/concerns, and voting in elections where UOGD policy is on the ballot (Partridge et al., 2017; Theodori, 2009, 2013; Thomas et al., 2017b, 2018; Wheeler et al., 2015). These efforts have played at least some role, moreover, in efforts to restrict or ban UOGD in U.S. localities (Cama, 2015; McLure, 2012; New York State Department of Environmental Conservation, n.d.; Rubinkam, 2021) and in other countries (Carrell, 2017; "German government agrees to ban fracking indefinitely," 2016; Nelsen, 2016; O'Halloran**,** 2017; Silverstein, 2019; van de Graaf et al., 2018). Amid these high stakes, those on both sides of the issue often use news media to emphasize potential impacts of energy development and their putative positive or negative effects (Bell et al., 2019; Jones et al., 2013; Pierce, 2016; Scanlan, 2017), all as part of strategic efforts to influence public sentiment. Such efforts certainly have value given that attention to news media coverage of economic and environmental impacts heightens and lowers issue support, respectively.

However, the fact that political ideology drives attention to coverage of environmental but not economic impacts suggests that advocates emphasizing the latter (often as part of efforts to promote UOGD) may find it easier to reach a cross-partisan audience than those advocating the former (often as part of efforts to oppose it). Overcoming motivated reasoning is particularly challenging in such contexts. One solution may involve altering people's motivations when encountering UOGD information, such as so-called accuracy motivation that involves the desire to reach a "correct" decision by evaluating information as objectively as possible (Druckman & McGrath, 2019). There is some evidence that motivations can be altered through specific appeals (Druckman & McGrath, 2019), although it is unclear how these efforts would fare in a more real-world setting. Another option may be to affirm (political) values and identities prior to encountering issue-related information, given UOGD's political divisiveness in the U.S. and the

reasons for it stated earlier. Messaging experiments have likewise produced promising results (Cohen et al, 2007) but with similar questions involving real-world applicability.

To conclude, we identified theory-supported associations among attention to news coverage of UOGD's economic and environmental impacts, political ideology, beliefs about those impacts, and issue support. We contribute to existing work on media attention antecedents and outcomes but with a hitherto unexplored focus on selective attention to specific issue dimensions that have garnered media and public attention. We also highlight the importance of news discourse in shaping UOGD-related public opinion and advocacy efforts (and, by extension, the trajectory of UOGD policy).

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Appendix A (Supplementary Data)

Supplemental Table A.1.: Full PROCESS Model Results (with Covariates)

Supplemental Table A.2.: Variable Measures, Response Scales, and Corresponding SPSS Variable Names

Notes

[1] Appropriate terminology with which to describe unconventional energy extraction and associated impacts can shape public opinion on this issue (Evensen et al., 2014b). UOGD supporters and opponents alike tend to use "fracking"– a term that often elicits more negative attitudes relative to other terms like "shale oil or gas development" (Clarke et al., 2015). We elected to use "unconventional oil or gas development" (UOGD) as a means to avoid undue negativity and inadvertently bias our participants, but we recognize that no label is likely devoid of positive or negative connotations.

[2] As noted in Table 2, we measured political ideology related to economic and social issues. Research on the value, identity, personality, and other dimensions of political ideology (Clarke & Evensen, 2019**;** Devine, 2015; Feldman & Johnston, 2014; Jost et al., 2003b, 2009; Malka & Lelkews, 2010; Oyserman & Schwarz, 2017; Schwartz et al., 2014) has led to long-standing debates over unidimensional versus multi-dimensional conceptualizations as well as single-item versus multi-item measures (Jost et al., 2009). Schwartz et al. (2014, p. 901) argued that the single left-right or liberal-conservative ideological dimension (and measure) "structures political thought," while Jost et al. (2009 p. 312) observed that it has "fared surprisingly well in terms of theoretical utility and empirical validity." However, others contend that this single dimension may reflect political discourse among elites (especially elected officials) but not the public (Jost et al., 2009; Feldman & Johnston, 2014). Our focus on social and economic facets of political ideology likewise speaks to these conceptual debates. Some scholars contend that the two are conceptually distinct because they are associated with different antecedents (Feldman & Johnston, 2014), including underlying value structures (Schwartz, 1994), leading to various population subgroups based on how liberal/conservative people are in these respective areas (Jost et al., 2009). In contrast, others have suggested that the two have a "common ancestry" in the "basic needs for order, certainty, and security" (Feldman & Johnston, 2014, p. 3). Indeed, the two were highly reliable in our analysis ($r_{sb} = 0.895$), as has been the case in other studies using these measures (Howell et al., 2017; Treier & Hillygus, 2009).

A third, middle-ground approach explores variation in conceptual structure across countries. For example, McCright et al. (2016b) and Schwartz et al. (2014) suggested that the meaning of liberal-conservative social and economic ideology differs between former Communist and non-Communist European countries, with Schwartz et al. finding a unidimensional structure for the latter but not the former.

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Attention to News Media Coverage of Unconventional Oil/Gas Development Impacts: Exploring Psychological Antecedents and Effects on Issue Support

Tables and Figures

Figure 1: Proposed Model with Hypotheses (Not Including Indirect Effects)

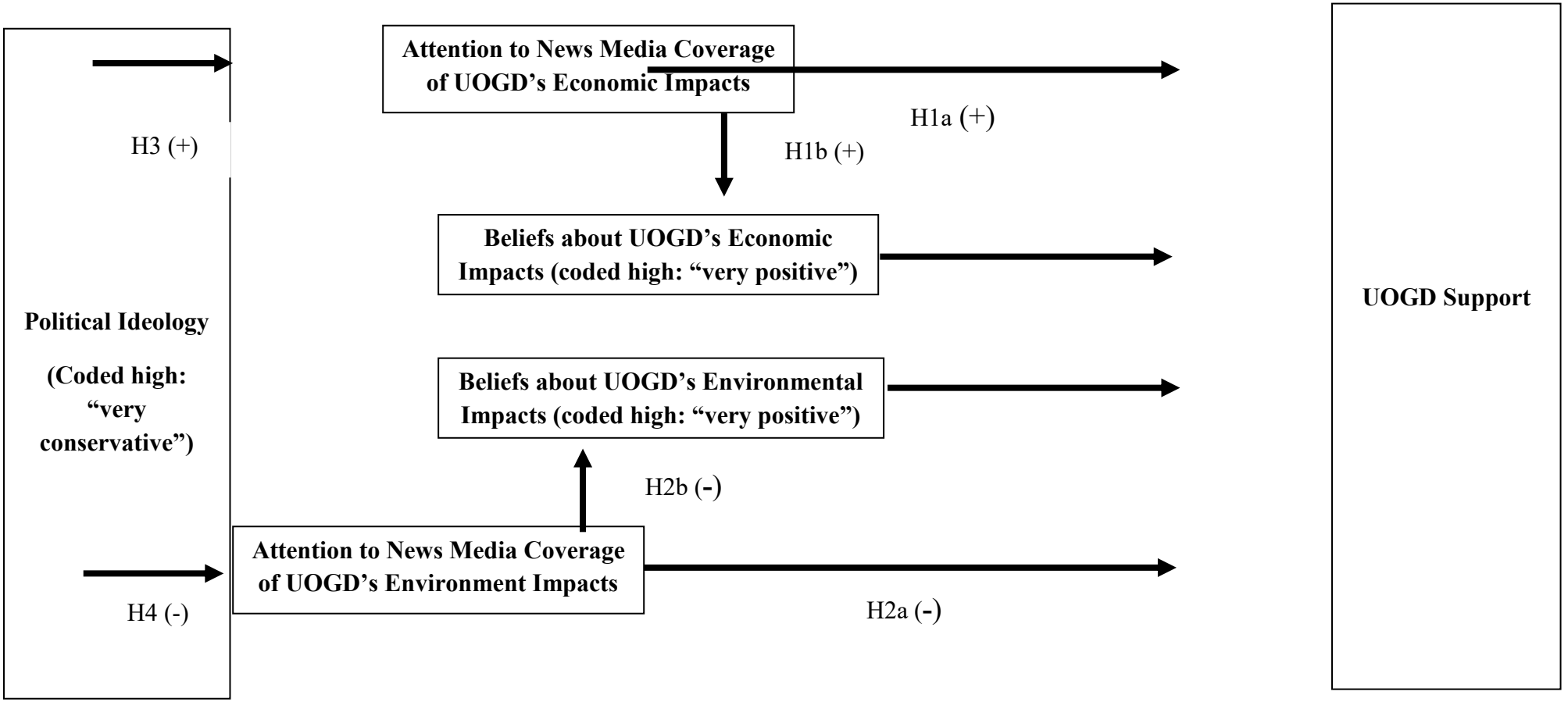


Table 1: Sample Demographics Compared to the United States Population

Variable	Sample Demographics	United States population
Age -% 18-44	55.1%	46% [1]
Age - % 45+	44.9%	54% [1]
Gender [1]	50% female	50% female [1]
% White	85.6%	77.5% [2]
% ≥ 4-year college degree (age 25 +)	27.2%	35% [3]
% Northeast [4]	20%	17.2% [5]
% South [6]	35%	38.3% [5]
% Midwest [7]	25%	20.7% [5]
% West [8]	20%	23.7% [5]

[1] Data courtesy of: US Census Bureau, Total US Resident Population by Age, Sex, and Series (April 1, 2020). https://www.census.gov/data/tables/2020/demo/popest/2020-demographic-analysis-tables.html

[2] Data courtesy of: US Census Bureau, Annual Estimates of the Resident Population by Sex, Age, Race, and Hispanic Origin for the United States (April 1, 2010 to July 1, 2019). https://www.census.gov/newsroom/press-kits/2020/population-estimates-detailed.html

[3] Data courtesy of: US Census Bureau, Educational Attainment of the Population 18 Years and Over, by Age, Sex, Race, and Hispanic Origin: 2021. https://www.census.gov/data/tables/2021/demo/educational-attainment/cps-detailed-tables.html

[4] Coded in survey as follows: Pennsylvania, New York, New Jersey, Delaware, Rhode Island, Connecticut, Massachusetts, New Hampshire, Vermont, and Maine.

[5] Data courtesy of: US Census Bureau, Annual Estimates of the Resident Population for the United States, Regions, States, District of Columbia, and Puerto Rico: April 1, 2020 to July 1, 2021. https://www.census.gov/data/tables/time-series/demo/popest/2020s-national-total.html

[6] Coded in survey as follows: Maryland, West Virginia, Virginia, North Carolina, South Carolina, Georgia, Florida, Tennessee, Kentucky, Alabama, Mississippi, Louisiana, Arkansas, Oklahoma, and Texas.

[7] Coded in survey as follows: Kansas, Nebraska, South Dakota, North Dakota, Minnesota, Iowa, Missouri, Illinois, Indiana, Ohio, Michigan, and Wisconsin

[8] Coded in survey as follows: Colorado, Wyoming, Montana, Idaho, Washington, Oregon, California, Arizona, Nevada, Utah, New Mexico, Hawaii, and Alaska.

Table 2: Variable Measures and Response Scales

Variable	Question	Response Scale	M (SD)
Political ideology	When it comes to economic issues, do you think of yourself as… When it comes to social issues, do you think of yourself as…	1 = very liberal 2 = somewhat liberal 3 = moderate 4 = somewhat conservative 5 = very conservative	2.99 (1.06) $r_{sb} = 0.895$
Attention to news media coverage of UOGD's economic impacts	In general, how much attention do you pay to information about the following in the news, such as when reading a newspaper, going online, or watching TV? Stories about the economic impacts of shale oil and gas development via fracking.	1 = no attention at all 2 = very little attention 3 = a moderate amount of attention 4 = a good amount/great deal of attention	3.06 (0.98)
Attention to news media coverage of UOGD's environmental impacts	In general, how much attention do you pay to information about the following in the news, such as when reading a newspaper, going online, or watching TV? Stories about the environmental impacts of shale oil and gas development via fracking.	1 = no attention at all 2 = very little attention 3 = a moderate amount of attention 4 = a good amount/great deal of attention	3.06 (0.97)

Beliefs about UOGD's economic impacts	How positive or negative of an impact do you think shale oil and gas development via fracking is having on the following? The United States economy in general	1 = very negative 2 = moderately negative 3 = slightly negative 4 = slightly positive 5 = moderately positive 6 = very positive	4.04 (1.33)
Beliefs about UOGD's environmental impacts	How positive or negative of an impact do you think shale oil and gas development via fracking is having on the following? The environment in the United States in general	1 = very negative 2 = moderately negative 3 = slightly negative 4 = slightly positive 5 = moderately positive 6 = very positive	3.15 (1.45)
UOGD support	Overall, to what extent do you support or oppose shale oil and gas development via fracking in the U.S. in general?	1 = strongly oppose 2 = moderately oppose 3 = slightly oppose 4 = slightly support 5 = moderately support 6 = strongly support	3.56 (1.69)

Age	Please select the age range that best describes you (condensed scale)	0 = 18-44 years – 55.1% 1 = 45 + years – 44.9%	--
Gender	Are you (male/female)?	0 = male (50%) 1 = female (50%)	--
Education	What is your highest level of formal education?	1 = Less that high school (no diploma) 2 = High school graduate/GED 3 = Attended college/currently no degree 4 = 2-year Associate's Degree/trade school 5 = 4-year (Bachelor's) Degree 6 = Advanced degree beyond 4-year degree	3.35 (1.41)
Political party affiliation	Which of the following best describes your political party affiliation?	1 = Strong Democratic 2 = Democrat 3 = Independent/leaning Democratic 4 = Independent 5 = Independent/leaning Republican 6 = Republican 7 = Strong Republican	3.84 (1.74)

UOGD familiarity	Overall, how familiar are you with shale oil and gas development via "fracking?"	1 = Not at all familiar 2 = Not very familiar 3 = Somewhat familiar 4 = Moderately familiar 5 = Very familiar	3.18 (1.15)
Live in an area with current UOGD	To the best of your knowledge, do you live in an area where shale oil and gas development via fracking is currently occurring?	0 = No – 83.4% 1 = Yes – 16.6%	--

Table 3: PROCESS Model Results

Variables and Relationship	Direction	Hypothesis	b	95% CI	Support?
[M1] Attention to media coverage of UOGD's economic impacts → [Y] support	+	H1a	**0.26*** **	**0.12, 0.4**	Yes
[M1] Attention to media coverage of UOGD's economic impacts →[M2] Belief about economic impacts ("very positive" coded high)	+	H1b	**0.16***	**0.03, 0.29**	Yes
[M3] Attention to media coverage of UOGD's environmental impacts → [Y] support	-	H2a	**-0.27*** **	**-0.42, -0.12**	Yes
[M3] Attention to media coverage of UOGD's environmental impacts → [M4] Belief about environmental impacts ("very positive" coded high)	-	H2b	0.05	-0.09, 0.2	No
[X] Political ideology (conservative coded high) → [M1] attention to media coverage of UOGD's economic impacts	+	H3	0.01	-0.05, 0.08	No
[X] Political ideology (conservative coded high) → [M3] attention to media coverage of UOGD's environmental impacts	-	H4	**-0.08****	**-0.15, -0.02**	Yes
(INDIRECT – Economic pathway): X → M1 → Y	+	H5	0.003	-0.02, 0.02	No
(INDIRECT – Economic pathway): X → M1 → M2 → Y	+	H6	0.0008	-0.004, 0.006	No
(INDIRECT – Environmental pathway): X → M3 → Y	+	H7	**0.022**	**0.004, 0.05**	Yes
(INDIRECT – Environmental pathway): X → M3 → M4 → Y	+	H8	-0.0023	-0.01, 0.004	No

Notes: Analysis controls for age, gender, education, political party affiliation, UOGD familiarity, and whether one lives in an area where UOGD is occurring (self-reported). Model results for controls not shown.

Total direct effect of political ideology on support: **0.2*** (0.1, 0.3)**

Total indirect effect of political ideology on UOGD support: **0.33 (0.21, 0.44)**

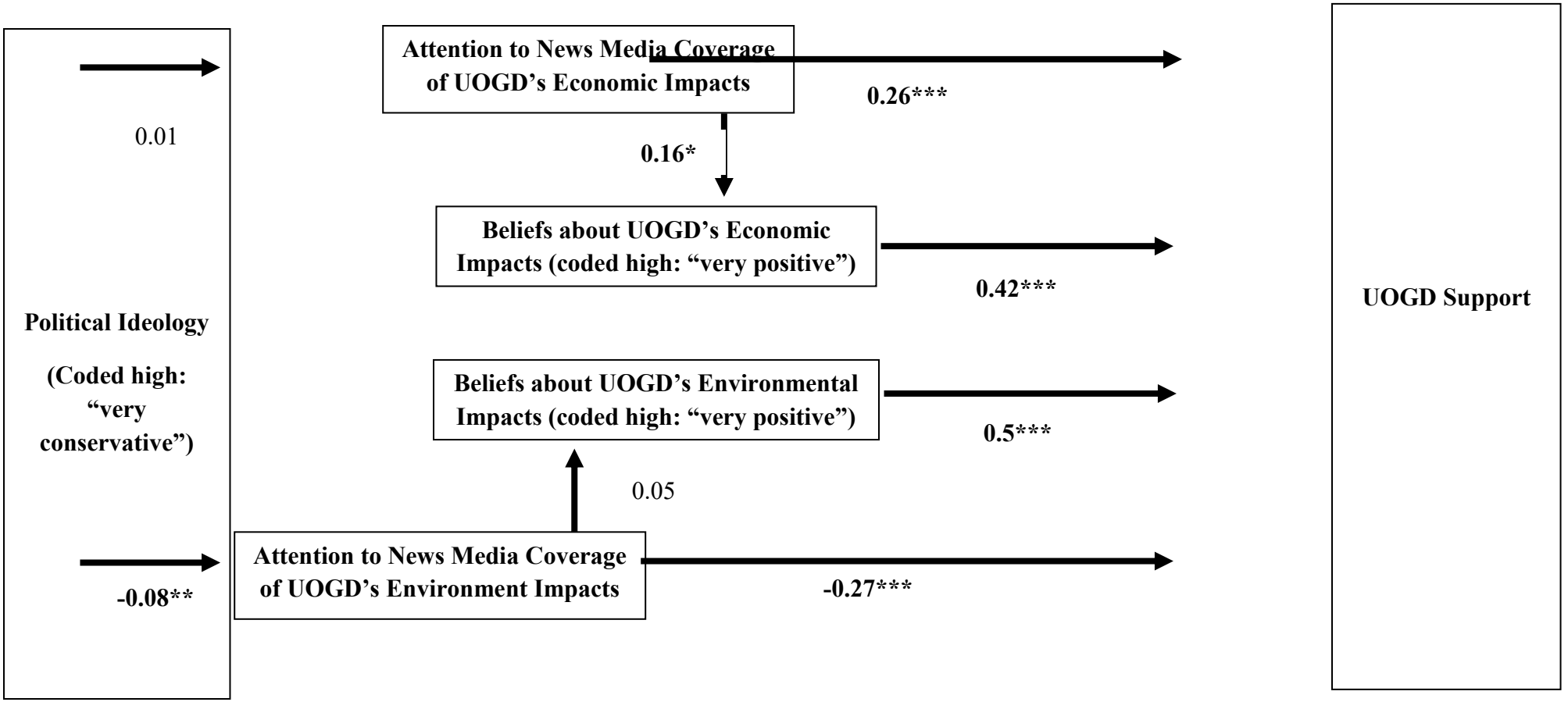
Total effect of political ideology on UOGD support **= 0.53*** (0.39, 0.66)**

Significant unstandardized coefficients and confidence intervals, the latter of which do not include 0, are **bolded**.

N = 700

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

Figure 2: PROCESS Model Results (Not Including Indirect Effects)



Notes: Analysis controls for age, gender, education, political party affiliation, UOGD familiarity, and whether one lives in an area where UOGD is occurring (self-reported). Model results for controls not shown.

Significant unstandardized coefficients are **bolded**.

N = 700

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