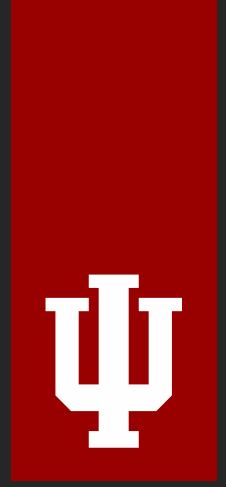

INDIANA UNIVERSITY BLOOMINGTON

# Are all electrons the same? Evaluating support for local transmission lines through a survey experiment

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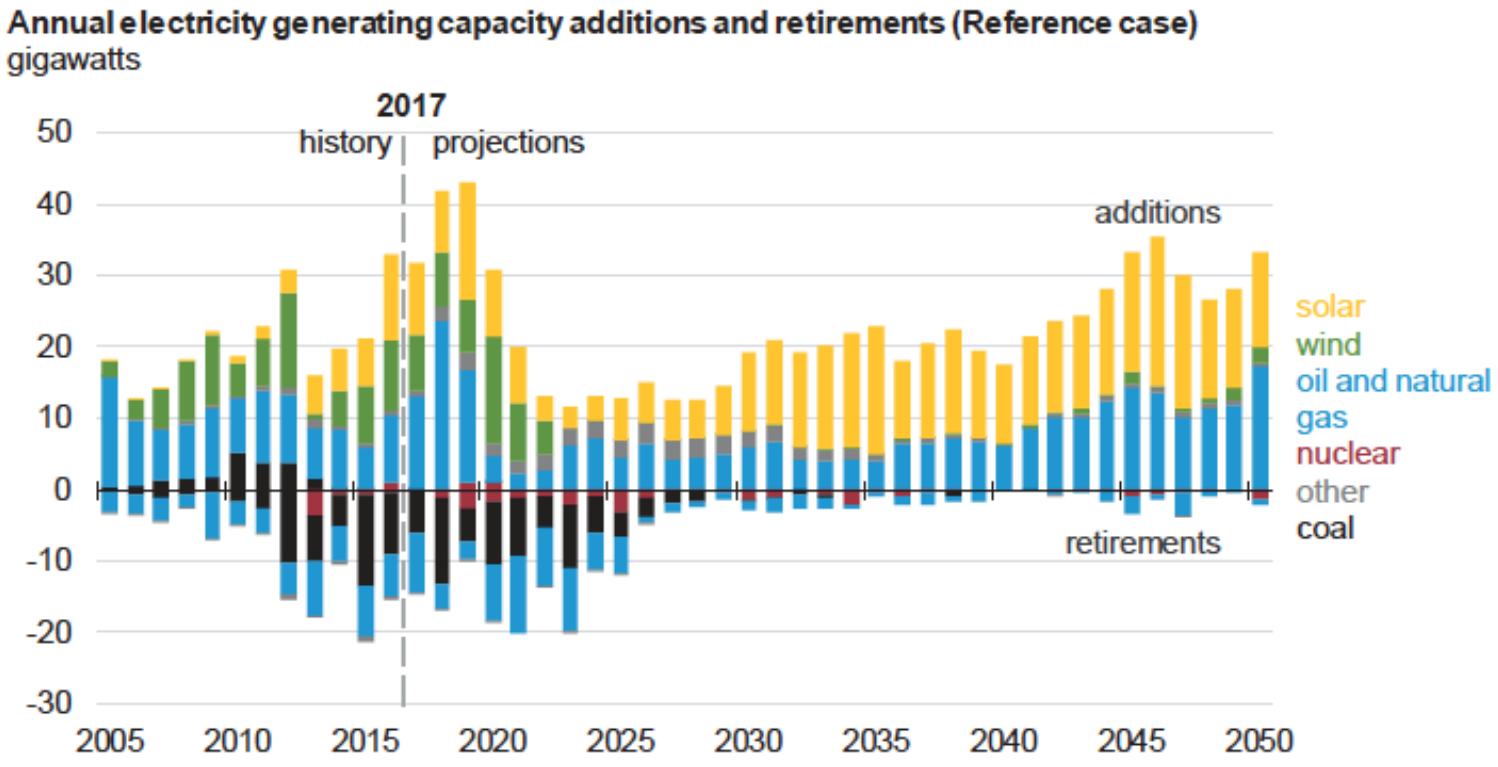
We gratefully acknowledge the support of the Alfred P. Sloan Foundation

# Most of the approximately 640,000 miles of high-voltage transmission lines in the U.S. were built in the 1950s or 1960s, and designed to last about 50 years

# Planned Energy Builds

1,022 new renewable generators and 421 natural gas generators planned for construction between 2017 and 2021 (U.S. EIA 2017)




(U.S. EIA, 2018)

# Public Opposition to Infrastructure Siting


# Local Opposition to Infrastructure Siting


# What Explains Public Opposition?

- **Place attachment** (Devine-Wright 2009; Cain and Nelson 2013; Devine-Wright 2012 )
- **Prior familiarity**/views about an energy technology (Joe et al. 2016; Ansolabehere and Konisky 2009)
- **Personal** views, demographic attributes, or environmental beliefs (Carlisle and Smith 2005; Carley et al. 2012; Ansolabehere and Konisky 2009; Axsen and Kurani 2013; Laroache et al. 2001; Hansla 2011)
- **Risk aversion** and perceptions of project risk (Cain and Nelson 2013; Groothuis and Miller 1997)
- **Trust** in government or industry (Devine-Wright 2012; Midden and Huijts 2009; Groothuis and Miller 1997)

➢ Importance of **project attributes**, as communicated or understood by an individual, trigger feelings about a specific technology, and lead one to attribute more or less risk to the project based on intuitive, automatic reasoning?

Some evidence: Devine-Wright 2012; Upham and Shackley 2006; Ansolabehere and Konisky 2009

# Research Question

Does knowing the source of electricity that is carried in transmission lines—specifically, renewables, natural gas, or coal—affect individuals' level of support for line construction near their home?

# Research Design

- Embedded survey experiment
- Online survey administered by YouGov in October 2017
- Nationally representative sample
- n=2,000

# Experiment

**1**

*"To meet growing electricity demand in your community, it will be necessary to build new transmission lines in your area that connect to new sources of electricity generation."*

**2**

| Control | Treatment 1: Renewable Energy | Treatment 2: Natural Gas | Treatment 3: Coal |
|---|---|---|---|
| | *"These new sources consist of solar and wind farms that have been built to generate electricity."* | *"These new sources consist of natural gas plants that have been built to generate electricity."* | *"These new sources consist of coal plants that have been built to generate electricity."* |

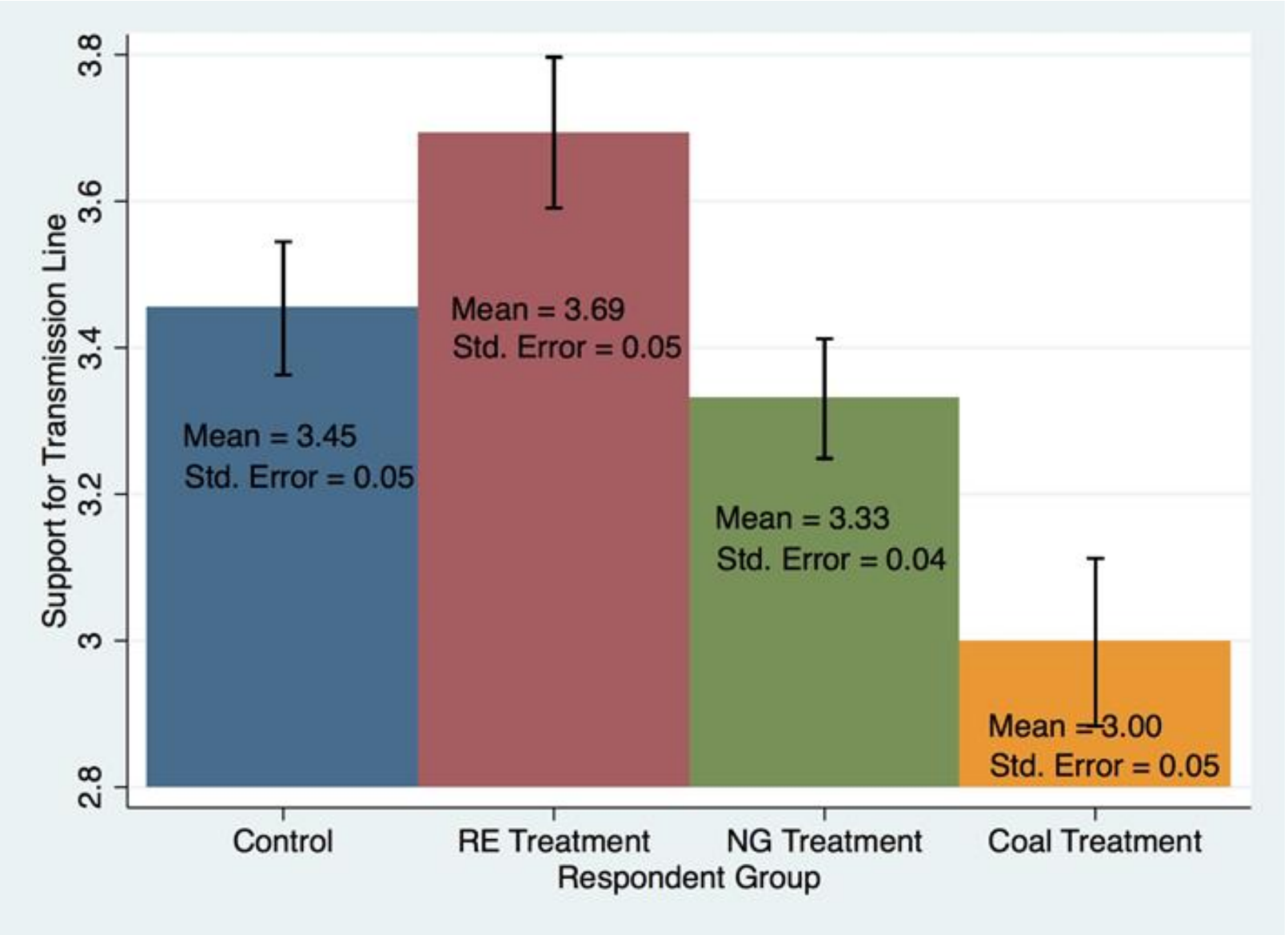
**3**

*"Would you support or oppose a decision to build these transmission lines to connect these new sources of electricity?"* [Likert Scale Response from 1=Strongly Oppose to 5=Strongly Support]

# Balanced Groups

| | Control Group | | | Renewable Energy Treatment | | | Natural Gas Treatment | | | Coal Treatment | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Obs | Mean | Std. Dev. | Obs | Mean | Std. Dev. | Obs | Mean | Std. Dev. | Obs | Mean | Std. Dev. |
| Age | 498 | 50.16 | 16.47 | 500 | 51.34 | 6.10 | 500 | 49.12 | 17.60 | 502 | 50.96 | 17.39 |
| Female | 498 | 0.53 | 0.50 | 500 | 0.59 | 0.49 | 500 | 0.55 | 0.50 | 502 | 0.56 | 0.50 |
| Minority | 498 | 0.32 | 0.47 | 500 | 0.34 | 0.47 | 500 | 0.34 | 0.47 | 502 | 0.34 | 0.48 |
| Married | 498 | 0.58 | 0.50 | 500 | 0.57 | 0.49 | 499 | 0.54 | 0.50 | 501 | 0.56 | 0.50 |
| Children <18 | 495 | 0.24 | 0.43 | 498 | 0.24 | 0.43 | 497 | 0.27 | 0.45 | 497 | 0.26 | 0.44 |
| Family Income | 437 | 6.03 | 3.29 | 425 | 6.17 | 3.52 | 433 | 6.07 | 3.38 | 442 | 5.97 | 3.26 |
| Democrat | 498 | 0.47 | 0.50 | 500 | 0.47 | 0.50 | 500 | 0.43 | 0.50 | 502 | 0.51 | 0.50 |
| Republican | 498 | 0.34 | 0.47 | 500 | 0.33 | 0.47 | 500 | 0.37 | 0.48 | 502 | 0.30 | 0.46 |
| Independent | 498 | 0.19 | 0.39 | 500 | 0.20 | 0.40 | 500 | 0.19 | 0.39 | 502 | 0.19 | 0.40 |

# Results


Support for Transmission Line
2.8
3
3.2
3.4
3.6
3.8
Mean = 3.45
Std. Error = 0.05
Mean = 3.69
Std. Error = 0.05
Mean = 3.33
Std. Error = 0.04
Mean = 3.00
Std. Error = 0.05
Control
RE Treatment
NG Treatment
Coal Treatment
Respondent Group

# Robustness Check: Competing Hypotheses

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model |
|---|---|---|---|---|---|---|
| | RE Treatment | | NG Treatment | | Coal Treatment | |
| Treatment | 0.265*** | 0.245** | -0.237** | -0.282*** | -0.424*** | -0.509*** |
| | (0.0944) | (0.0972) | (0.0960) | (0.0973) | (0.0956) | (0.0973) |
| General Support for Solar | | 0.145* | 0.0236 | -0.0275 | -0.0618 | -0.0390 |
| | | (0.0874) | (0.0875) | (0.0893) | (0.0827) | (0.0875) |
| General Support for Wind | | 0.148* | 0.0409 | 0.00598 | -0.0445 | -0.0455 |
| | | (0.0764) | (0.0775) | (0.0752) | (0.0762) | (0.0724) |
| General Support for Natural Gas | 0.292*** | 0.220*** | | 0.277*** | 0.205*** | 0.0841 |
| | (0.0566) | (0.0535) | | (0.0593) | (0.0535) | (0.0544) |
| General Support for Coal | -0.0123 | -0.0236 | 0.186*** | 0.116** | | 0.323*** |
| | (0.0542) | (0.0555) | (0.0578) | (0.0574) | | (0.0593) |
| General Support for Transmission Lines | | 0.238*** | | 0.281*** | | 0.262*** |
| | | (0.0525) | | (0.0621) | | (0.0652) |
| N | 821 | 821 | 830 | 828 | 828 | 826 |

Competing hypotheses for which we control (not shown): Demographics; Political orientation; Environmental attitudes; Risk aversion; Trust in government and energy companies; Perceptions of local conditions; Expenditures on electricity

# Discussion

1. Individuals care about the source of energy that is carried through electricity lines and these preferences strongly dictate support or opposition of local transmission siting

2. Electrons from solar and wind: greater support
   - Enough to overcome local residents' objections to new lines?

3. Electrons from coal: greater opposition
   - Implications if coal experiences a resurgence following removal of Clean Power Plan?

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