Many Voices in the Room: A National Survey Experiment on How Framing Changes Views Toward Fracking in the United States

—Supplementary Materials—

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S1 Pre-experiment survey

Before implementing our main survey experiment in April 2016, we conducted a pre-experiment survey in January 2016 to collect basic information about the respondents' knowledge of fracking; their familiarity with technical, economic, and environmental arguments about fracking; their views on the political salience of fracking; and their support for fracking. The sample size was $n = 1,704$.

Here, we enumerate the questions that were asked in the pre-treatment survey and the response categories that were available for each question. A "don't know" or "not sure" option was always given as an additional response option.

1. *Have you ever heard about fracking?* Response categories: Yes (= 1); No (= 0).

2. *How familiar are you with the technical details of hydraulic fracturing?* Response categories: $1-6$ scale, ranging from "very unfamiliar" (= 1) to "very familiar" (= 6).

3. *How familiar are you with the economic arguments in favor of hydraulic fracturing?* Response categories: $1-6$ scale, ranging from "very unfamiliar" (= 1) to "very familiar" (= 6).

4. *How familiar are you with the environmental arguments against hydraulic fracturing?* Response categories: $1-6$ scale, ranging from "very unfamiliar" (= 1) to "very familiar" (= 6).

5. *How important is fracking as a political issue?* Response categories: $1-3$ scale, ranging from "very important" (= 1) to "not important" (= 3).

6. *On balance, do you favor or oppose fracking?* Response categories: $1-6$ scale, ranging from "strongly oppose" (= 1) to "strongly favor" (= 6).

7. *Based on your knowledge, what do you believe is the strongest argument in favor of fracking?* Response category: Open ended text entry.

8. *Based on your knowledge, what do you believe is the strongest argument against fracking?* Response category: Open ended text entry.

S2 Summary statistics from pre-experiment survey

We report summary statistics for our pre-experiment survey here. The first two tables S1 and S2 provide basic summary statistics from the full-sample data, both without and with survey weights. The next two tables show the estimated means of the main variables, separately for states with and without fracking at the respondent level (Table S3) and state level (Table S4), together with p-values from Wald tests for whether means across groups are equal. The means were estimated using sampling and post-stratification weights. We do not find a systematic difference among respondents based on whether there was fracking activity in their state of residence.

	n	Mean	SD	Min	Max
Fracking support (January)	1137	3.22	1.49	1	6
Heard about fracking	1629	0.83	0.37	0	1
Technical knowledge about fracking	1539	3.09	1.43	1	6
Economic knowledge about fracking	1529	3.37	1.46	1	6
Environmental knowledge about fracking	1539	3.61	1.49	1	6
Political salience of fracking	1207	2.11	0.68	1	3

Table S1: Sample summary statistics from the pre-experiment survey.

	n	Mean	SD	Min	Max
Fracking support (January)	1137	3.15	1.44	1	6
Heard about fracking	1629	0.77	0.41	0	1
Technical knowledge about fracking	1539	2.83	1.40	1	6
Economic knowledge about fracking	1529	3.10	1.46	1	6
Environmental knowledge about fracking	1539	3.38	1.53	1	6
Political salience of fracking	1207	2.05	0.66	1	3

Table S2: Summary statistics from the pre-experiment survey with survey weights.

	n	Group means for U.S. states		p-value
		Non-fracking	Fracking	
Fracking support (January)	1137	3.18	3.12	0.686
Heard about fracking	1629	0.75	0.80	0.131
Technical knowledge about fracking	1539	2.81	2.86	0.680
Economic knowledge about fracking	1529	3.03	3.18	0.245
Environmental knowledge about fracking	1539	3.31	3.47	0.226
Political salience of fracking	1207	2.09	1.99	0.099

Table S3: Mean comparison at respondent level by whether the state has fracking activity. Means are adjusted by survey weights. The last column reports p-values from an adjusted Wald test.

	n	Group means for U.S. states		p-value
		Non-fracking	Fracking	
Fracking support (January)	51	3.27	3.35	0.603
Heard about fracking	51	0.83	0.88	0.194
Technical knowledge about fracking	51	3.21	3.25	0.460
Economic knowledge about fracking	51	3.36	3.44	0.680
Environmental knowledge about fracking	51	3.55	3.74	0.186
Political salience of fracking	51	2.03	2.00	0.702

Table S4: Mean comparison at state level by whether the state has fracking activity. Means are adjusted by survey weights. The last column reports p-values from an adjusted Wald test.

S3 Responses from Amazon Mechanical Turk pre-test

Prior to fielding our pre-treatment survey and main survey experiment, we collected a convenience sample of $n = 187$ respondents on Amazon's Mechanical Turk (MTurk) from two surveys in September 2015 and December 2015. The frames we presented to respondents reflected the main arguments in the public debate on fracking in the United States at the time. Specifically, our frames against fracking focused on (i) water contamination; (ii) the uncertain consequences of fracking, including earthquakes; (iii) a diversion of investment away from renewables (only asked in the December survey); and (iv) risks to private lands. Our frames in support of fracking focused on (i) job creation, (ii) energy security, (iii) tax revenues, and (iv) lower oil and gasoline prices.

For each frame, we asked respondents whether that frame opposes or supports fracking and the strength of that frame in swaying their opinion. Since we used the same wording for each treatment text in this MTurk pre-test as in the main experiment, this exercise helps us validate our experimental survey instrument.

Frame	n	Directionality (mean)	Strength (mean)	Top rank (percent)
Anti-fracking frames				
Water	186	1.69	4.84	76%
Uncertainty	187	2.03	4.02	61%
Diversion from clean energy	86	2.09	4.24	10%
Land use	186	2.18	3.63	44%
Pro-fracking frames				
Jobs	186	5.43	4.29	36%
Energy security	184	5.39	4.09	29%
Tax revenue	186	5.18	3.87	21%
Energy prices	186	5.25	4.07	27%

Table S5: Pre-test from MTurk sample ($n = 187$). For each frame, we report the number of responses (column 2), whether respondents believe the frame opposes fracking (low values) or favors fracking (high values) on a $1 - 6$ scale (column 3), how weak (low values) or strong (high values) on a $1 - 6$ scale a frame is (column 4), and how often (in %) a frame is considered among the top three most persuasive arguments (column 5). In the "directionality" column, values closer to 6 suggest support for fracking and values closer to 1 suggest opposition towards fracking. In the "strength" column, values closer to 6 suggest a stronger frame and values closer to 1 suggest a weaker frame.

The table above reports how respondents in the pre-test scored the directionality and strength of each frame. On a scale from $1-6$, low/high values indicate opposition to/support for fracking (labeled as directionality) and denote the weakness or strength of each argument (labeled as strength), independent of its direction. We also had respondents rank all eight frames based on their persuasiveness.

It is apparent that the benefits of fracking are usually framed with reference to jobs created and to energy security. Moreover, the risks and costs of fracking are presented with reference to water contamination and uncertain environmental consequences. While the diversion argument does not rank as highly among respondents, it is relevant for the long-term transition toward a low carbon economy.

S4 Ordering effects

The treatment conditions involving counter-frames combine supporting and opposing arguments about fracking. To rule out ordering effects from showing some arguments always before others, we randomized the order in which frames are shown. For example, for the condition that was assigned to receive both the water contamination and job creation frame, half of the respondents saw the water argument followed by the job creation frame, while the other half saw the job creation frame before the water contamination frame.

Table S6 below shows the results from comparing the means of fracking support by frame order. The final two columns report p-values from two tests: a simple, two-sided t-test of means and a χ^2 test of whether the entire distribution of the 6-point fracking support variable differs systematically by frame order. We highlight statistical significance in bold and find only a single test for which the test statistic falls below the 5% significance threshold. This makes us confident to rule out the possibility of ordering effects.

			Means		p-values	
#	Condition	n	Group 1	Group 2	t-test	χ^2 test
7	Water + Jobs	117	3.21	2.92	0.268	0.841
8	Water + Energy security	123	2.69	2.49	0.435	0.743
9	Uncertainty + Jobs	124	2.95	3.26	0.277	0.132
10	Uncertainty + Energy security	121	2.80	3.35	**0.033**	0.384
11	Diversion + Jobs	139	3.07	3.26	0.487	0.575
12	Diversion + Energy security	118	2.96	2.80	0.556	0.057

Table S6: Fracking support, by frame order, for counterframe treatment conditions.

S5 Main results

This section reports our main results. Below, we show means and p-values from comparing each frame against the control group mean. We report means and significance levels without and with survey weights. We indicate statistically significant results below the 5% significance level in bold.

		Without survey weights		With survey weights	
#	Condition	Mean	p-value	Mean	p-value
1	Control	3.32	—	3.39	—
2	Water	2.42	**0.000**	2.39	**0.000**
3	Uncertainty	2.68	**0.001**	2.66	**0.029**
4	Diversion	2.77	**0.012**	2.65	**0.029**
5	Jobs	3.78	**0.034**	3.58	0.588
6	Energy security	3.75	**0.044**	3.73	0.326
7	Water + Jobs	3.07	0.212	3.39	0.981
8	Water + Energy security	2.60	**0.000**	2.57	**0.010**
9	Uncertainty + Jobs	3.09	0.270	2.90	0.102
10	Uncertainty + Energy security	3.07	0.206	2.91	0.124
11	Diversion + Jobs	3.16	0.427	2.98	0.197
12	Diversion + Energy security	2.88	**0.037**	2.76	**0.046**

Table S7: Main results for single frames and counterframes. For each frame/condition, we report means and p-values from comparing the mean against the control group mean. Values closer to 1 indicate opposition to fracking and values closer to 6 indicate support for fracking. Columns (2) and (3) report results without survey weights and columns (4)-(5) show results when survey weights are applied. We highlight statistical significance below the 5% threshold in bold.

S6 Multiple comparisons

Our study design has twelve experimental conditions. As we compare group means of each condition against the control group means, we end up with eleven comparisons; correcting p-values is advisable.

Table S8 shows corrected p-values from three popular correction methods: the Bonferroni, Bonferroni-Holm, and Benjamini-Hochberg corrections. As it is *a priori* unclear what the 'correct' correction method is, we prefer to report results from multiple ones, especially as the Bonferroni-based methods correct for the family-wise error rate, while the Benjamini-Hochberg correction corrects for the false discovery rate. The latter is often considered more lenient.

We only report multiple comparison corrections for results which are significant before the correction. We highlight statistical significance again in bold and show that levels of statistical significance do not change too much even when correcting for multiple comparisons.

			Type of p-value correction		
#	Condition	p-value	Bonferroni	Bonferroni-Holm	Benjamini-Hochberg
1	Control	—	—	—	—
2	Water	**0.000**	**0.000**	**0.000**	**0.000**
3	Uncertainty	**0.001**	**0.011**	**0.009**	**0.003**
4	Diversion	**0.012**	0.132	0.096	**0.033**
5	Jobs	**0.034**	0.374	0.238	0.067
6	Energy security	**0.044**	0.484	0.238	0.069
7	Water + Jobs	0.212	—	—	—
8	Water + Energy security	**0.000**	**0.000**	**0.000**	**0.000**
9	Uncertainty + Jobs	0.270	—	—	—
10	Uncertainty + Energy security	0.206	—	—	
11	Diversion + Jobs	0.427	—	—	—
12	Diversion + Energy security	**0.037**	0.407	0.238	0.067

Table S8: Multiple comparison p-value corrections. Column (3) shows the original p-values we report in the main text. Columns (4)-(6) report corrected p-values using the Bonferroni, Bonferroni-Holm, and Benjamini-Hochberg methods. Statistical significance at 5% level is indicated in bold.

S7 Interaction models: Fracking knowledge

In this section we show results from statistical tests of heterogeneous treatment effects. In particular, we are interested in whether fracking knowledge may condition our main results. For this, we use respondent information from our pre-experiment survey, conducted in January 2016, to ensure that these variables are truly measured pre-treatment.

We carry out two distinct tests: First, we use respondent information on self-reported fracking knowledge as a conditioning variable to proxy for information levels about fracking. Second, we use non-response or "Don't know" information from the pre-experiment survey to construct a measure for lacking information. We discuss and present results from these two tests in turn.

Test 1: Conditioning effect of high knowledge

The first conditioning variable we use comes from three questions about fracking knowledge from the pre-experiment survey. Specifically, we asked respondents about their familiarity with the technical details of fracking as well as their familiarity with environmental and economic arguments on the issue. Respondents could answer on a $1-6$ scale, ranging from "very unfamiliar" to "very familiar." We aggregate information from these three survey questions into a new variable of overall fracking knowledge. A respondent is coded as having "high knowledge" if they reported familiarity scores of at least 5 in all three familiarity questions; "low knowledge" respondents are those with scores of less than 2 throughout; all others fall in a medium category.

To facilitate the direct interpretation of the interaction effects, we recode our conditioning variables into binary variables to contrast treatment effects for those with high knowledge against those with medium or low levels.

We also show a more complete interaction model that includes various other control variables: whether a respondent has already formed an opinion on fracking (3 levels); a respondent's assessment of their economic situation (5 levels); a respondent's view towards global warming (4 levels); a respondent's age (continuous) and gender (2 levels); whether the respondent identifies as Republican (binary) or Democrat (binary); a respondent's household income (6 levels); how politically interested the respondent is (4 levels); and whether the respondent lives in a state with fracking

activity (binary), coded as a US state with shale oil or gas production in 2016, according to U.S. Energy Information Administration data. All models include state fixed effects and robust standard errors.

In general, we find virtually no evidence of any statistically significant interaction effects, let alone any systematic effects. This is the case when we use the above described index variable of knowledge across technical, economic, and environmental dimensions of fracking as well as when we use self-reported knowledge on these dimensions separately.

	(1) Model		(2) Model		(3) Model	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Water	-0.881***	0.212	-0.719***	0.239	-0.549**	0.215
Uncertainty	-0.892***	0.207	-0.884***	0.225	-0.494**	0.221
Diversion	-0.569**	0.235	-0.564**	0.258	-0.037	0.254
Jobs	0.468**	0.233	0.543**	0.256	0.452**	0.228
Energy security	0.518**	0.229	0.508*	0.262	0.730***	0.235
Water+Jobs	-0.206	0.221	-0.195	0.247	0.013	0.210
Water+Energy security	-0.901***	0.222	-0.801***	0.232	-0.278	0.217
Uncertainty+Jobs	-0.252	0.221	-0.203	0.238	0.149	0.226
Uncertainty+Energy security	-0.120	0.224	-0.033	0.252	0.253	0.221
Diversion+Jobs	-0.182	0.220	-0.251	0.239	-0.093	0.212
Diversion+Energy security	-0.225	0.234	-0.130	0.253	0.187	0.206
High knowledge	0.016	0.602	0.176	0.578	0.400	0.453
Water × High knowledge	0.299	0.754	0.277	0.738	0.531	0.639
Uncertainty × High knowledge	1.043	0.746	1.002	0.744	0.383	0.591
Diversion × High knowledge	0.147	0.874	0.145	0.869	-0.574	0.597
Jobs × High knowledge	0.076	0.805	-0.186	0.756	-0.289	0.571
Energy security × High knowledge	-0.466	0.889	-0.889	0.829	-1.194*	0.697
Water+Jobs × High knowledge	0.434	0.748	0.474	0.715	0.563	0.608
Water+Energy security × High knowledge	1.495*	0.798	1.062	0.848	0.358	0.654
Uncertainty+Jobs × High knowledge	0.662	0.822	0.620	0.809	0.265	0.756
Uncertainty+Energy security × High knowledge	-0.059	0.776	0.056	0.796	-0.458	0.614
Diversion+Jobs × High knowledge	0.487	0.778	0.556	0.750	-0.155	0.623
Diversion+Energy security × High knowledge	-1.034	0.779	-1.120	0.787	-0.953	0.645
Saliency of fracking			-0.625***	0.074	-0.151**	0.076
Opinion strength about fracking					-0.381***	0.081
Economic conditions overall					-0.105	0.069
Global warming views					-0.648***	0.058
Age					0.005	0.003
Female					-0.185*	0.095
Republican					0.315**	0.137
Democrat					-0.603***	0.122
Household income					0.069**	0.033
Political interest					0.162**	0.069
Fracking state					3.033***	0.533
Observations	1278		1036		752	

Dependent Variable: Fracking support (1-6 scale). Higher values indicate more support for fracking.
All models with state fixed effects and robust standard errors.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table S9: Regression results from interaction models when overall fracking knowledge is the conditioning variable. Negative values indicate a reduction in support for fracking and positive values indicate an increase in support for fracking.

	(1) Model		(2) Model		(3) Model	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Water	-1.034***	0.210	-0.856***	0.239	-0.644***	0.218
Uncertainty	-1.052***	0.207	-1.045***	0.228	-0.613***	0.230
Diversion	-0.688***	0.234	-0.684***	0.258	-0.145	0.257
Jobs	0.332	0.232	0.401	0.258	0.372	0.237
Energy security	0.419*	0.226	0.403	0.262	0.655***	0.240
Water+Jobs	-0.323	0.222	-0.325	0.252	-0.081	0.219
Water+Energy security	-1.006***	0.217	-0.934***	0.232	-0.394*	0.220
Uncertainty+Jobs	-0.463**	0.223	-0.454*	0.241	-0.050	0.240
Uncertainty+Energy security	-0.235	0.224	-0.134	0.257	0.255	0.227
Diversion+Jobs	-0.346	0.221	-0.451*	0.240	-0.212	0.220
Diversion+Energy security	-0.369	0.232	-0.279	0.253	0.084	0.212
High technical knowledge	-0.617	0.510	-0.414	0.489	-0.044	0.382
Water × High technical knowledge	0.877	0.672	0.770	0.660	0.898	0.570
Uncertainty × High technical knowledge	1.612**	0.641	1.486**	0.643	0.827	0.529
Diversion × High technical knowledge	0.756	0.813	0.706	0.811	-0.119	0.538
Jobs × High technical knowledge	0.627	0.699	0.301	0.669	0.033	0.503
Energy security × High technical knowledge	0.023	0.783	-0.399	0.716	-0.853	0.610
Water+Jobs × High technical knowledge	0.782	0.656	0.830	0.637	0.836	0.534
Water+Energy security × High technical knowledge	1.820**	0.737	1.454*	0.759	0.807	0.613
Uncertainty+Jobs × High technical knowledge	1.470**	0.666	1.427**	0.672	0.774	0.584
Uncertainty+Energy security × High technical knowledge	0.423	0.675	0.336	0.685	-0.426	0.533
Diversion+Jobs × High technical knowledge	1.174*	0.679	1.347**	0.666	0.331	0.569
Diversion+Energy security × High technical knowledge	-0.407	0.711	-0.532	0.722	-0.524	0.601
Saliency of fracking			-0.625***	0.074	-0.154**	0.077
Opinion strength about fracking					-0.366***	0.081
Economic conditions overall					-0.109	0.069
Global warming views					-0.649***	0.058
Age					0.005	0.003
Female					-0.201**	0.095
Republican					0.319**	0.135
Democrat					-0.584***	0.121
Household income					0.070**	0.033
Political interest					0.158**	0.069
Fracking state					2.955***	0.545
Observations	1292		1045		756	

Dependent Variable: Fracking support (1-6 scale). Higher values indicate more support for fracking.
All models with state fixed effects and robust standard errrors.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table S10: Regression results from interaction models when technical fracking knowledge is the conditioning variable. Negative values indicate a reduction in support for fracking and positive values indicate an increase in support for fracking.

	(1) Model		(2) Model		(3) Model	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Water	-0.957***	0.219	-0.745***	0.248	-0.670***	0.228
Uncertainty	-0.829***	0.216	-0.759***	0.234	-0.478**	0.226
Diversion	-0.564**	0.246	-0.551**	0.269	-0.114	0.263
Jobs	0.333	0.249	0.426	0.285	0.283	0.263
Energy security	0.570**	0.238	0.567**	0.273	0.643**	0.252
Water+Jobs	-0.197	0.235	-0.151	0.267	0.042	0.237
Water+Energy security	-0.793***	0.237	-0.642***	0.247	-0.191	0.239
Uncertainty+Jobs	-0.224	0.233	-0.167	0.252	0.087	0.247
Uncertainty+Energy security	-0.178	0.235	-0.098	0.270	0.084	0.236
Diversion+Jobs	-0.217	0.229	-0.305	0.248	-0.280	0.222
Diversion+Energy security	-0.223	0.250	-0.122	0.282	0.120	0.232
High economic knowledge	0.201	0.425	0.363	0.409	0.296	0.325
Water × High economic knowledge	0.362	0.558	0.257	0.559	0.676	0.471
Uncertainty × High economic knowledge	0.366	0.587	0.239	0.594	0.235	0.517
Diversion × High economic knowledge	0.052	0.622	0.076	0.624	-0.105	0.496
Jobs × High economic knowledge	0.334	0.558	0.093	0.553	0.120	0.450
Energy security × High economic knowledge	-0.568	0.657	-0.684	0.649	-0.399	0.561
Water+Jobs × High economic knowledge	0.169	0.539	0.138	0.535	0.167	0.465
Water+Energy security × High economic knowledge	0.435	0.614	0.132	0.629	-0.113	0.479
Uncertainty+Jobs × High economic knowledge	0.087	0.577	0.083	0.584	0.234	0.521
Uncertainty+Energy security × High economic knowledge	0.069	0.555	0.135	0.564	0.225	0.454
Diversion+Jobs × High economic knowledge	0.293	0.563	0.415	0.557	0.351	0.471
Diversion+Energy security × High economic knowledge	-0.597	0.575	-0.636	0.572	-0.344	0.460
Saliency of fracking			-0.629***	0.075	-0.156**	0.076
Opinion strength about fracking					-0.430***	0.083
Economic conditions overall					-0.109	0.070
Global warming views					-0.640***	0.059
Age					0.005	0.003
Female					-0.206**	0.095
Republican					0.327**	0.135
Democrat					-0.600***	0.121
Household income					0.061*	0.033
Political interest					0.131*	0.069
Fracking state					3.010***	0.508
Observations	1286		1043		756	

Dependent Variable: Fracking support (1-6 scale). Higher values indicate more support for fracking.
All models with state fixed effects and robust standard errors.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table S11: Regression results from interaction models when economic fracking knowledge is the conditioning variable. Negative values indicate a reduction in support for fracking and positive values indicate an increase in support for fracking.

	(1) Model		(2) Model		(3) Model	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Water	-1.188***	0.223	-0.947***	0.268	-0.786***	0.250
Uncertainty	-1.089***	0.224	-1.063***	0.254	-0.624**	0.256
Diversion	-0.858***	0.249	-0.786***	0.288	-0.234	0.288
Jobs	0.218	0.239	0.297	0.279	0.322	0.269
Energy security	0.443*	0.235	0.492*	0.282	0.575**	0.254
Water+Jobs	-0.358	0.238	-0.289	0.286	-0.112	0.262
Water+Energy security	-0.922***	0.251	-0.771***	0.273	-0.244	0.270
Uncertainty+Jobs	-0.483**	0.239	-0.449*	0.268	-0.014	0.275
Uncertainty+Energy security	-0.239	0.236	-0.170	0.280	0.226	0.253
Diversion+Jobs	-0.361	0.236	-0.441	0.270	-0.290	0.255
Diversion+Energy security	-0.436*	0.252	-0.287	0.290	0.009	0.245
High environmental knowledge	-0.870**	0.368	-0.580	0.371	-0.105	0.308
Water × High environmental knowledge	1.018**	0.493	0.682	0.512	0.776*	0.451
Uncertainty × High environmental knowledge	0.967**	0.486	0.866*	0.499	0.481	0.445
Diversion × High environmental knowledge	0.868	0.544	0.568	0.547	0.206	0.468
Jobs × High environmental knowledge	0.703	0.527	0.489	0.529	0.101	0.432
Energy security × High environmental knowledge	-0.154	0.551	-0.417	0.550	-0.164	0.505
Water+Jobs × High environmental knowledge	0.399	0.483	0.301	0.500	0.496	0.438
Water+Energy security × High environmental knowledge	0.612	0.489	0.327	0.500	-0.059	0.439
Uncertainty+Jobs × High environmental knowledge	0.788	0.501	0.699	0.512	0.325	0.473
Uncertainty+Energy security × High environmental knowledge	0.199	0.488	0.209	0.518	-0.258	0.428
Diversion+Jobs × High environmental knowledge	0.666	0.499	0.639	0.511	0.279	0.436
Diversion+Energy security × High environmental knowledge	0.011	0.516	-0.223	0.526	-0.057	0.438
Saliency of fracking			-0.569***	0.077	-0.130*	0.077
Opinion strength about fracking					-0.403***	0.085
Economic conditions overall					-0.095	0.070
Global warming views					-0.652***	0.059
Age					0.005	0.003
Female					-0.237**	0.096
Republican					0.315**	0.137
Democrat					-0.611***	0.123
Household income					0.073**	0.034
Political interest					0.159**	0.069
Fracking state					3.033***	0.587
Observations	1295		1050		760	

Dependent Variable: Fracking support (1-6 scale). Higher values indicate more support for fracking.
All models with state fixed effects and robust standard errors.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table S12: Regression results from interaction models when environmental fracking knowledge is the conditioning variable. Negative values indicate a reduction in support for fracking and positive values indicate an increase in support for fracking.

Test 2: Conditioning effect of no knowledge

As an alternative test of how information may condition the main experimental results, we use evidence for the lack of knowledge. Among the respondents in our main experiment, only 237 (out of 1525, 15.5%) reported not having heard of fracking, so the topic *per se* was well known among most respondents. Having heard of fracking, as we show in the discussion of our pre-experiment survey, does not translate into robust knowledge of the topic.

We, therefore, constructed a more useful measure. To do so, we used information from the pre-experiment survey's open-ended responses. We asked respondents to name what they think represents the strongest argument in favor of or against fracking. We then coded each respondent who did not provide an answer to both of these questions as having "low prior knowledge" on fracking. This leaves us with a higher share of more than a quarter of respondents with little-to-no fracking knowledge. This binary variable serves as a conditioning variable in the same model specifications as reported above.

We do not find any systematic effects of lacking prior knowledge of a specific argument about fracking. Hence, there is no evidence that respondents with no prior knowledge are more responsive to our treatment effects.

	(1) Model		(2) Model		(3) Model	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Water	-0.748***	0.233	-0.675***	0.240	-0.470**	0.218
Uncertainty	-0.694***	0.233	-0.730***	0.236	-0.430**	0.216
Diversion	-0.553**	0.254	-0.572**	0.259	-0.195	0.235
Jobs	0.487*	0.257	0.479*	0.260	0.259	0.217
Energy security	0.476*	0.265	0.444	0.277	0.471*	0.247
Water+Jobs	-0.188	0.239	-0.080	0.242	0.229	0.218
Water+Energy security	-0.671***	0.239	-0.630***	0.241	-0.279	0.218
Uncertainty+Jobs	-0.168	0.240	-0.140	0.246	0.143	0.234
Uncertainty+Energy security	-0.106	0.251	-0.066	0.259	0.023	0.213
Diversion+Jobs	-0.108	0.238	-0.130	0.245	-0.180	0.215
Diversion+Energy security	-0.293	0.252	-0.248	0.258	0.046	0.209
No prior knowledge	0.309	0.316	0.566	0.445	0.004	0.471
Water × No prior knowledge	-0.638	0.417	-0.622	0.762	0.196	0.684
Uncertainty × No prior knowledge	0.124	0.442	0.146	0.615	0.310	0.593
Diversion × No prior knowledge	0.092	0.455	1.086	0.677	0.849	0.718
Jobs × No prior knowledge	-0.197	0.437	-0.312	0.639	0.853	0.688
Energy security × No prior knowledge	-0.172	0.428	-0.507	0.590	0.419	0.604
Water+Jobs × No prior knowledge	-0.268	0.423	-0.416	0.883	-0.850	0.691
Water+Energy security × No prior knowledge	-0.124	0.433	-0.147	0.609	1.022	0.873
Uncertainty+Jobs × No prior knowledge	-0.185	0.467	-0.613	0.777	0.292	0.766
Uncertainty+Energy security × No prior knowledge	-0.248	0.406	-0.079	0.633	1.346**	0.645
Diversion+Jobs × No prior knowledge	-0.040	0.416	-0.810	0.604	0.354	0.663
Diversion+Energy security × No prior knowledge	-0.257	0.451	-1.226	0.932	-0.600	0.776
Saliency of fracking			-0.594***	0.075	-0.132*	0.077
Opinion strength about fracking					-0.324***	0.084
Economic conditions overall					-0.074	0.069
Global warming views					-0.659***	0.059
Age					0.004	0.003
Female					-0.245***	0.094
Republican					0.320**	0.136
Democrat					-0.608***	0.121
Household income					0.077**	0.033
Political interest					0.170**	0.066
Fracking state					3.367***	0.559
Observations	1442		1071		769	

Dependent Variable: Fracking support (1-6 scale). Higher values indicate more support for fracking.
All models with state fixed effects and robust standard errors.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table S13: Regression results from interaction models when lack of fracking knowledge is the conditioning variable. Negative values indicate a reduction in support for fracking and positive values indicate an increase in support for fracking.

S8 Interaction models: Congruent information

Our fourth hypothesis expects that *congruent* information conditions the effectiveness of frames and counter-frames. For this, we again relied on information provided by responses to open-ended questions in the pre-experiment survey. We simply assessed whether the effectiveness of frames and counter-frames that, for instance, involve the water frame increased among respondents who mentioned water contamination as the strongest argument against fracking in the pre-experiment survey.

This is what we refer to as congruent information. Since only six respondents named the diversion argument in the open-ended responses, we cannot run interaction models with those respondents included, but we can for all other four main frames. We kept all other specifications exactly the same as above, i.e., we included the same set of covariates and include state fixed effects.

From these additional models, we found that congruent information can condition the effectiveness of framing effects, at least for the water frame. We found that respondents who mentioned water contamination from fracking in their open-ended responses do show less support for fracking when they are presented with a water frame. Interestingly, these respondents also showed less favorable attitudes toward fracking across many other frames as well. This could suggest that when respondents who already hold concerns against fracking are presented with additional anti-fracking arguments (either as single frames or counter-frames), this amplifies their opposition against fracking. Here, information would be congruent in terms of offering additional anti-fracking arguments rather than exactly the same argument.

This effect is only present for the water frame pre-treatment information, but no such effects occur with any of the other pre-treatment arguments, either the anti-fracking or pro-fracking ones.

	(1) Model		(2) Model		(3) Model	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Water	-0.851**	0.428	0.388	0.648	0.910	0.659
Uncertainty	-1.121***	0.383	-0.603	0.518	0.311	0.519
Diversion	-0.791*	0.435	-0.437	0.627	0.436	0.518
Jobs	0.205	0.402	0.482	0.549	0.778	0.626
Energy security	0.623	0.403	0.967	0.592	1.937***	0.564
Water+Jobs	0.163	0.408	0.810	0.663	0.092	0.546
Water+Energy security	-0.762*	0.403	-0.300	0.559	0.689	0.590
Uncertainty+Jobs	-0.402	0.458	0.403	0.643	1.632**	0.678
Uncertainty+Energy security	-0.129	0.375	0.535	0.551	1.086**	0.538
Diversion+Jobs	0.123	0.431	0.341	0.609	0.784	0.608
Diversion+Energy security	-0.521	0.417	-0.293	0.553	0.182	0.650
Pre-treatment: Water	0.116	0.629	0.793	0.718	0.816	0.593
Water × Pre-treatment: Water	-0.357	0.767	-1.533	0.952	-1.429	0.902
Uncertainty × Pre-treatment: Water	0.098	0.806	-0.430	0.948	-1.127	0.741
Diversion × Pre-treatment: Water	-0.241	0.776	-1.122	0.914	-0.992	0.730
Jobs × Pre-treatment: Water	0.248	0.774	-0.611	0.890	-1.196	0.788
Energy security × Pre-treatment: Water	-0.992	0.783	-1.748*	0.933	-1.823**	0.825
Water+Jobs × Pre-treatment: Water	-0.574	0.768	-1.454	0.937	-0.524	0.771
Water+Energy security × Pre-treatment: Water	-0.127	0.820	-0.819	0.954	-1.011	0.796
Uncertainty+Jobs × Pre-treatment: Water	-0.177	0.777	-1.150	0.925	-2.377***	0.905
Uncertainty+Energy security × Pre-treatment: Water	-0.858	0.760	-1.600*	0.878	-1.595**	0.757
Diversion+Jobs × Pre-treatment: Water	-0.429	0.791	-1.030	0.941	-1.407*	0.807
Diversion+Energy security × Pre-treatment: Water	-0.086	0.802	-0.652	0.914	-0.623	0.809
Overall knowledge of fracking			0.128	0.193	0.347*	0.193
Saliency of fracking			-0.663***	0.133	-0.064	0.162
Opinion strength about fracking					-0.611***	0.156
Economic conditions overall					-0.384***	0.123
Global warming views					-0.480***	0.114
Age					0.000	0.006
Female					-0.406**	0.182
Republican					0.676**	0.312
Democrat					-0.473**	0.206
Household income					0.104*	0.059
Political interest					0.094	0.126
Fracking state					2.673**	1.164
Observations	552		379		282	

Dependent Variable: Fracking support (1-6 scale). Higher values indicate more support for fracking.
All models with state fixed effects and robust standard errors.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table S14: Regression results from interaction models when pre-treatment open-ended responses mentioning water is a conditioning variable. Negative values indicate a reduction in support for fracking and positive values indicate an increase in support for fracking.

	(1) Model		(2) Model		(3) Model	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Water	-0.985**	0.409	-0.130	0.637	0.643	0.654
Uncertainty	-0.892**	0.405	-0.338	0.600	0.086	0.506
Diversion	-0.581	0.425	-0.635	0.588	0.134	0.530
Jobs	0.505	0.405	0.462	0.550	0.750	0.531
Energy security	0.551	0.362	0.561	0.557	1.675***	0.523
Water+Jobs	0.136	0.374	0.429	0.535	0.262	0.450
Water+Energy security	-0.667*	0.404	-0.427	0.646	0.392	0.508
Uncertainty+Jobs	-0.374	0.435	0.176	0.583	0.125	0.496
Uncertainty+Energy security	-0.453	0.371	-0.266	0.606	0.281	0.485
Diversion+Jobs	0.323	0.408	0.456	0.583	0.388	0.559
Diversion+Energy security	-0.108	0.434	-0.025	0.662	0.273	0.544
Pre-treatment: Uncertainty	0.219	0.649	0.430	0.721	0.666	0.755
Water × Pre-treatment: Uncertainty	-0.066	0.785	-0.629	0.932	-0.970	0.980
Uncertainty × Pre-treatment: Uncertainty	-0.471	0.798	-0.816	0.896	-0.515	0.879
Diversion × Pre-treatment: Uncertainty	-0.959	0.771	-0.752	0.874	-0.425	0.863
Jobs × Pre-treatment: Uncertainty	-0.514	0.808	-0.550	0.893	-1.135	0.924
Energy security × Pre-treatment: Uncertainty	-1.299	0.954	-1.120	1.038	-1.708*	0.945
Water+Jobs × Pre-treatment: Uncertainty	-0.930	0.846	-1.041	0.941	-0.631	0.909
Water+Energy security × Pre-treatment: Uncertainty	-0.294	0.811	-0.452	0.939	-0.496	0.878
Uncertainty+Jobs × Pre-treatment: Uncertainty	-0.245	0.796	-0.690	0.931	0.137	1.095
Uncertainty+Energy security × Pre-treatment: Uncertainty	0.136	0.799	0.155	0.929	0.013	0.912
Diversion+Jobs × Pre-treatment: Uncertainty	-1.042	0.812	-1.299	0.934	-0.799	0.965
Diversion+Energy security × Pre-treatment: Uncertainty	-1.029	0.810	-1.034	0.982	-0.758	0.918
Overall knowledge of fracking			0.122	0.191	0.285	0.198
Saliency of fracking			-0.700***	0.131	-0.058	0.163
Opinion strength about fracking					-0.650***	0.171
Economic conditions overall					-0.341***	0.125
Global warming views					-0.499***	0.119
Age					-0.000	0.007
Female					-0.383**	0.187
Republican					0.666*	0.338
Democrat					-0.488**	0.205
Household income					0.120*	0.062
Political interest					0.156	0.131
Fracking state					3.029***	0.913
Observations	552		379		282	

Dependent Variable: Fracking support (1-6 scale). Higher values indicate more support for fracking.
All models with state fixed effects and robust standard errors.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table S15: Regression results from interaction models when pre-treatment open-ended responses mentioning uncertain consequences is the conditioning variable. Negative values indicate a reduction in support for fracking and positive values indicate an increase in support for fracking.

	(1) Model		(2) Model		(3) Model	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Water	-1.325***	0.284	-0.946***	0.347	-0.637*	0.342
Uncertainty	-1.038***	0.286	-1.093***	0.326	-0.439	0.364
Diversion	-0.763**	0.315	-0.652*	0.363	-0.307	0.372
Jobs	0.115	0.315	0.161	0.374	0.249	0.308
Energy security	0.256	0.301	0.079	0.362	0.563	0.354
Water+Jobs	-0.044	0.289	0.004	0.366	-0.084	0.324
Water+Energy security	-0.692**	0.308	-0.680*	0.348	-0.214	0.298
Uncertainty+Jobs	-0.185	0.277	0.164	0.303	0.207	0.304
Uncertainty+Energy security	-0.050	0.298	0.343	0.358	0.277	0.301
Diversion+Jobs	-0.180	0.292	-0.214	0.334	-0.053	0.341
Diversion+Energy security	-0.411	0.304	-0.248	0.361	-0.075	0.326
Pre-treatment: Jobs	-0.427	0.627	-0.558	0.644	-0.185	0.460
Water × Pre-treatment: Jobs	1.628*	0.987	1.588	1.077	1.895***	0.585
Uncertainty × Pre-treatment: Jobs	-0.183	0.732	-0.081	0.777	-0.395	0.708
Diversion × Pre-treatment: Jobs	-0.490	0.977	-0.310	0.990	-0.027	0.595
Jobs × Pre-treatment: Jobs	0.681	0.911	0.683	0.959	0.638	0.755
Energy security × Pre-treatment: Jobs	1.166	0.952	1.619*	0.894	1.124*	0.622
Water+Jobs × Pre-treatment: Jobs	-0.213	0.721	0.058	0.747	-0.260	0.614
Water+Energy security × Pre-treatment: Jobs	0.107	0.941	0.491	1.086	-0.544	0.900
Uncertainty+Jobs × Pre-treatment: Jobs	0.531	0.961	0.240	0.912	0.458	0.985
Uncertainty+Energy security × Pre-treatment: Jobs	-0.558	0.995	-0.856	1.075	0.249	0.560
Diversion+Jobs × Pre-treatment: Jobs	0.039	0.831	0.085	0.865	0.148	0.625
Diversion+Energy security × Pre-treatment: Jobs	-1.753**	0.702	-1.761**	0.751	-1.737**	0.726
Overall knowledge of fracking			0.376**	0.165	0.368**	0.174
Saliency of fracking			-0.485***	0.106	-0.080	0.112
Opinion strength about fracking					-0.225*	0.130
Economic conditions overall					-0.119	0.107
Global warming views					-0.614***	0.086
Age					0.004	0.005
Female					-0.148	0.145
Republican					0.529***	0.196
Democrat					-0.445**	0.193
Household income					0.066	0.055
Political interest					0.083	0.107
Fracking state					2.116***	0.706
Observations	716		535		405	

Dependent Variable: Fracking support (1-6 scale). Higher values indicate more support for fracking.
All models with state fixed effects and robust standard errors.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table S16: Regression results from interaction models when pre-treatment open-ended responses mentioning job creation is the conditioning variable. Negative values indicate a reduction in support for fracking and positive values indicate an increase in support for fracking.

	(1) Model		(2) Model		(3) Model	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Water	-1.481***	0.382	-1.117**	0.528	-0.695	0.445
Uncertainty	-1.220***	0.340	-1.345***	0.475	-0.533	0.338
Diversion	-1.015***	0.367	-1.020**	0.467	-0.843**	0.402
Jobs	0.160	0.425	0.188	0.557	0.571	0.471
Energy security	0.539	0.393	0.535	0.543	0.830*	0.491
Water+Jobs	-0.120	0.393	-0.144	0.710	-0.670*	0.381
Water+Energy security	-0.892**	0.384	-0.605	0.520	0.032	0.446
Uncertainty+Jobs	-0.367	0.404	0.355	0.523	0.510	0.499
Uncertainty+Energy security	-0.318	0.372	0.220	0.542	0.345	0.416
Diversion+Jobs	-0.262	0.380	-0.318	0.530	-0.071	0.451
Diversion+Energy security	-0.835**	0.376	-1.096**	0.515	-0.589	0.480
Pre-treatment: Energy security	0.174	0.403	0.279	0.475	0.450	0.350
Water × Pre-treatment: Energy security	0.668	0.561	0.627	0.696	0.324	0.621
Uncertainty × Pre-treatment: Energy security	0.326	0.538	0.390	0.635	0.008	0.584
Diversion × Pre-treatment: Energy security	0.630	0.606	0.795	0.686	1.106*	0.617
Jobs × Pre-treatment: Energy security	0.079	0.588	0.112	0.691	-0.358	0.582
Energy security × Pre-treatment: Energy security	-0.359	0.569	-0.463	0.699	-0.336	0.653
Water+Jobs × Pre-treatment: Energy security	0.139	0.542	0.193	0.808	0.581	0.536
Water+Energy security × Pre-treatment: Energy security	0.529	0.592	0.031	0.677	-0.463	0.565
Uncertainty+Jobs × Pre-treatment: Energy security	0.443	0.540	-0.233	0.634	-0.383	0.618
Uncertainty+Energy security × Pre-treatment: Energy security	0.682	0.568	0.275	0.703	-0.098	0.516
Diversion+Jobs × Pre-treatment: Energy security	0.160	0.563	0.203	0.676	0.072	0.568
Diversion+Energy security × Pre-treatment: Energy security	0.420	0.586	0.863	0.689	0.403	0.620
Overall knowledge of fracking			0.331**	0.162	0.363**	0.165
Saliency of fracking			-0.496***	0.106	-0.047	0.112
Opinion strength about fracking					-0.321***	0.123
Economic conditions overall					-0.081	0.105
Global warming views					-0.635***	0.084
Age					0.004	0.005
Female					-0.155	0.145
Republican					0.502***	0.191
Democrat					-0.350*	0.189
Household income					0.045	0.053
Political interest					0.056	0.110
Fracking state					1.999***	0.633
Observations	716		535		405	

Dependent Variable: Fracking support (1-6 scale). Higher values indicate more support for fracking.
All models with state fixed effects and robust standard errors.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table S17: Regression results from interaction models when pre-treatment open-ended responses mentioning energy security is the conditioning variable. Negative values indicate a reduction in support for fracking and positive values indicate an increase in support for fracking.