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The relevance of proximity and workplace experiences for the individual support of power plants: An empirical analysis of wind, coal, and nuclear energy

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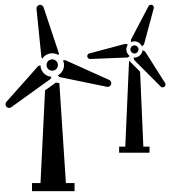
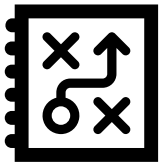
1. Motivation

Environmentally-friendly energy policy in Germany



- Environmentally-friendly energy policy in Germany
  - Expansion of renewable energies (65%)
  - Phase-out of nuclear power until 2022
  - Phase-out of coal power until 2038



- Implementation problems
  - Local protest
  - Long approval procedures
  - Economically dependent areas

➡ Support of individuals is needed

Previous studies

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- Factors influencing support for power plant (expansion)
  - Environmental values (e.g. Bidwell, 2013; Rand & Hoen, 2017)
  - Political identification (e.g. Sherren et al., 2019; Ziegler, 2019)
  - Age (e.g. Greenberg, 2009; Hüppe & Weber, 1999)
  - Gender (e.g. Greenberg, 2009; Hüppe & Weber, 1999)

- Experience as
  1. Residential proximity to the power plants
  2. Workplace experiences in the energy sector

Previous studies – Residential proximity

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- Wind power plants
  - Several studies investigating proximity to wind power plants on support levels (Hoen et al., 2019; Schumacher et al., 2019; Swofford & Slattery 2010; Warren et al., 2005)
- Coal power plants
  - Few studies (e.g. Thomson & Kempton, 2018)
  - Some on proximity to coal on support for renewable energies (e.g. Goldfarb et al., 2016; Olson-Hazboun, 2018)
- Nuclear power plants
  - Studies about perceived risk (e.g. Hüppe & Weber, 1999; Veneables et al., 2012)
  - Few literature on support levels (e.g. Franchino, 2014; Frantál, 2017)

Previous studies – Workplace experiences in the energy sector

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- Wind power plants
  - Several studies on impacts on housing value (overview by Brinkley and Leach, 2019)
  - Some studies about perceived economic impacts (e.g. Bidwell, 2013; Harold et al., 2021; Slattery et al., 2012)
  - Few studies on working experiences (Baxter et al. 2013; Sherren et al., 2019)
- Coal power plants
  - Few studies (e.g. Frantál, 2016; Sherren et al., 2019)
- Nuclear power plants
  - Few studies (e.g. Greenberg, 2009; Sherren et al., 2019)

Contribution of the study

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- Experience with power plants is considered through two components
  - Residential proximity
  - Workplace experiences
- Systematic comparison of the three most important and politically discussed energy sources
- Consideration of all relevant variables that were found to affect support for power plant expansion in past literature

2. Data and variables

Hypotheses I

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1. Hypothesis

a. *Residential proximity to wind, coal, and nuclear power plants has a positive effect on the support for the expansion of the corresponding power plants in proximity to participants´ residences.*

b. *Residential proximity to wind, coal, and nuclear power plants has a negative effect on the support for the expansion of the corresponding power plants in proximity to participants´ residences.*

2. Hypothesis

Working experiences in the wind, coal, and nuclear energy sector have a positive effect on the support for the expansion of the corresponding power plant in proximity to participants´ residences.

Data

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- Large-scale computer-based survey among 3705 German citizens
  - Stratified sample in terms of age, gender, place of residence, religious affiliation
- Market master Data
  - Data about all operating power pants in Germany
- Regional identification register
  - Data about postcode districts that lie within 50km distance from the frontier of another postcode district

Dependent variables

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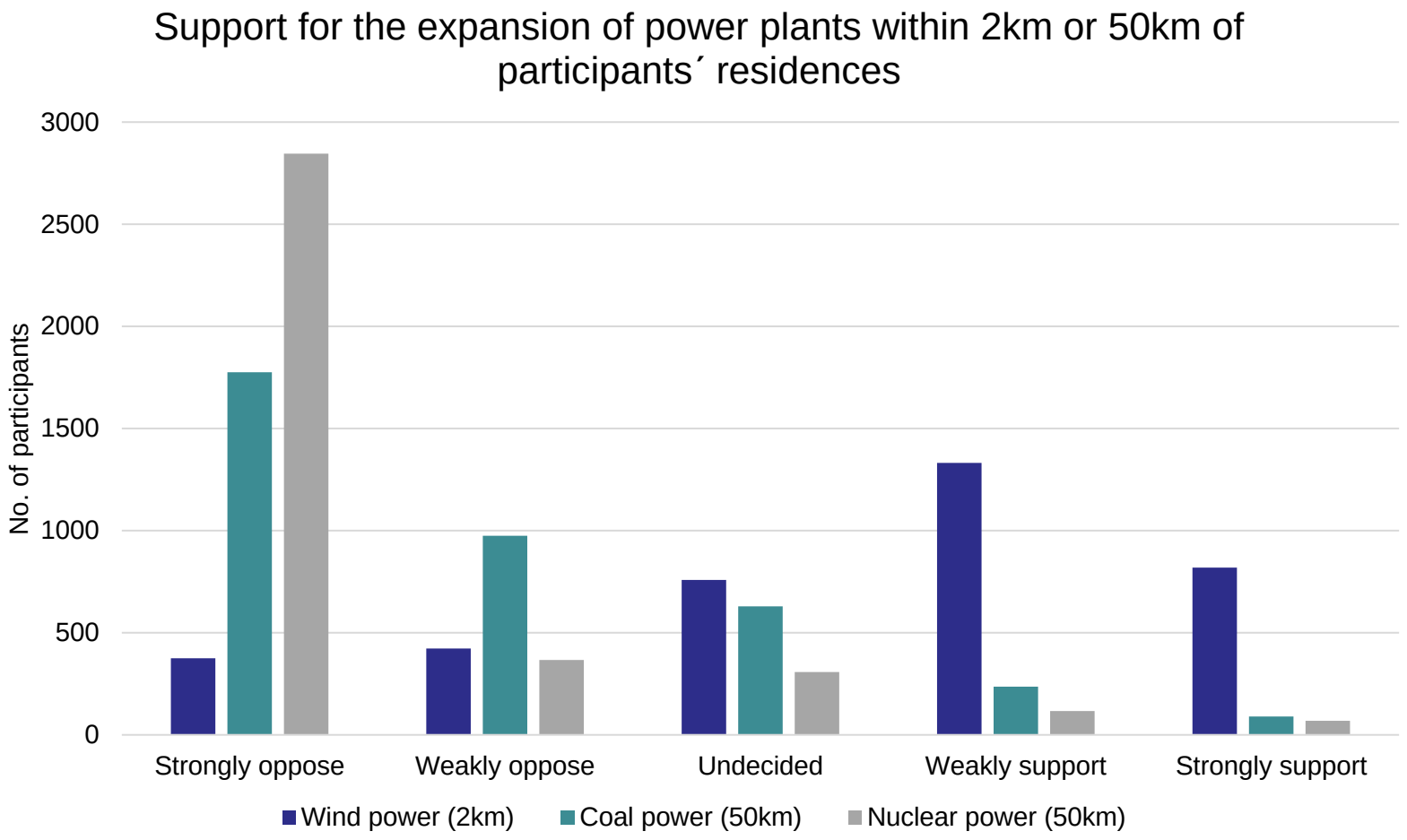
- “To what extent do you support the installation of the following energy power plants in your immediate neighborhood within 2km (50km) of your residence?”
  - Support wind power plant in region (2km)
  - Support coal power plant in region (50km)
  - Support nuclear power plant in region (50km)

- Binary and ordered probit models

Descriptive statistics



Experience through proximity

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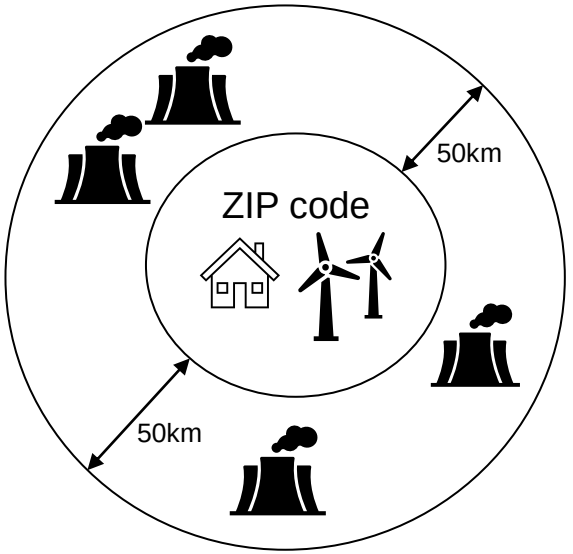
- Idea: Negative externalities through residential proximity to power plants
- All operating wind, coal, and nuclear power plants in Germany
- Matching participants and power plants through ZIP code
- Explanatory variables:
  - Wind power plants in region
  - Coal power plants in region
  - Nuclear power plants in region



Experience through workplace

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- Idea: Economic incentives for the expansion of the regarding energy source through working in the energy sector
- “Do you currently or have you in the past worked directly or indirectly (e.g. supplier companies) in the following energy power plants yourself or someone in your environment (friends, family, colleagues)”
- Explanatory variables:
  - Work experiences wind energy sector
  - Work experiences coal energy sector
  - Work experiences nuclear energy sector

3. Econometric results

Econometric results

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Variables	Support wind power plant in region	Support wind power plant in region	Support coal power plant in region	Support coal power plant in region	Support nuclear power plant in region	Support nuclear power plant in region
Wind power plant in region	0.051***					
	(2.88)					
Number wind power plants in region		0.001*				
		(1.82)				
Work experience wind energy sector	0.061**	0.061**				
	(2.13)	(2.16)				
Coal power plant in region			0.029***			
			(3.06)			
Number coal power plant in region				0.000		
				(1.18)		
Work experience coal energy sector			0.110***	0.116***		
			(3.96)	(4.06)		
Nuclear power plant in region					-0.009	
					(-1.12)	
Number nuclear power plants in region						-0.005
						(-0.79)
Work experience nuclear energy sector					0.105***	0.105***
					(4.21)	(4.20)
NEP	0.005**	0.005**	-0.005***	-0.005***	-0.004***	-0.004***
	(2.17)	(2.17)	(-4.19)	(-4.22)	(-4.21)	(-4.22)
Ecological policy identification	0.107***	0.106***	-0.030***	-0.032***	-0.025***	-0.025***
	(5.70)	(5.66)	(-2.91)	(-3.02)	(-3.32)	(-3.31)
Social policy identification	0.056***	0.056***	-0.006	-0.005	-0.010	-0.011
	(2.98)	(2.94)	(-0.53)	(-0.47)	(-1.37)	(-1.38)
Liberal policy identification	0.006	0.006	0.011	0.011	0.008	0.008
	(0.31)	(0.31)	(1.04)	(1.11)	(1.12)	(1.10)
Conservative policy identification	-0.061***	-0.063***	0.034***	0.034***	0.048***	0.048***
	(-3.05)	(-3.17)	(2.85)	(2.82)	(4.75)	(4.74)
Time preference	0.124	0.125	-0.058	-0.061	0.007	0.006
	(1.51)	(1.52)	(-1.22)	(-1.28)	(0.19)	(0.18)
Risk taking preferences	0.039**	0.039**	0.027**	0.026**	0.017**	0.017**
	(2.19)	(2.18)	(2.50)	(2.43)	(2.16)	(2.16)
Trust	-0.006	-0.006	0.012***	0.012***	0.010***	0.010***
	(-1.03)	(-1.00)	(3.32)	(3.29)	(3.79)	(3.77)
Altruism	0.101**	0.100**	0.006	0.006	0.018	0.018
	(2.58)	(2.54)	(0.28)	(0.25)	(1.08)	(1.07)
Positive reciprocity	0.005	0.005	0.009***	0.009***	0.003	0.003
	(1.05)	(1.06)	(3.05)	(3.09)	(1.48)	(1.47)
Negative reciprocity	-0.008**	-0.008**	0.001	0.001	0.000	0.000
	(-2.42)	(-2.43)	(0.80)	(0.73)	(0.23)	(0.23)
Age	-0.004***	-0.004***	0.000	0.000	0.001**	0.001**
	(-7.02)	(-6.87)	(1.55)	(1.61)	(2.30)	(2.31)
Female	-0.027	-0.028*	-0.021**	-0.021**	-0.015**	-0.015**
	(-1.62)	(-1.67)	(-2.18)	(-2.21)	(-2.16)	(-2.15)
High education	-0.041**	-0.042**	-0.009	-0.009	0.017**	0.017**
	(-2.46)	(-2.54)	(-0.99)	(-0.94)	(2.43)	(2.44)
High household income	0.009	0.010	-0.005	-0.005	0.009	0.009
	(0.53)	(0.62)	(-0.57)	(-0.57)	(1.24)	(1.22)
Observations	3,705	3,705	3,705	3,705	3,705	3,705

Control variables

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Variables	Support wind power plant in region	Support wind power plant in region	Support coal power plant in region	Support coal power plant in region	Support nuclear power plant in region	Support nuclear power plant in region
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Experience through proximity

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Work experience nuclear energy sector					0.105*** (4.21)	0.105*** (4.20)

Wind: Hypothesis 1a is supported

Coal: Hypothesis 1 cannot be confirmed

Nuclear: Hypothesis 1 cannot be confirmed

Experience through workplace

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Hypothesis 2 is supported for wind, coal, and nuclear power

4. Discussion and conclusions

Summary

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- No significant effect of residential proximity to coal and nuclear power plants on support for their expansion
- Positive effect on wind power plant expansion
- Workplace highly significantly positively effects support levels

Conclusions and policy implications

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- Worries about negative externalities seem to be unreasonable
  - People who experience proximate power plants do not have significantly lower support levels
- Structural change in coal- and nuclear energy intensive areas
  - Convince local municipalities of the environmentally-friendly policies
  - Secure economic basis of these municipalities
- Further research
  - Understanding determinants of local support in more depth
  - Comparing effects of different energy sources

Thank you