"Investigating Property Value Impacts Near Midwestern Utility-Scale Solar Projects Using Difference-in-Difference Methods"

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Introduction:

Utility-scale solar project proposals have been accelerating exponentially in the U.S. as the energy transition from fossil fuels to renewables unfolds. While the emissions and economic related benefits of deploying such projects are well documented, relatively less is known about their impact on nearby **property values**. This research investigates the location of utility-scale solar facilities in the **Midwest**, the average 3-bedroom housing value in the surrounding area, and whether the presence of a utility-scale solar project affects nearby property values in any manner.

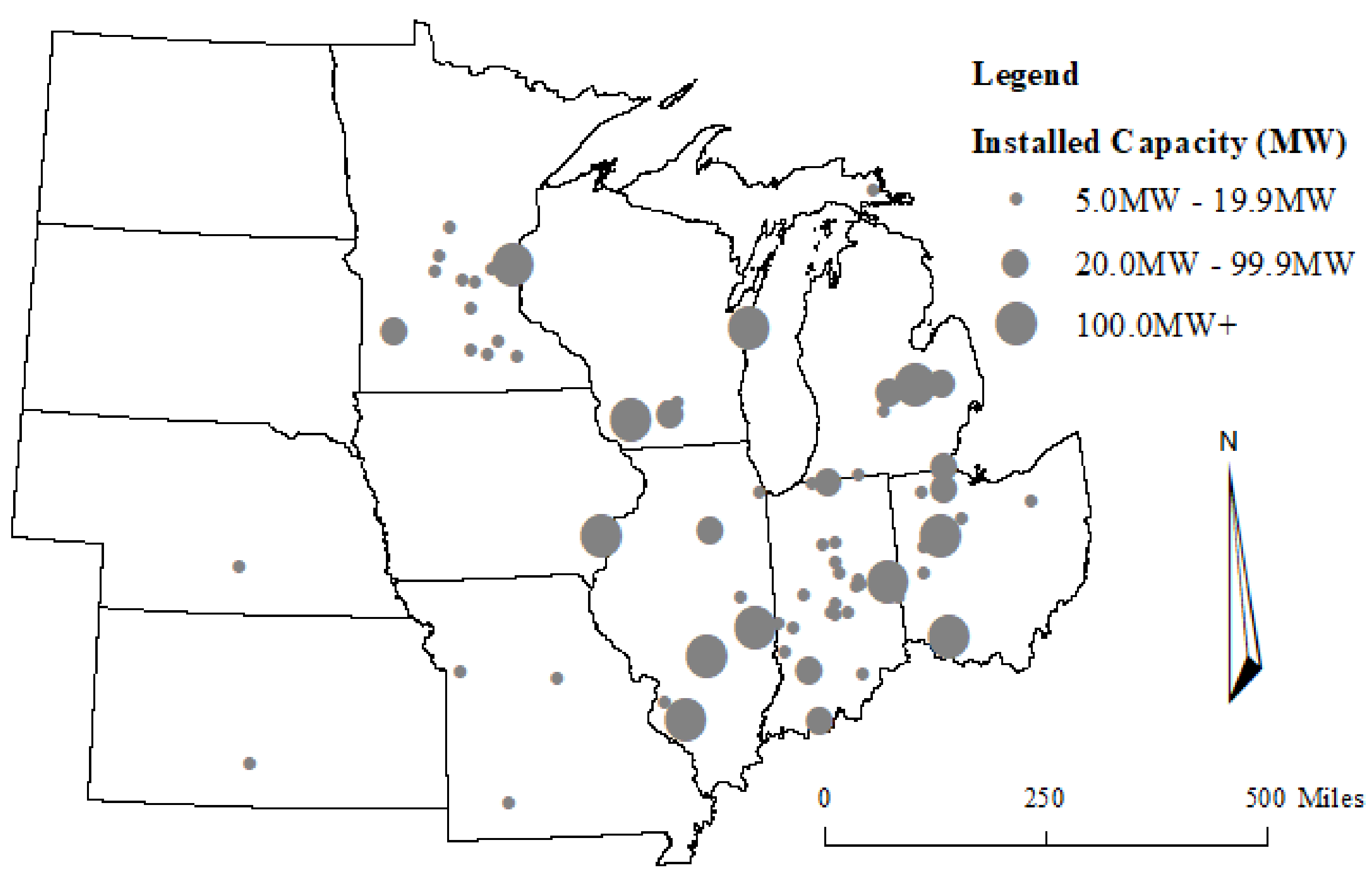
Research Objective:

To determine the **association** and **magnitude** of impact between utility-scale solar projects and nearby property values.

Data and Methods:

This study included **70** utility-scale solar facilities (≥5MW-DC installed capacity) that became operational in the Midwest from **2009–2022** using data from the Lawrence Berkley National Laboratory. Alongside housing value data from Zillow, additional data was incorporated, including rurality, county, and state. Both normal housing value and standardized housing value (Case Schiller Index adjusted value) were tested. Three difference-in-difference (DID) models were conducted to determine the results.

Utility-Scale Solar Installs Across the Midwest



Variable Definitions

Variable	Definition
P_{xt}	Housing pricing at zip code x at time t
$Treated_{xt}$	Binary variable, 1 for the treatment group, 0 for the control group
$Post_{xt}$	Binary variable, 1 for after operation, 0 for before operation
$Rurality_{xt}$	Binary variable, 1 for non-metro zip codes, 0 for metro zip codes
$Size_{xt}$	Binary variable, 1 for projects with an installed capacity between 5–20 MW, 0 for projects with an installed capacity larger than 20 MW
$Year_{xt}$	Categorical variable, each year is in its own category
δ_{st}	State fixed effect
δ_{ct}	County fixed effect
δ_{xt}	Zip code fixed effect
C	Constant
E	Standard Error

DID Model Example (State Model)

$$P_{xt} = \beta^1 * Treated_{xt} + \beta^2 * (Treated_{xt} * Post_{xt}) + \beta_3 * Rurality_{xt} + \beta_4 * Size_{xt} + \beta_5 * Year_{xt} + \delta_{st} + C + E$$

Results:

DID Property Value Impact CS Adjusted AHV Analysis

Variables/Models	Model 1: State	Model 2: County	Model 3: Zip Code
Treated VS Controlled (β_1)	-1,458	-3,338***	Unidentified
Property Value Impact (β_2)	-662	2,640**	700***
Rurality (β_3)	-25,563***	-22,166***	Unidentified
Project Between 5–20 MW Installed Capacity (β_4)	13,620***	50,206***	23,200***
Constant (C)	177,335***	158,793***	143,235***
Numbers of Observations (n)	5,778	5,778	5,778
Standard Error (E)	12,472	2,670	2,443
R^2	0.5642	0.8209	0.9897
Adjusted R^2	0.5629	0.8197	0.9895

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

DID Property Value Impact Normal AHV Analysis

Variables/Models	Model 1: State	Model 2: County	Model 3: Zip Code
Treated VS Controlled (β_1)	-2,921***	-2,976***	Unidentified
Property Value Impact (β_2)	2,004**	1,310**	3,199***
Rurality (β_3)	-21,910***	-10,425***	Unidentified
Project Between 5–20 MW Installed Capacity (β_4)	19,492***	779	8,357***
Constant (C)	94,369***	185,827***	143,235***
Numbers of Observation (n)	20,815	20,815	20,815
Standard Error (E)	9,985	21,281	18,388
R^2	0.5880	0.8158	0.9483
Adjusted R^2	0.5875	0.8151	0.9479

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Conclusions:

-Utility-scale solar projects can increase nearby property values by **0.5–2.0%**

-Smaller projects have more of a positive impact on nearby property values than projects that are ≥20 MW

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