

# The Disamenity Impact of Solar Farms: A Hedonic Analysis

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# Solar Farms

- Photovoltaic (PV) panels convert sunlight into direct current

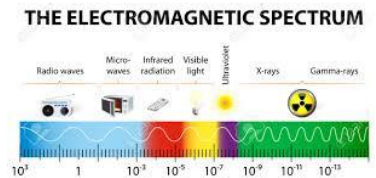
Solar farm



- Solar panels are 1-2m off the ground arranged in rows to facilitate access and avoid shading

# Environmental Impacts

- Waste, use of rare earths and toxic materials
- Electromagnetic radiation and noise
- Glint and glare
- Potential for negative interactions between various taxa and panels
- Visual impacts generally ignored in surveys of the impacts (Tsoutsosa, 2005)



# Literature review

- There are no hedonic analyses of the impact of solar farms
- Von Mollendorff and Welsch (2017) examine differences in subjective wellbeing for individuals located near to solar facilities in Germany
- There are numerous studies of whether the installation of PV solar panels on residential houses is capitalised into house prices
- Numerous studies of the impact of windfarms on nearby property values

# Solar power in the UK

- The number of PV solar farms in the UK has grown considerably
- Planners told to avoid sites with high quality agricultural land and land with high environmental or cultural value
- **Community reactions:** The main objections involve the visual impact but difficult to find comments made about the impact on house prices (which are anyway irrelevant for planning purposes)



# This Paper

- First hedonic analysis of the impact of solar farms on nearby property prices
- DID methodology to investigate the impact of solar farms on property values in England and Wales
- Dataset: information on >600 solar farms and >5000 properties
- Results suggest that there is a significant impact on property prices and that solar farms are not environmentally benign

# Data

- Data on PV solar farms is taken from the Renewable Energy Planning Database (REPD) for August 2017
- Data includes dates when solar farms were proposed / permitted / built / operational as well as capacity
- Property transactions data taken from the England and Wales Land Registry (EWLR) database from January 1995 to September 2017
- Using geographical coordinates it is possible to identify the 6-digit postcode where solar farms are located

# Regression analysis

- DID Regression with Postcode Fixed Effects  
(including controls for the type of property)
- DID Regression with Postcode Fixed Effects **by capacity**  
(including controls for the type of property)
- DID Regression with Property Level Fixed Effects



# DID with postcode-FE

Variable	Model 1	Model 2	Model 3	Model 4
Detached	0.522*** (0.034)	0.542*** (0.040)	0.536*** (0.039)	0.518*** (0.037)
Semi-detached	0.121*** (0.030)	0.131*** (0.035)	0.135*** (0.029)	0.131*** (0.029)
Flat	-0.055 (0.080)	-0.029 (0.086)	-0.090 (0.108)	-0.124 (0.085)
Freehold	0.203** (0.097)	0.214** (0.106)	0.068 (0.107)	0.068 (0.105)
New	0.0101 (0.049)	-0.012 (0.062)	-0.042 (0.052)	0.018 (0.065)
Proposed	-0.041** (0.018)			
Permitted		-0.065*** (0.022)		
Built			-0.068** (0.029)	
Operational				-0.060** (0.026)
Trend	YES	YES	YES	YES
Postcode-FE	YES	YES	YES	YES
No. Obs.	5861	4624	2866	3630

- Basic model considers relative prices before-and-after solar farm is PROPOSED / PERMITTED / BUILT / OPERATIONAL
- Any of these is associated with a statistically significant reduction in relative prices
- Simultaneously including all of these dummy variables suggests that the key moment is when a development is PERMITTED

# DID with postcode-FE by capacity

Variable	$\leq 5\text{MW}$ Model 5	$> 5\text{MW}$ Model 6
Detached	0.545*** (0.054)	0.546*** (0.041)
Semi-detached	0.130*** (0.045)	0.138*** (0.037)
Flat	0.120* (0.071)	-0.187* (0.102)
Freehold	0.360*** (0.082)	-0.092 (0.154)
New	0.018 (0.077)	-0.082 (0.065)
Permitted	-0.059** (0.029)	-0.076*** (0.029)
Trend	YES	YES
Postcode-FE	YES	YES
No. Obs.	3,161	1,463

- Developments with a higher capacity impose a larger disamenity impact but not significantly so
- Households are unlikely to care about the generating capacity of the solar farm so much as the area of the development (5MW  $\approx$  24 Ha)
- Over the last 10 years the efficiency of panels has increased from 12 to 17 percent

# DID with property-FE

Variable	Model 17	Model 18	Model 19	Model 20
New	0.096*** (0.032)	0.090** (0.035)	-0.012 (0.045)	0.096*** (0.037)
Proposed	-0.021 (0.017)			
Permitted		-0.038** (0.019)		
Built			-0.034 (0.025)	
Operational				-0.048** (0.021)
Trend	YES	YES	YES	YES
Property-FE	YES	YES	YES	YES
No. Obs.	5861	4624	2866	2354

- The model controls for all structural and locational attributes of individual properties (other than whether it is a new build). Identification relies on before-and-after sales of the same property
- Because there are relatively few repeat-sales straddling the dates of interest the statistical significance of these variables is reduced
- The PERMITTED dummy continues to be statistically significant (not statistically different to the postcode-FE model)

# Conclusions

- Solar farms impose disamenity impacts on properties located in the same 6-digit postcode of between 4-6 percent depending on the model
- It would be interesting to compare these results with studies from other countries as well as those from other valuation methodologies (when available)
- Do impacts extend beyond the 6-digit postcode and do they differ depending on existing land cover e.g. brownfield versus greenfield sites?
- How do disamenity impacts vary with scale of the development?

# Thank you!



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