

Wind energy and life satisfaction: Evidence from the UK

Kirill Ryazantsev

HSE / NES

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Motivation

- In the UK the wind energy generation rose six-fold in the last 10 years
- Onshore wind network expansion leads to negative externalities on people living nearby (anecdotal evidence)
- We need to measure the magnitude of the externalities to take into account the indirect costs in decision making process
- To measure externalities I use life satisfaction as proxy for personal utility (Benjamin et al., 2012)

Research question

Does the installation of wind turbine influence the life satisfaction of people in the county where it is installed?

Literature review

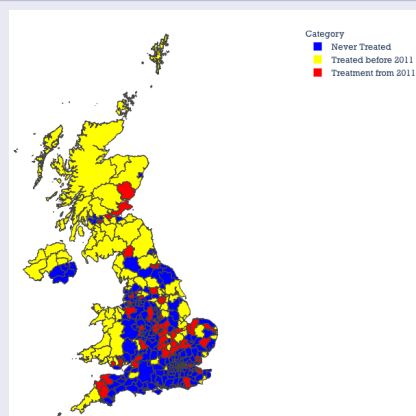
- Moellendorff & Welsch (2015) study Germany neighbourhood data. Difference estimation on the presence of wind farm. Life satisfaction decreases by -0.033 points in the postcode due to wind farm installation. The effect is comparable to 1/17 of losing a job.
- Krekel & Zerrahn (2017) They use difference-in-differences with propensity score on Germany neighbourhood data. Installation of a wind turbine in a 4km radius leads to a decrease in life satisfaction by -0.1405 points, comparable to 1/4 of losing a job.
- Gibbons (2015) uses difference-in-differences design in treatment group neighborhoods with visible wind farms and in control with non-visible wind farms. House price data from the UK. He argues that the "price reduction is around 5-6% on average for housing with a visible wind farm within 2km, falling to under 2% between 2-4km"

Data

Raw Data

- Onshore Wind Turbines Data (Lat Long)
- Life satisfaction data on county level (from 2011 to 2018)
- Borders of the UK counties
- Population density (2011)
- GDP per capita (2011)

Map by categories



Descriptive Statistics for group: treatment from 2011

Focus only on treated from 2011

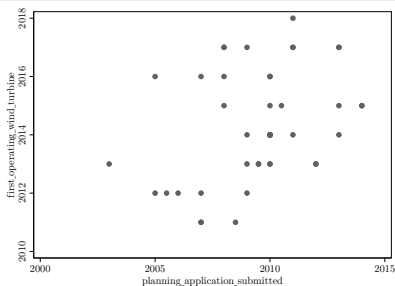
- 51 counties
- 408 observations
- identification assumption: the year of the county being treated is not determined

Summary

	Category	Treatment from 2011
Life Satisfaction	min	7.39
	max	7.94
	mean	7.65
	std	0.13
	count	51.00
Population Density	min	0.50
	max	85.00
	mean	8.24
	std	14.10

Identification assumption

Scatter plot of first application and first installation in treated counties



OLS test of identifying assumption

	(1)
	Installation Year
Planning_Year	0.313** (0.117)
Turbine_Capacity	0.00125 (0.0259)
Population_Density	-0.00439 (0.0359)
GDP_per_capita	0.0000413 (0.0000610)
N	44
R ²	0.161
Robust errors	yes

Standard errors in parentheses

* $p < .10$, ** $p < .05$, *** $p < .01$

Regression specification

Specification

$$\text{Life Satisfaction}_{i,t} = \sum_{z=-1}^3 \beta_z \text{Dummy treatment}_{i,t-z} + \alpha_i + \lambda_t + u_{i,t} \quad (1)$$

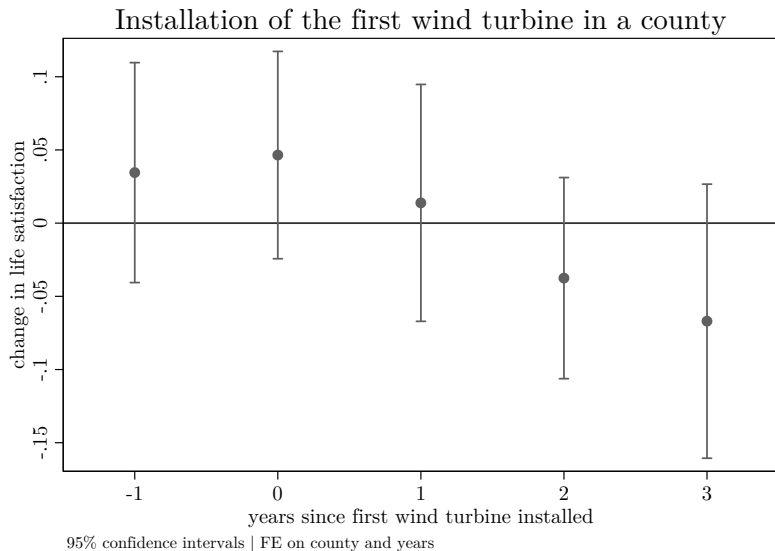
$$\text{Dummy treatment}_{i,t} = \begin{cases} 1 & \text{in the year of first operating wind turbine} \\ 0 & \text{otherwise} \end{cases}$$

α_i = county fixed effect

λ_t = year fixed effect

$u_{i,t}$ = error term (clustered on county level)

Results



Conclusion

- Life satisfaction decreases by 0.037 points (0.37%) in the second year and the third year by 0.067 points(0.67%) after the installation. However, the effect is not significant
- The effect is equal to 3/100 of job loss, which is equivalent in monthly pay to £70
- The resulting coefficients are in borders of Moellendorff & Welsch (2015) and Krekel & Zerrahn (2017) estimations
- The paper extends Subjective Well-Being (SWB) approach for measuring the UK wind farms externalities and suggests external validity of results obtained for Germany.

Appendix

Table 1: Main regression table

	(1)	(2)	(3)	(4)
	Life Satisfaction	Life Satisfaction	Life Satisfaction	Life Satisfaction
-1	0.0345 (0.0374)	0.194 (0.192)	0.0336 (0.0386)	0.0353 (0.0387)
0	0.0465 (0.0353)	0.185 (0.134)	0.0466 (0.0355)	0.0486 (0.0355)
+1	0.0138 (0.0403)	0.122 (0.0957)	0.0162 (0.0439)	0.0176 (0.0437)
+2	-0.0375 (0.0342)	0.0346 (0.0601)	-0.0370 (0.0322)	-0.0371 (0.0324)
+3	-0.0670 (0.0466)		-0.0681 (0.0455)	-0.0688 (0.0457)
_cons	7.754*** (0.0227)	7.420*** (0.140)	7.544*** (0.00782)	7.538*** (0.00895)
N	204	160	1555	1231
R ²	0.557	0.585	0.592	0.568
County FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Clustered errors	yes	yes	yes	yes

Standard errors in parentheses. Errors are clustered on a county level

Life Satisfaction outcome on 10 point scale (10 is the totally happy and 1 is totally unhappy)

Dummy (0) for the treatment year with lead (-1) pre-trend and lags (+1,+2,+3) to show lagged effect

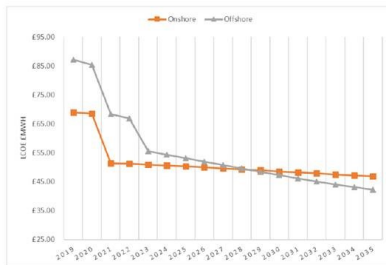
All specifications are reported with two-way fixed effect on county and years

* $p < .10$, ** $p < .05$, *** $p < .01$

QA

Cost onshore vs offshore

Figure: 1 LCOE comparison of wind technologies



Source: Cornwall Insight

Questions

- The placebo test suggested is not possible to perform as planning years are before the data on life satisfaction
- 34.82 MWh is average consumption. The difference is 20 pounds for 1 MWh. $20 \times 34 = 680$ pounds per person difference in year. 70 pounds per person is still not enough to prefer offshore to onshore wind turbines.