



Great expectations: Public opinion about energy transition

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ABSTRACT

Energy transition is a fundamental part of the policy response to climate change, but unlike climate change, we know little about the factors that shape public attitudes about it. We address three questions: 1) how supportive are people of energy transition, 2) how do pre-existing ideas – about politics, economics, climate change, and energy – affect public views on energy transition, and 3) how malleable is public opinion about transition? Using the Canadian province of Alberta – a context where oil and gas are politically and economically predominant – we assess these questions with a population-based survey experiment ($n = 1591$). Results indicate that energy transition is widely popular. Pre-existing values and beliefs about the economy; political identification with the left-right spectrum; worry about climate change; and hope in the future of oil and gas as a predominant industry strongly structure attitudes about transition. We argue that championing the economic benefits of clean energy will not be persuasive with people who continue to have high hopes in the future economic benefits of fossil fuels. Instead, we suggest policy makers focus instead on the economic risks that come from continued reliance on fossil fuels.

1. Introduction¹

Decarbonization of the economy is an essential process to address climate change. It can be achieved through *energy transition*—that is, transitioning from the production and use of fossil fuels to more renewable and sustainable sources of energy. While existing research addresses attitudes about climate change (Mildenberger et al., 2016), or specific policies such as gas taxes (Jagers, Martinsson and Matti, 2019) and carbon prices (Maestre-Andrés, Drews, and van den Berg, 2019), few studies explicitly investigate public support for the broad political, economic, social, and technological transformations associated with energy transition.

To address this gap, we ask three sets of research questions. First, how do people think and feel about moving away from fossil fuels? Is this different from their attitudes about moving towards renewables? Second, how do pre-existing ideas – about politics, climate change, and energy – affect their views on energy transition? Which are most associated with support for energy transition? Third, how malleable is public

opinion about transition? Can positive (negative) information about energy transition increase (decrease) support for it?

Using a population-based survey experiment ($n = 1591$) fielded in spring 2019, our results suggest people are generally supportive of energy transition, both in terms of moving away from fossil fuels and moving towards renewable sources of energy. The correlates of support for transition are a mix of the expected and unexpected. The two strongest predictors of support for energy transition are pessimistic evaluations of the future viability of the oil and gas industry, and a high level of worry about climate change. Belief in human-caused climate change has a relatively small though still statistically significant effect. Political orientations matter too, as economic conservatism and self-identified conservative/right ideology are strongly associated with opposition to energy transition. We also find attitudes about transition are somewhat malleable: both positive and negative news framing of the economic effects of energy transition *increase* support for it. This project offers a potential roadmap for those who fear energy transition may be “technically feasible but politically impossible” in democratic politics

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(Bernauer and McGrath, 2016: 680).

2. Background: explaining public opinion about energy transition

Existing scholarship has found attitudes about climate change, and energy transition by extension, are driven by four key things: 1) socio-demographics; 2) underlying values and beliefs; 3) perceptions about climate change and the energy industry; and 4) short term cues, such as news media (see [Drews and van den Bergh, 2015](#) for an overview). What is less clear from previous scholarship is how these factors work together to create and shape public opinion about issues like energy transition.

We draw on established political behaviour literature to argue these factors act as a series of plausibly interconnected relationships ([Gidengil et al., 2012: 8](#)). This allows factors more distant from the attitude to be explained—in our case, how people think and feel about energy transition—to affect it directly, but also to be mediated through more proximate factors, including such as news stories about the economic benefits or drawbacks of transition. This multistage explanatory model has three main benefits. First, it captures a sequence of thinking that many people plausibly go through when thinking about energy transition. Second, it includes a wide range of motivations that could inform attitudes about transition. Third, it addresses how some distant factors, such as age and gender, affect factors temporally “closer” to transition, such as information people receive about transition from the news ([Gidengil et al., 2012: 14](#)). The model we propose is outlined in [Fig. 1](#), and we discuss the content of each step below.

2.1. Social background

Social background includes personal characteristics like gender, age, socioeconomic status, location, and parental status. Studies frequently highlight the importance of education, gender, and age as determinants of climate change belief ([Brulle et al., 2012](#)). Education remains the strongest predictor of climate change awareness around the world ([Lee et al., 2015](#)). Women are more likely than men to be interested in and aware of climate change ([Scannell and Gifford, 2013](#)). Younger people are more likely to agree with the scientific consensus surrounding the existence and implications, yet [Feldman et al. \(2010\)](#) also show that young Americans are more resistant to new information about climate change than their older counterparts. People with higher incomes are more willing to pay for climate mitigation ([von Borgstede et al., 2013](#)). Being able to see some forms of renewable energy, such as wind turbines, makes people more likely to support that form of energy ([Olson-Hazboun et al., 2016](#)); this is more likely to occur in rural areas than in urban cores. Similarly, urban areas often have the highest demands for energy, but individuals living in densely populated cities are able to structure their daily lives around minimizing their use of fossil fuels for transportation – by walking, cycling, or taking public transit – in ways that are typically unavailable for most rural residents. And, while becoming a parent does not lead people to become more concerned about climate change ([Thomas et al., 2018](#)), children who are worried about climate change can induce their parents to be more concerned about it ([Lawson et al., 2019](#)).

These factors should also affect attitudes about energy transition. We expect women, younger people, and those with higher levels of education will be more likely to support energy transition when compared to men, older people, and those with lower levels of education. Similarly, we expect parents with children living at home may be more likely to support transition, though we expect this effect to be small. Those with lower incomes may be more opposed to transition than those with higher incomes—in part because they may feel they lack the necessary resources to be able to adapt well to more renewable sources of energy. We are agnostic to the effects of region because, as noted above, there is evidence to suggest that urban and rural dwellers alike may be open to energy transition, albeit for different reasons.

2.2. Underlying values, beliefs, and political orientations

We argue the second block—underlying values, beliefs, and political orientations—is crucial, though the factors included within it are often misunderstood. Ideology and partisanship’s effects on attitudes about climate policy are not new ([Cochrane, 2015](#); [Coan and Holaman, 2008](#); [McCright and Dunlap, 2010](#); [Alló and Loureiro, 2014](#); [McCright et al., 2014](#); [Palm et al., 2017](#); [Luo and Zhao, 2019](#)). However, beyond observing these factors are important, few studies articulate how and why they matter (c.f. [Drews and van den Bergh, 2015](#); [Sovacool, 2014](#)). This is where political science scholarship is especially useful.

Underlying values and beliefs are general, enduring principles individuals hold about desirable outcomes or ways of living ([Rokeach, 1973](#)). They are deeply held, stable over time, and found in similar forms across different cultures ([Schwartz and Bilsky, 1987](#)). This contrasts with attitudes, which are feelings of like and dislike towards specific objects or policies ([Rokeach, 1973](#)), which highlights how attitudes stem from values and beliefs. Underlying values and beliefs act as a kind of general measure against which someone can decide whether to adopt more specific positions ([Feldman, 1988](#)). Importantly, because sincere values and beliefs can conflict with each other, attitudes that stem from them are *not* required to be logically consistent. Instead, specific attitudes that flow from values and beliefs highlight the relative importance someone places on certain values over others. Here, we focus on two sets of values: economic conservatism and social conservatism. Economic conservatism captures support for free enterprise, government intervention in the economy, and wealth redistribution, while social conservatism focuses on ideas about social hierarchy relating to gender, sexual orientation, race, and “family values.” Both structure individuals’ political preferences across many countries ([Inglehart, 1977](#); [Dalton et al., 1984](#)) including Canada ([Gidengil et al., 2012](#)).

The other part of this block are political orientations, what are based in social group membership ([Converse, 1964](#)). Membership in a politically salient group acts as a heuristic that helps someone to decide whether to support a policy, particularly if their values and beliefs are silent on that issue, or they lack a coherent belief system. This typically occurs through socialization, where an individual adopts the same preferences as the elites of their group ([Campbell et al., 1960](#)), through viewing policies through the lens of group benefits ([Converse, 1964](#)), or through symbolic association of some policies with certain groups ([Conover and Feldman, 1981](#)).

We capture two political orientations. The first is identification on an abstract left-right political spectrum. This left-right continuum is not grounded in a coherent set of concrete policy preferences or values but is the result of emotional evaluations of and attachment to symbols associated with left and right ([Conover and Feldman, 1981](#)). This means ideological thinking is derived *both* from values, as noted above, and group identity. This is why it is not uncommon for people to be

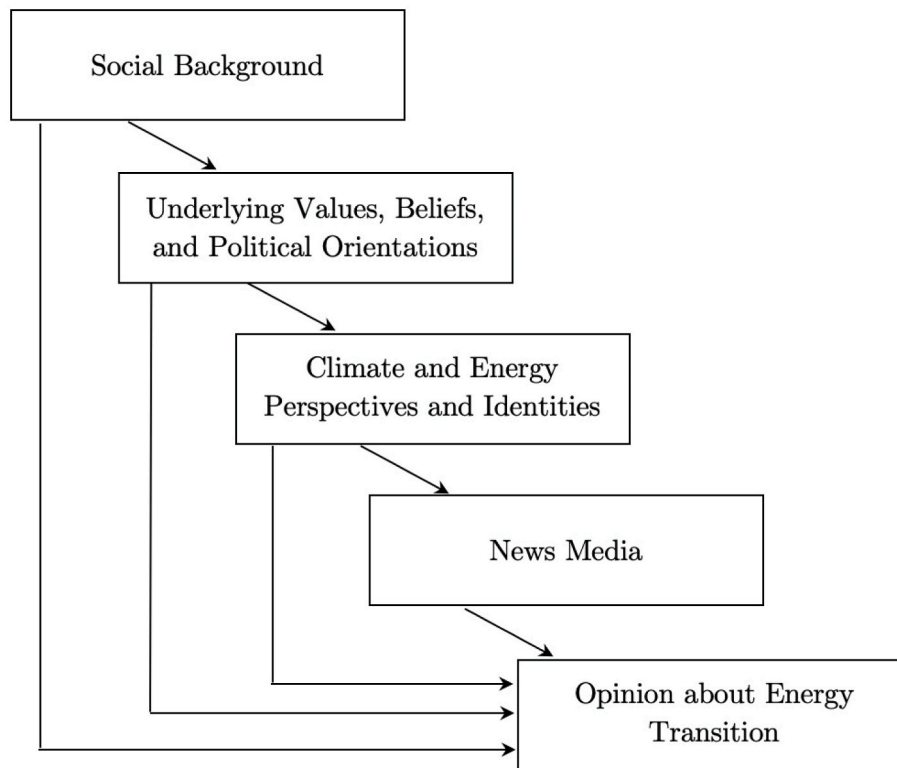


Fig. 1. Multistage explanatory model for public opinion about energy transition.

left-leaning in terms of values but right-leaning in self-identification (Ellis and Stimson, 2012). Yet, identifying with the left leads people to prioritize different issues and take different positions on those issues than those who identify with the right (Cochrane, 2015).

The second political orientation is party identification or partisanship. Classically defined as an individual's long-standing emotional attachment to a political party (Campbell et al., 1960), partisanship acts as a perceptual screen through which they view the political world. It is consistently a strong predictor of political preferences, including climate attitudes and beliefs in the United States (Campbell et al., 1960; Miller and Shanks, 1996) and Canada (Gidengil et al., 2012). In Europe, fundamental attitudes, such as voters' satisfaction with their democracy, can rest on how closely they feel to a political party (van Egmond et al., 2020).²

We argue these factors must precede attitudes about climate and energy. Group membership cues two psychological processes. The first is motivated reasoning, which causes values, beliefs, and political

orientations to structure attitudes about climate and energy, rather than the reverse (e.g., Kahan, 2015). Motivated reasoning is when people embrace information that confirms their existing way of thinking, and reject or resist information that counters their prior beliefs or want to believe (van der Linden et al., 2015). It works in tandem with the second psychological process, confirmation bias, which is when privileged information that supports one's existing views causes them to ignore disconfirming data (Nickerson, 1998). Together, group identity, motivated reasoning, and confirmation bias lead people to work hard to ensure information and arguments uphold and support their pre-existing group identities. This kind of emotionally-driven reasoning biases people's attitudes (Kraft et al., 2015; Mason, 2018). Partisans and ideological identifiers alike will use their group membership to help develop their attitudes about energy transition. If party leaders are supportive, then it is more likely that partisans will be as well.

This generates two sets of expectations. First, our expectations about values and beliefs are mixed. On one hand, energy transition often requires some government intervention to ensure renewable forms of energy are viable and have market access. This should lead those with more economically conservative values to oppose transition. Yet, we have no *a priori* reason to expect those with higher levels of social conservatism to be less supportive of transition, as social conservatism is primarily concerned with moral issues, sexuality, gender roles, and the family. Thus, we expect only economically conservative values to structure attitudes about energy transition. Second, with respect to political orientations, we expect those who identify on the political left to be more supportive of transition than those on the right, given that political parties, advocacy organizations, and elites who support transition tend to be associated with the left. This holds for both general left-right and party identification.

2.3. Climate and energy perspectives and identities

The third block measures climate and energy perspectives and identities. This block includes three sets of factors that may shape public

² The relationship between education, and ideology and partisanship highlights the rationale behind our explanatory model. Ideology and partisanship can seemingly override the effects of education and scientific literacy. For example, information about climate change does not change attitudes, but instead reinforces prior views with "those whose cultural commitments predispose them to be concerned about climate change become even more so as their level of science comprehension increases" (Kahan, 2015: 12). In fact, ideological polarization about the existence of climate change increases amongst those who are more knowledgeable about politics, science and energy policy (Bolsen et al., 2015), particularly on the ideological right (Pew Research Centre, 2008). Conservatives with high cognitive sophistication quantitative reasoning skills (Kahan, 2013) are especially inclined to engaged in motivated reasoning when it comes to climate science. In a similar way, left-leaning voters are less inclined to accept scientific consensus about the safety storage of nuclear waste (Kahan, 2013). Thus, we cannot understand the effects of education here without taking ideology and partisanship into account, even though education arguably comes "first."

opinion about energy transition, most of which are closer to public opinion about transition than underlying values and beliefs or social background characteristics. The most obvious is if people believe in and are worried about anthropogenic climate change (Mildenberger et al., 2016). If someone does not believe climate change is real, they would be unlikely to think it is necessary to transition from fossil fuels to more renewable sources of energy. Similarly, the more worried someone is about climate change, the more likely they would be to support energy transition.

Perhaps counterintuitively, there is no consistent evidence to show that individuals employed in the fossil fuel industry are consistently opposed to environmental protections (Coan and Holaman, 2008). They may, however, be opposed to energy transition as a risk to their economic prosperity. Relatedly, there are relatively few people directly employed in the oil and gas industry, even in Alberta, so we do not expect industry employment to play a large role here. Instead, beliefs about the future prominence and prosperity of fossil fuels in general should be a more important factor. It is plausible that someone who believes oil will remain an important, lucrative industry for years to come will be reluctant to transition away from it to more renewable sources of energy. We further expect factors noted above, such as gender, ideology, and partisanship to indirectly affect attitudes about energy transition through these more proximate factors about the environment and energy.

The final factor we include in this block is personal experience with a natural disaster. Personal experience with extreme weather or natural disasters such as flooding and forest fires has been linked to increased concern about climate change (Capstick and Pidgeon, 2014; Demski et al., 2017). In turn, this may affect support for energy transition.

2.4. News media

News media are the fourth and final block in our explanatory model. Because energy transition is a relatively new issue and remains a predominant feature of the climate change debate, the effects of information from the news may be especially important. Early work in public opinion formation highlights the media's role in shaping the "pictures in our heads" (Lippmann, 2004 [1922]: 1). Considerable scholarship demonstrates communication affects opinion (c.f. Nelson et al., 1997; Iyengar, 2010), often through framing effects (Druckman, 2005). A frame is "a central organizing idea or story line that provides meaning to an unfolding strump of events, weaving a connection among them" (Gamson and Modigliani, 1987: 143).

We expect if someone is exposed to a news frame that suggests transition is positive, they may be more likely to support it. The reverse should also hold, as literature on negativity bias in news suggests that the negative frame should be more powerful (Soroka et al., 2019). Yet, because people are more receptive to news frames if they are consistent or "resonated" with existing beliefs (Shen, 2004: 400), we expect other factors – gender, ideology, belief in climate change – to affect the effectiveness of these frames. This is the primary reason why news media are the last block in Fig. 1: they are closest to public opinion about energy transition, but also most likely to be affected by prior factors addressed above.

3. Data and methods

We conduct our study in the Canadian province of Alberta for several reasons. First, it is the heart of Canada's energy industry, particularly with respect to oil and gas extraction. While most Canadians may not yet know what they think about energy transition, odds are good that Canadians living in Alberta will be equipped to speak to it, as energy is especially salient in there. These data were collected immediately following a provincial election where issues relating to energy and the environment were hotly contested (Graney and Clancy, 2019). Second, Alberta is an especially challenging case, as energy is conflated almost

exclusively with oil and gas there and is tied closely to the province's prosperity and wealth. Most Albertans are aware of more renewable sources of energy, but it is common to view them as desirable additions, rather than as transformative (Marshall et al., 2018). Strategies that are found to be effective in increasing support for transition in Alberta are likely generalizable to other, "less challenging" jurisdictions that are less dependent on oil and gas (c.f. Mildenberger et al., 2016). Third, oil and gas are heavily politicized in Alberta. While all major political parties in the province support building pipelines to transport bitumen produced from Alberta's oil sands to port, the left-leaning New Democratic Party (NDP) introduced a coal phase out for electricity generation, carbon pricing, supports for renewable energy such as solar and wind, and significantly greater environmental regulations for industry. In contrast, the right-leaning United Conservative Party (UCP) not only cancelled many of these initiatives but used COVID-19 as grounds to suspend environmental monitoring related to oil and gas extraction (Weber, 2020).

Our data are drawn from an online survey of 1591 adult Albertans fielded in April 2019 by Vox Pop Labs. Participants were selected from those who had participated in a previous Canadian federal or Alberta provincial election survey conducted by Vox Pop Labs.³ Our survey sample is somewhat different from Alberta's population in that they are more highly educated, more likely to work in oil and gas, more middle-aged, and more likely to support the NDP. However, all other factors, including other sociodemographics and ideological identification, match reliable estimates of Alberta's population. These caveats should be considered when interpreting the results that follow. Participants were offered no incentives and were recruited using a single email prompt sent to randomly selected participants.⁴

Embedded within the survey is an experiment designed to assess the potential effects of news media on attitudes about energy transition. We use realistic media reports to increase the external validity of our experimental treatments (c.f. Mutz, 2011). Participants were randomly assigned into one of three possible groups: a control group; a group that listened to a positive news story about energy transition; and a group that listened to a negative news story about energy transition. The positive news story focused on the potential economic benefits of transitioning to solar energy; the negative condition outlines the potential death of a small coal-mining town (Hanna, Alberta) due to transitioning away from coal-generated electricity.⁵ The control group did not hear any news story. Each treatment was modelled on an actual news story and was edited only to standardize length and format. Treatments were block randomized to ensure balance on gender, belief in anthropogenic climate change, and ideological identification across all three groups. Manipulation checks confirm that treatment was effective (82% in the positive, and 92% in the negative condition).

³ This study was approved by ethics boards at the University of Calgary and University of Alberta. Our survey recruited individuals who participated in a Vox Pop Labs *Vote Compass* survey conducted in the previous federal or provincial election. *Vote Compass* is a public engagement tool used by Canada's public broadcaster, the Canadian Broadcasting Corporation or CBC, during general election campaigns. During the 2019 provincial election, just under 10% of Alberta's population ($n = 410,531$) used *Vote Compass*, offering us a current and large participant pool to sample from. The response rate is 13%.

⁴ This study was approved by ethics boards at the University of Calgary and University of Alberta, and the response rate is 13%.

⁵ Treatment transcripts are found in Appendix B.

Immediately following the experimental treatment, participants were asked seven Likert-type questions about energy transition.⁶ Together these seven questions load on a single factor ($\lambda = 4.23$, $\alpha = 0.91$).⁷ While some items might seem redundant, existing work suggests that, in a context heavily dependent on fossil fuels, how the public feels about adding renewables is rather different than its feelings about removing oil and gas (Marshall et al., 2018).

1. Alberta should move away from oil and gas.
2. Alberta should move towards renewable sources of energy.
3. Alberta should expand its oil and gas industry.
4. I am proud of Alberta's oil and gas industry.
5. We should restructure our economy to slow down the effects of climate change.
6. The economy will suffer if we fail to adopt renewable energy such as wind and solar.
7. The economy will suffer if we move away from fossil fuels such as oil, gas, and coal.

To create our dependent variable, responses are coded from least to most supportive of energy transition and summed. The resulting index is scaled to range from 0 (least supportive of transition) to 1 (most supportive). Mean support for transition on this scale is 0.57 (SD = 0.253, see Table 1). In substantive terms, a score of 0.57 is roughly equivalent to answering “agree” to six out of the seven items that comprise the

Table 1
Descriptive statistics.

Variable	n	Mean	SD	Min	Max
Support for Energy Transition	1558	0.568	0.253	0	1
Social Background Characteristics					
Gender (1 = woman)	1580	0.473	0.499	0	1
Age (0 = 19 years old; 1 = 91 years old)	1543	0.427	0.237	0	1
Education (0 = HS or less; 1 = graduate degree)	1536	0.583	0.324	0	1
Income (0 = \$0; 1 = \$500,00+)	1479	0.505	0.267	0	1
Suburban	1552	0.341	0.474	0	1
Rural	1552	0.187	0.390	0	1
Children at home	1549	0.268	0.443	0	1
Underlying Values, Beliefs, and Political Orientations					
Economic conservatism	1575	0.407	0.263	0	1
Social conservatism	1562	0.260	0.240	0	1
Left-right identification	1591	0.452	0.238	0	1
UCP identification	1547	0.276	0.447	0	1
NDP identification	1547	0.372	0.483	0	1
Climate and Energy Perspectives and Identities					
Work in oil and gas	1554	0.253	0.435	0	1
Hope in future of oil and gas	1585	0.354	0.264	0	1
Belief in anthropogenic climate change	1363	0.798	0.401	0	1
Climate change anxiety	1386	0.716	0.256	0	1
Experienced natural disaster	1553	0.097	0.295	0	1
News Media					
Positive frame	1591	0.327	0.469	0	1
Negative frame	1591	0.329	0.470	0	1

⁶ The questions that makes up the scales measuring support for transition, economic conservatism, social conservatism, and hope in oil and gas are found in Appendix A.

⁷ λ refers to factor loadings, and α refers to Cronbach's alpha. Both are measures of reliability to test how well Likert type items from survey data capture a target concept (in this case, attitudes towards energy transition). For both, higher values indicate greater confidence in the reliability of the scale in question.

scale.

The indicators used to build each block in Fig. 1 are also described in Table 1. Socio-demographics include gender (women = 1) and age in years. Education and income are ordinal measures both scaled 0 to 1. Binary variables are used for place of residence (reference category is urban) and parental status.

Economic and social conservatism are each measured through a three-question index. Economic conservatism measures attitudes toward job creation, trickle-down economics, and wealth redistribution ($\alpha = 0.81$). Social conservatism captures attitudes toward gender equality, abortion, and LGBTQA + rights ($\alpha = 0.77$). Both measures are scaled from 0 to 1, with 1 indicating higher levels of conservatism. To measure left-right ideological identification, we ask respondents to place themselves on a hypothetical 11-point scale where 0 means left and 1 means right. This measure has also been scaled from 0 to 1, with 1 indicating the most right-wing position. Party identification is captured using two binary variables, one captures strong identifiers with the UCP, the other with the NDP. The residual category for party identification is comprised of weak identifiers of either the UCP or NDP, those who identify with another party, and those who do not identify with any party.⁸

Belief in anthropogenic climate change and experience with a natural disaster are binary coded.⁹ Work in oil and gas is a binary variable that captures participants who either work in oil and gas themselves or have someone in their household who does. The other two indicators in this block are continuous variables. We use three other measure to capture climate and energy beliefs. We ask participants how worried they are about climate change on a 0 (not worried) to 10 (very worried) scale; we use this measure rescaled 0 to 1. Hope in oil and gas is an index comprised of two questions: if Alberta is too dependent on oil and gas (reverse coded) and if oil and gas will remain Alberta's most important industry in 25 years ($\alpha = 0.71$). Higher values reflect a more “hopeful” outlook that oil and gas will remain the predominant industry in the province.

Finally, we include two binary variables to capture our experimental treatments – one to indicate participants who heard the positive news story framing energy transition away as a positive economic opportunity, and another for participants who heard the negative story about energy transition's potential negative economic effects. The reference category for both measures are participants in the control group who did not hear a news story.

We operationalize our multistage model of support for energy transition by estimating a series of models, starting with social background and successively adding each block of variables until all four blocks are included in the final model (Model 4). All models are estimated using OLS regression.

4. Results

Overall, our findings suggest that Albertans support energy transition. On average, our participants score a 0.57 on our transition index (SD = 0.25). Substantively this means that most participants agree that Alberta should move away from oil and gas, albeit with some reservations. Only 10% of respondents have scores indicating they systematically disagree with every statement we presented about transitioning away from fossil fuels towards renewable sources of energy. In contrast,

⁸ Conventional practice in the United States is to measure both ideology and partisanship on a continuous ordinal scale. There are simply too many effective parties in Canada to do this. As a result, standard practice is to ask participants two questions: if they identify with a party and then how strong that identification is (c.f. Gidengil et al., 2012).

⁹ Participants were asked to indicate if they had direct experience being evacuated as a result of a natural disaster. Large numbers of Albertans were evacuated for extensive flooding in 2013 and/or wildfires in 2016.

over 35% of participants agreed with each statement, sometimes strongly.

These results are similar to other public opinion research conducted in Alberta. Data collected in the spring of 2020 suggest that 79% of Albertans want to transition toward renewable sources of energy and a majority (51%) think the province should move away from oil and gas (DeCillia, 2020). Given that these data are drawn from a randomly selected, representative sample and that these two items form part of our transition measure (see Appendix A), we are confident the estimates presented here are close to real population values.

Following the model presented in Fig. 1, the results are presented in Fig. 2. Recall that this approach sees each block as a series of interconnected relationships, allowing for many factors to both directly and indirectly affect how people feel about energy transition. Recall, too that this approach captures a sequence of thinking that many people go through (if incompletely), includes plausible motivations that inform attitudes about transition, and addresses how some distant factors affect variables “closer” to transition (c.f. Gidengil et al., 2012: 14).¹⁰

The results from the first block – sociodemographic characteristics – match most of our expectations. Women, younger people, and those with higher education are more supportive of energy transition when compared to men, older people, and those with lower levels of education. Contrary to expectations, parents with children living at home are less likely to support transition, though this effect is small. Those with higher incomes are more likely to be opposed to transition than those with lower incomes; this may be because much of the wealth generated in Alberta is tied to oil and gas. Compared to urban dwellers, those in suburban and rural areas are less supportive of energy transition. Yet, aside from age and gender, most of these sociodemographic factors affect attitudes about energy transition indirectly, as they fall out of statistical significance when other factors are considered.

The second block, shown in Model 2 in Fig. 2, addresses values, beliefs, and political orientations. Most of our expectations are confirmed. Economically conservative values decrease support for economic transition. Those who identify more with the political right are also more likely to be opposed to transition, as are those who identify with the right-leaning political party in Alberta, the UCP. Importantly, all of these effects are robust to the addition of attitudes about climate change and future hopes for energy (Model 3), suggesting that these values and political identities strongly structure attitudes about energy transition in their own right.

While social conservatives appear less supportive of transition, and those who identify with the left-leaning NDP appear more supportive of transition away from fossil fuels towards more renewable sources of energy, both effects are likely better explained by attitudes about climate and energy, as partisanship and social conservatism are statistically insignificant when those factors are included.

Consistent with expectations, climate and energy perspectives have considerable effects on attitudes about energy transition (Model 3). Those working in, or related to someone working in oil and gas are significantly less likely to support energy transition away from fossil fuels. Similarly, those who believe in anthropogenic climate change are more likely to support energy transition when compared to those who do not. While neither result is surprising, the effects are small. Personal

experience with a natural disaster had no significant effect on attitudes about energy transition.

In contrast, the variables with the largest effects are climate anxiety and hope in the future oil and gas. The more worried someone is about climate change, the more supportive they are of transitioning away from fossil fuels towards renewable sources of energy. Similarly, the greater hope and expectations someone has in the future of oil and gas, the more opposed they are to energy transition. What makes these results surprising is not their direction, but the magnitude of their effects. Those who are most worried about climate change strongly and enthusiastically endorse energy transition, just as those who place their future hopes in oil and gas forcefully reject it.

Finally, Model 4 shows treatment effects from the survey experiment in the form of positive and negative media framing of energy transition. Both positive and negative news media framing of the economic effects of transition have a positive, statistically significant effect on attitudes towards energy transition. This is somewhat surprising, as prior research suggests that media effects should be biased toward negativity.

To help clarify these results, predicted probabilities of key positive and negative factors related to energy transition are presented in Figs. 3 and 4.¹² Each figure includes a reference line at 0.5 on our transition scale to highlight when factors are associated with support or opposition to transition. Both figures are generated from Model 4 in Fig. 2.

One of the most striking things about Figs. 3 and 4 is that, all other things being equal, very few factors drive participants to oppose energy transition. Only high hopes in the future of oil and gas as Alberta's primary industry, and absolutely no worry about climate change are associated with opposition to transitioning away from fossil fuels towards renewable sources of energy. Of these, hope in oil and gas has the most dramatic effects (Fig. 3). Support for transition is certainly more tepid the more participants value market conservatism or identify on the political right, but tepid support is, in our view, substantively different than outright opposition.¹³ Similarly, the factors associated with the most enthusiasm for transition are often rejections: of the future of oil and gas and of market conservative values. Finally, it is noticeable in Fig. 4 that the difference between believing in or denying climate change affects attitudes about transition amongst our participants about as much as hearing a positive new story about the potential economic benefits of transition.

5. Discussion

Our most important finding is that, even in a context where fossil fuels are both economically and politically predominant, our survey participants still, on average, support energy transition. While several factors make them less enthusiastic about energy transition (e.g., market conservatism, future hope in oil and gas, lack of concern about climate change), few drive them to oppose it outright.

Borrowing from public opinion and election scholarship, we argue that research investigating how people feel about energy transition must pay close attention to the plausible sequences associated with values and beliefs, partisanship, and prior attitudes about climate and energy. While prior research has pointed to the central importance of belief in the scientific consensus on climate change as a prerequisite for support for climate action (van der Linden et al., 2015), our findings show that it would be a mistake to conclude that belief in anthropogenic climate change is necessary to building support for energy transition, or that

¹⁰ These direct and indirect relationships can be seen by how variables' statistical significance changes over successive models. If a variable is initially a statistically significant predictor of support for transition but then is no longer statistically significant – or is still significant but with a smaller effect size – with the introduction of later variables, that original variable's effect can be understood to occur indirectly through those later variables. Variables that continue to have a statistically significant relationship with support for transition, even with the introduction of later variables, can be understood as having a direct effect on support for transition.

¹¹ The OLS model used to generate Fig. 2 is available in Appendix C.

¹² These figures plot the predicted level of support for transition at various levels of key variables while holding all other variables at their means. Because the dependent variable is measured continuously on a scale from 0 to 1, scores above 0.5 can be considered more supportive than opposed to transition.

¹³ Similar results hold for party identification (not shown): UCP supporters are lukewarm on energy transition, while NDP supporters, other partisans, and non-partisans are much more enthusiastic.

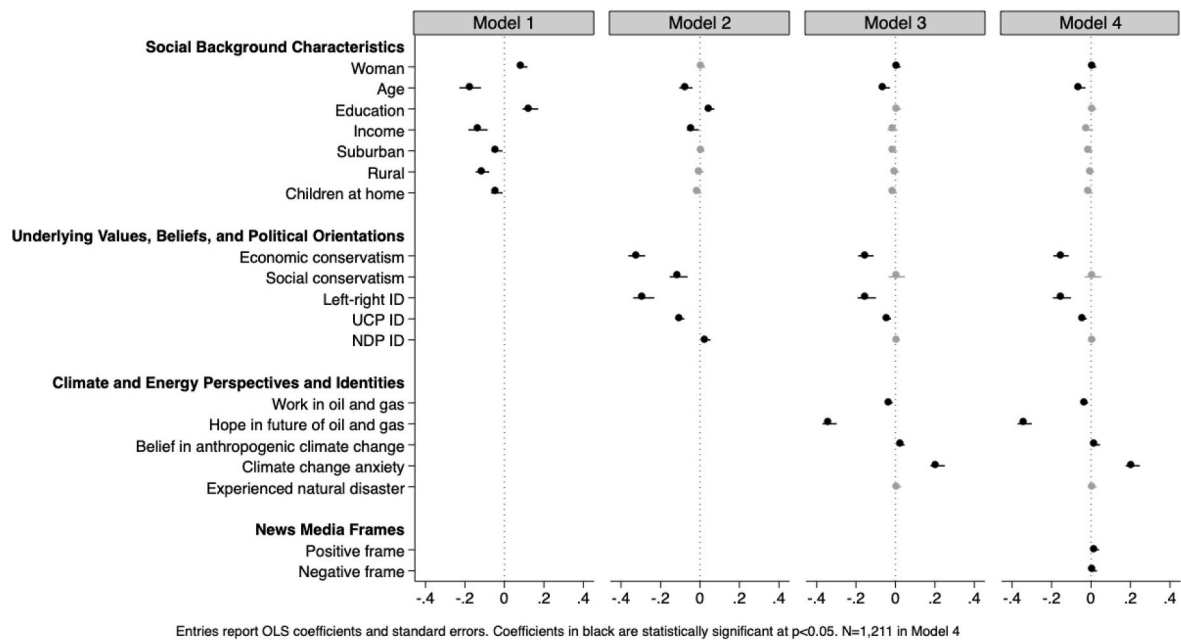


Fig. 2. Multistage models explaining public opinion about energy transition, Alberta ¹¹.

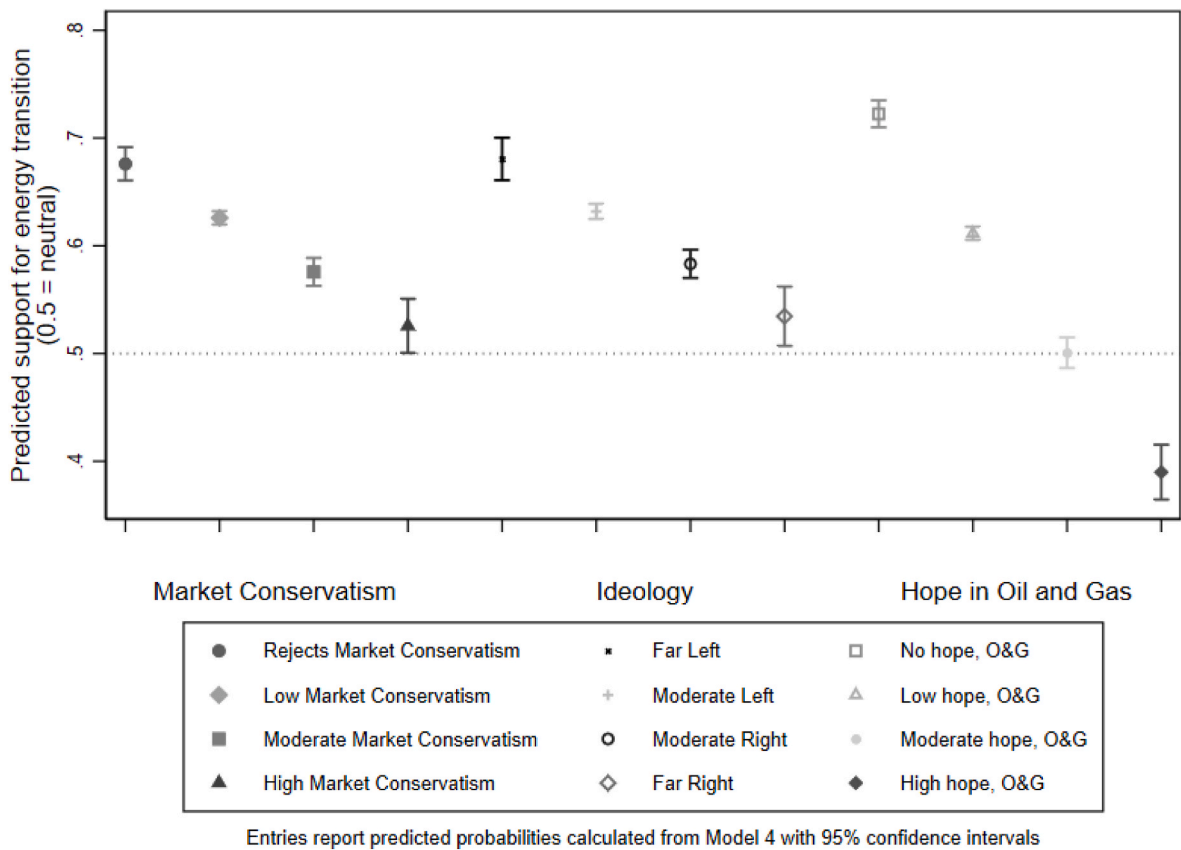


Fig. 3. Effects of negative predictors on energy transition.

disbelief leads inevitably to opposition. Instead, what is most important are individuals' evaluations of the future—either of the economic viability of fossil fuels or of the potential hazards of climate change. While previous research has identified that emotions such as fear, interest, concern and hope to predict support for climate action (see [Drews and van den Burgh, 2016](#)), our focus on the role of economic optimism is

a novel contribution. Other political orientations are important too, including individuals' general ideas about government intervention in the economy and where they place themselves in abstract ideological space. Future research may want to examine if emotional connection to the oil and gas industry represents a group identity akin to other political science research that

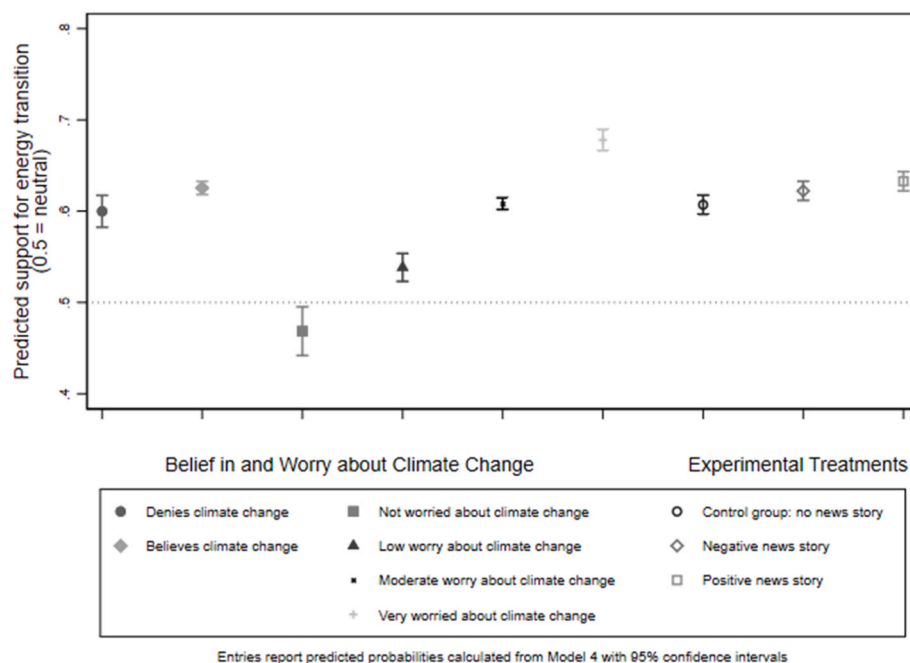


Fig. 4. Effects of positive predictors of energy transition.

has highlighted the importance of groups to shaping public opinion attitudes (Mason, 2015; Jardina, 2019). Another trajectory could lead researchers to evaluate if status threat (Mutz, 2018) is animating resistance to energy transition.

Prior research suggests certain groups—for example, those living in rural areas, those with lower levels of education, or those with relative inexperience with the negative effects of climate change—would be laggards on issues like energy transition (Bell and York, 2010). Our results suggest this is not necessarily the case, as these factors exert no meaningful influence on attitudes about transition in this study. This lends further weight to our argument that prior values and beliefs, political orientations, and climate and energy perspectives must not only be considered, but considered in the appropriate sequence.

Our findings offer several insights as to what might make acting on energy transition more politically palatable in a fossil fuel intensive economy. First, our data suggest that most Albertans were not very hopeful about the future of oil and gas when these data were collected in 2019. This makes sense: Alberta's energy sector has contracted significantly since the boom years of 2008–2014, and this has had considerable negative effects on the province's economy. GDP growth in 2019 was only 0.4%—significantly below the 20-year average of 2.8% (CBC, 2019). If optimism about Alberta's energy industry falls, it is possible that support for energy transition could grow. Though some commercial data already largely confirm our findings (Anderson and Coletto, 2017), future research must confirm the extent to which these factors operate in other fossil fuel intensive economies and consider how they operate beyond these jurisdictions.

Second, economic anxiety about—or more specifically, prospective economic evaluations of the future importance of fossil fuels (see Schimpf et al., 2021) may be more salient and accessible to many than are more general ideas or sentiments about energy transition. These data were collected in spring 2019, following a period of relatively poor economic performance for oil and gas. This would render those prospective economic evaluations politically powerful. Other studies suggest that economic prosperity is linked to increased support for environmental protection (Brulle et al., 2012). Our results suggest the relationship between economic performance and policies designed to promote environmental protection and/or energy transition may work differently in fossil fuel intensive economies, reinforcing the findings of

Olson-Hazboun et al. (2016). In these cases, strong economic performance driven by oil and gas may boost optimism in that industry, and thus decrease support for energy transition. In contrast, weaker economic performance from fossil fuels may undermine optimism about the future of fossil fuels which may then in turn boost support for energy transition and policies that promote it. This may be one reason why our news story about the negative effects of energy transition—job losses in a coal mining town—did not drive down support for energy transition: it may have reminded participants that there are job losses ahead in fossil fuel extraction, and so may undermine a “business as usual” policy approach in a fossil fuel intensive context.

Third, our findings about the significant, positive effects of pro-transition media frames merits further study. In keeping with the literature on framing effects, communication or news frames can affect attitudes about energy transition in spite of individuals' prior background characteristics, partisanship, identity and pre-existing ideas and values to change people's attitudes (Zaller, 1992; Nelson et al., 1997; Druckman, 2005). While our study did not find terribly large framing effects, the fact these effects are about as large as belief in anthropogenic climate change is striking and provide evidence supporting the power of elite cues to shift public opinion (see Zaller, 1992; Campbell et al., 1960).¹⁴ This reinforces Brulle et al.'s (2012) argument that elites cues can be important factors in climate policy support.

We do not suggest that simple media messages can change mass opinion about energy transition through a stimulus-response mechanism. Rather, following Gamson (1992), we argue media messages are contested and open to several potential interpretations. Likely, the most effective means of changing public support for energy transition lies in changing elite discourse. One plausible interpretation of our findings on framing effects and our argument about pre-existing identities is, if elites consistently speak to transition, public opinion could follow those cues, particularly if those cues are positive and speak to the economic potential of energy transition.

¹⁴ Our findings on the positive framing effects are in line with Tvinnereim and Ivarstflaten (2016) who found that support for energy transition in Norway was shaped by the cost distribution of measures, suggesting that information about the employment benefits of transition to renewables is important.

6. Conclusion & policy implications

Our population-based survey experiment ($n = 1591$) suggests that Albertans are generally supportive of energy transition despite the province's economic reliance on oil and gas. The most important factors associated with support for transition are a skepticism of the future economic viability of the province's oil and gas industry and a high degree of anxiety about the potential negative effects from climate change. Other important factors include a high degree of support for government intervention in the economy and identifying on the left of the ideological spectrum. Still statistically significant, but of relatively minor importance are not party identification and belief in human-caused climate change. Finally, our experimental manipulations of cuing either positive or negative consequences of energy transition are both associated with increased support for transition (versus no cuing of any potential consequences), and the effect of this cue is about the same size as the difference between accepters and deniers of human-caused climate change.

This paper confirms the importance of expected future economic benefits in policy evaluations and support (e.g., Mayer and Malin (2019)). Considerable research underscores the role of public opinion in the climate mitigation policy adoption (Anderson et al., 2017; Bernauer and McGrath, 2016; Bromley-Trujillo and Poe, 2020; Drews and van den Bergh, 2016; Egan and Mullin, 2017; Meckling et al., 2015). The focal point of much of this work examines the costs and benefits associated with implementing climate policies. Some previous research finds that people are more inclined to support low-carbon forms of energy when they believe the greener industries create new jobs and help to revitalize a sluggish economy (Slattery et al., 2012; Lindén et al., 2015). However, in line with other research (Olson-Hazboun et al., 2016; Olson-Hazboun et al., 2018), our findings suggest there are limits to the "green jobs" argument. Telling people of the economic benefits of clean energy might not work among those who have optimistic expectations of fossil fuels, especially in jurisdictions where fossil fuels are, or have been the driver of economic activity and prosperity. Given the many countries or sub-national units within countries that have historical ties to fossil fuel production, our findings suggest a different approach is needed in those places.

First, policy makers should switch the paradigm—that is, focus on the economic risks that come from continued reliance on oil and gas. The inability of the green jobs argument (a positively-framed message) to counter fear of lost fossil fuel jobs (a negatively-framed message) should not come as a surprise, given that political communication research shows negative frames tend to have stronger effects than positive frames (Soroka et al., 2019). This is also consistent with *prospect theory*, which finds the same expected value elicits different preferences, depending on whether it is framed in terms of losses or benefits (Kahneman, 2011). This is no shortage of risk from betting exclusively on fossil fuels. Economists warn the climate crisis could trigger a massive financial crisis, and worldwide losses in the neighbourhood of US \$20 trillion in assets (Guo et al., 2021). Since 2015, former central banker Mark Carney has cautioned that climate change poses a "potentially huge" risk for investors because of stranded assets (Meredith, 2021, para 11).

To be sure, these are anxious times for many people whose livelihoods are connected to fossil fuels. A 2021 economic assessment of Canada's oil and gas industry estimated that proposed federal government climate mitigation policies could result in as many as 450,000 job losses in the industry (CBC News, 2021). Policymakers would be wise to frame their communication as two prongs: (1) admit that averting catastrophic climate change will come with some job losses in the oil and gas industry; but (2) doing nothing will result in even more job losses—the oil and gas jobs that would have been lost anyway, the green jobs that were never created, and second-order job losses from an economy that failed to keep up with the times. This plays to *prospect theory*, which demonstrates people work harder to prevent losses than to achieve gains (Kahneman, 2011).

Second, the future of energy transition likely rests with conservative political elites. They are the most likely to resist policies designed to mitigate climate change and promote policies friendly to fossil fuels. In turn, their supporters in the electorate cue into elite rhetoric and use those cues to "cook up their opinions" (Kinder and Sanders, 1996: 156). It is possible that conservatives adopting more climate-friendly stances could bring some of their supporters onside. Evidence from the United States suggests that parties' movement on issues can co-partisans to change their values to align with the new ones of their parties' (Goren, 2005).

Alberta is an interesting case in this regard because its conservative premier, Jason Kenney has different messages regarding transition to internal and external audiences. Within Canada, the message continues to be promotion of the province's oil and gas industry, but to international audiences, the message is one of accepting the need to gradually transition away from fossil fuels (Braid, 2020). This suggests conservative leaders still see the need to transition, even when they might have a predisposition against intervening in the economy and even when they lead a province heavily reliant on fossil fuels. Continuing to speak two different messages runs the risk of being exposed as two-faced at home, or, if the jurisdiction fails to transition in time, suffering electoral losses because of being blamed by voters for not taking leadership.

Admittedly, this is a difficult trade-off to make for conservative politicians for the same reason opponents of energy transition have a difficult time accepting the need for energy transition—it involves sacrificing short-term gains to avoid long-term losses. As we suggested before, building support for energy transition might be more effective by pivoting the shifting the cost-benefit calculus from a choice between sticking with what we have today versus giving up what we have today to a choice between future losses of oil and gas jobs or future losses of oil and gas jobs plus a host of other jobs.

In sum, we would agree somewhat with Bernauer and McGrath (2016: 680); energy transition can be very difficult to enact politically in some contexts. The values, beliefs, and political orientations that structure attitudes about energy transition are longstanding and intractable, and building support for energy transition in a politically polarized context would be difficult.

Our study has some limitations. These findings need to be replicated for Alberta because our sample, while randomly selected, differs from the population in important ways (e.g., age, education, work in oil and gas). Also, our data is cross-sectional. Future longitudinal could assess the evolution of thinking as other countries make progress towards energy transition.

Future research may explore the potential group identity at play in resource-dependent jurisdictions such as Alberta. Bell and York (2010) find *ideological construction* within the coal mining industry in West Virginia that produces a community economic identity. Recent political science research find group identity strongly shapes political and policy preferences (Mason, 2018; Jardina, 2019); subsequent research may want to explore if an oil and gas industry group identity shapes opinions about energy transition.

The potential implications of recent changes in rhetoric of large international energy companies also merits future investigation, especially as they commit to cutting greenhouse gas emissions. This oil and gas industry framing could shift public beliefs about energy transition. Understanding the multifaceted factors that influence public opinion about energy transition policy issues will certainly help inform policymakers as they work towards mitigating climate change.

Finally, more experimental work is needed to which messages framed in which ways are most effective in moving public support. We suggest that questioning the long-term economic viability of fossil fuels might be a stronger argument than promoting the potential for renewable energy jobs. This could be tested the same population-based survey experiment design used in this study.

Still, given the lack of scholarship on public opinion on, and the importance of energy transition from fossil fuels to renewable sources of

energy is for addressing climate change, this study makes an important contribution.

Data statement

Once published, our data will be uploaded to institutional repositories for open/public access.

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CRediT authorship contribution statement

Melanee Thomas: Conceptualization, Methodology, Investigation,

Formal analysis, Resources, Writing – original draft, Writing – review & editing, Funding acquisition. **Brooks DeCillia:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing. **John B. Santos:** Formal analysis, Validation, Writing – review & editing. **Lori Thorlakson:** Conceptualization, Methodology, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

APPENDIX A

Question Wording

Energy Transition is measured using a scale comprised of seven items. Participants were asked to agree or disagree with each item (four-category Likert scale), and responses were coded with higher values indicating greater support for energy transition.

1. Alberta should move away from oil and gas.
2. Alberta should move towards renewable sources of energy.
3. Alberta should expand its oil and gas industry.
4. I am proud of Alberta's oil and gas industry.
5. We should restructure our economy to slow down the effects of climate change.
6. The economy will suffer if we fail to adopt renewable energy such as wind and solar.
7. The economy will suffer if we move away from fossil fuels, such as oil, gas, and coal.

Items load on a single factor ($\lambda = 4.23$, $\alpha = 0.91$). While some items might seem redundant, existing work suggests that, in a context heavily dependent on fossil fuels, how the public feels about adding renewables is rather different than its feelings about removing oil and gas (Marshall et al., 2018).

Economic Conservatism is measured using the following three items ($\alpha = 0.83$). Participants were asked to agree or disagree with each item (four-category Likert scale), and responses were coded with higher values indicating higher levels of economic conservatism.

1. When businesses make a lot of money, everyone benefits, including the poor.
2. Government should do more to reduce the gap between rich and poor.
3. The government should leave it to the private sector to create jobs.

Social Conservatism is measured using the following four items ($\alpha = 0.77$). Participants were asked to agree or disagree with each item (four-category Likert scale), and responses were coded with higher values indicating higher levels of social conservatism.

1. More should be done to reduce the pay gap between men and women.
2. Abortion is a health issue not a moral one.
3. Society would be better off if fewer women worked outside the home.
4. Parents should be notified if their child joins a gay-straight alliance at school.

Hope in Oil and Gas is measured using two questions ($\alpha = 0.71$). Participants were asked to agree or disagree with each item (four-category Likert scale), and responses were coded with higher values indicating more hope in the long-term viability of the oil and gas industry.

1. Alberta's economy is too dependent on oil and gas.
2. Twenty-five years from now, oil and gas will still be Alberta's most important industry

APPENDIX B

Transcripts, Experimental Treatments

MANIPULATION/TREATMENT — ECONOMIC OPTIMISM ANNOUNCER INTRO:

Traditional oil and gas jobs in Alberta could be replaced with trades and careers in renewable energy, like wind and solar power.

And as Kent Smith reports, the industry could produce billions of dollars for a provincial economy that once cooked with oil and gas.

REPORTER SCRIPT:

Ted Johnston needs workers.

He heads Solar Power — one of the country's biggest solar providers.

And a company poised for a massive expansion here in Alberta.

CLIP— “We’re going to need a workforce in the solar industry. That is engineering, sales, marketing, accounting, installation. We’re going to need lots of people — and we’ll pay them well.”

Alberta has a natural advantage when it comes to solar.

About thirty per cent more sun than the rest of the world.

A recent study by a solar industry group suggests expanding solar could bring up to five-billion dollars in new investment and 70,000 new jobs for Alberta.

By 20–30, thirty per cent of Alberta’s electricity will come from renewable sources such as solar, wind and hydro.

The wind energy sector, for its part, is poised to deliver 3.7 billion dollars in spending in ten years.

Alberta plans to add 5000 MW of renewable energy capacity over the next decade.

Experts predict that means a lot of people working in Alberta’s oil and gas industry now ... will eventually end up getting jobs in the renewable energy industry.

Kent Smith ... Canada News.

MANIPULATION/TREATMENT — ECONOMIC LOSS WITH TRANSITION ANNOUNCER INTRO:

Uncertainty continues to loom over the small southern Alberta town of Hanna Three hours northeast of Calgary.

The community’s coal-fired power plant will close in about a decade ... part of the province’s plan to transition to more green energy.

And as Kent Smith reports, even new provincial money to help develop renewable energy in the area has failed to reassure locals.

REPORTER SCRIPT: For more than one-hundred years now ... coal has fired the economic engine of Hanna ...

But ... plans to close the Sheerness coal mine and power plant is expected to lead many here to leave.

Two-hundred full-time jobs vanish when the power plant closes.

For Hanna it’s potentially devastating – and the equivalent of Edmonton losing 62,000 people or 90,000 people picking up and leaving Calgary.

Today, the province pledged nearly a half a million dollars to help Hanna develop solar or wind power here.

By 20–30, thirty per cent of Alberta’s electricity will come from renewable sources such as solar, wind and hydro.

Meaning billions in new investment – and thousands of expected news jobs in renewable energy.

The province hopes its money can help Hanna transition to clean energy

But ... local coal miner Dean Williams doesn’t buy it.

CLIP — DEAN WILLIAMS — “I’ve lived here all my life. What am I going to do? How am I going to feed my family? With wind money?”

And Hanna’s economic development officials echo Williams.

Conceding it’s going to be tough to attract green energy investment to a town many people think is dying.

Kent Smith ... Canada News.

APPENDIX C**Table C1**

Multistage Models Explaining Public Opinion about Energy Transition, Alberta

	<u>Model 1</u>	<u>Model 2</u>	<u>Model 3</u>	<u>Model 4</u>
Social Background Characteristics				
Woman	0.092*** (0.013)	0.010 (0.008)	0.013* (0.007)	0.014* (0.007)
Age	–0.173*** (0.028)	–0.072*** (0.017)	–0.056*** (0.014)	–0.056*** (0.014)
Education	0.131*** (0.020)	0.049*** (0.012)	0.008 (0.010)	0.006 (0.010)
Income	–0.134*** (0.025)	–0.036* (0.015)	–0.014 (0.013)	–0.014 (0.013)
Suburban	–0.038** (0.014)	0.005 (0.009)	–0.005 (0.007)	–0.005 (0.007)
Rural	–0.111*** (0.018)	–0.003 (0.011)	–0.002 (0.009)	–0.002 (0.009)
Children at home	–0.039* (0.015)	–0.010 (0.009)	–0.007 (0.008)	–0.007 (0.008)
Underlying Values, Beliefs, and Political Orientations				
Economic conservatism		–0.321*** (0.022)	–0.150*** (0.020)	–0.152*** (0.020)
Social conservatism		–0.108*** (0.023)	0.007 (0.021)	0.009 (0.021)
Left-right identification		–0.285*** (0.027)	–0.145*** (0.024)	–0.147*** (0.023)
UCP identification		–0.102*** (0.012)	–0.042*** (0.010)	–0.042*** (0.010)
NDP identification		0.034*** (0.010)	0.006 (0.008)	0.006 (0.008)

(continued on next page)

Table C1 (continued)

	Model 1	Model 2	Model 3	Model 4
Climate and Energy Perspectives and Identities				
Work in oil gas			−0.029*** (0.008)	−0.030*** (0.008)
Hope in future of oil and gas			−0.335*** (0.018)	−0.336*** (0.018)
Belief in anthropogenic climate change			0.026* (0.010)	0.026* (0.010)
Climate change anxiety			0.213*** (0.018)	0.211*** (0.018)
Experienced natural disaster			0.008 (0.011)	0.007 (0.011)
News Media Frames				
Positive frame				0.026*** (0.008)
Negative frame				0.015* (0.008)
Constant	0.636*** (0.023)	0.887*** (0.018)	0.696*** (0.023)	0.686*** (0.023)
Observations	1429	1406	1211	1211
R-squared	0.146	0.697	0.780	0.782

Cell entries are OLS coefficients with robust standard errors in parentheses.

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