Energy Infrastructure and Farmland Market

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Federal Reserve at Chicago, Midwest Agriculture Conference, November 28, 2023

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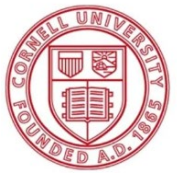

Cornell University
Cooperative Extension

Research & Extension Program Themes

- **Theme I: Agriculture & the Environment**
- **Theme II: Land Value, Land Ownership, Land Tenure, Land Use**
- **Theme III: Chinese Agriculture & its Global Trade Implications**
- Other Useful information:

  Appointment: 50% Research & 50% Extension

  Joined Cornell Dyson School & CCE in July 2022

  Faculty Affiliate, Cornell Institute for China Economic Research (CICER)

  Faculty Fellow, Cornell Atkinson Center for a Sustainable Future

  Assistant and Associate Professor at Iowa State 2015-2022

  Led Iowa land value survey; co-founded the ISU China Ag Center

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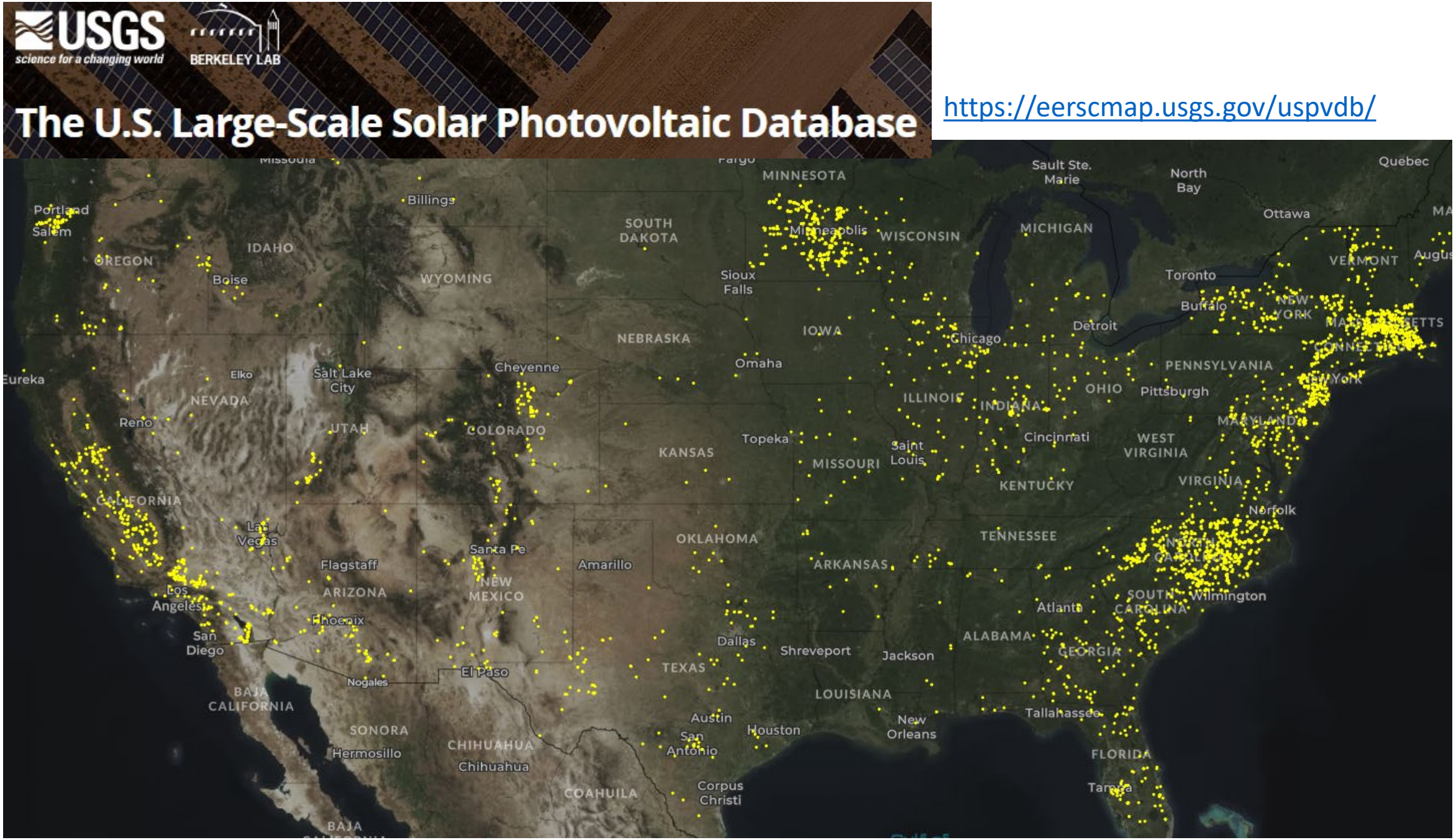
1. Solar farms & Agrivoltaics

Figure 3. Example APV Systems

Note: Image sources are Fraunhofer ISE, University of Arizona, and NREL.

South Korean 20-Mile Solar Bike Highway Generates Electricity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https://eerscmap.usgs.gov/uspvdb/
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Property Value Impacts of Commercial-Scale Solar Energy in Massachusetts and Rhode Island

Vasundhara Gaur and Corey Lang
Department of Environmental and Natural Resource Economics
University of Rhode Island

September 29, 2020

While utility-scale solar energy is important for reducing dependence on fossil fuels, solar arrays use significant amounts of land (about 5 acres per MW of capacity), and may create local land use disamenities. This paper seeks to quantify the externalities from nearby solar arrays using the hedonic method. We study the states of Massachusetts and Rhode Island, which have high population densities and ambitious renewable energy goals. **We observe over 400,000 transactions within three miles of a solar site**. Using a difference-in-differences, repeat sales identification strategy, **results suggest that houses within one mile depreciate 1.7% following construction of a solar array, which translates into an annual willingness to pay of $279. Additional results indicate that the negative externalities are primarily driven by solar developments on farm and forest lands in non-rural areas.** For these states, our findings indicate that the global benefits of solar energy in terms of abated carbon emissions are outweighed by the local disamenities.

When Energy Issues Are Land Use Issues: Estimating Preferences for Utility-Scale Solar Energy Siting

Vasundhara Gaur, Corey Lang, Gregory Howard and Ruth Quainoo

Land Economics, August 2023, 99 (3) 343-363; DOI: https://doi.org/10.3368/le.99.3.111221-0130R1

Abstract

Although solar energy receives broad support in general, utility-scale solar arrays can be contentious because at the siting stage, it becomes a land use issue replete with potential disamenities and trade-offs. We conduct a choice experiment survey to estimate preferences for attributes of utility-scale solar arrays in Rhode Island, United States. Our results suggest that the largest indicator of solar development approval is prior land use, with residents willing to pay an additional $10–$21 in monthly utility bills for developments in commercial, industrial, brownfield, and covered landfill areas, and $13–$49 to avoid developments on farm and forest land.

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1 Aug 2023
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Table 4. Select coefficient estimates for agricultural land sales over 30 acres.[a]

	Sample Includes:			
	Sale prices from $1,000 to $7,000 per acre	**Sale prices from $1,000 to $10,000 per acre**	**Sale prices from $300 to $7,000 per acre**	**Sale prices from $300 to $10,000 per acre**
	(1)	**(2)**	**(3)**	**(4)**
ln *(dist_sf)*	-0.003	0.008	-0.042	-0.022
	(0.047)	(0.051)	(0.055)	(0.058)
After	0.158	0.164	-0.050	-0.065
	(0.159)	(0.182)	(0.183)	(0.195)
ln *(dist_sf)* x *After*	-0.007	-0.011	0.056	0.066
	(0.069)	(0.071)	(0.088)	(0.089)
ln *(dist_tl)*	0.043*	0.044*	0.024	0.037
	(0.023)	(0.023)	(0.029)	(0.029)
ln *(dist_tl)* x *After*	-0.084**	-0.073**	-0.099*	-0.099**
	(0.036)	(0.036)	(0.050)	(0.048)
Adjusted R2	0.185	0.238	0.125	0.167
Observations	1,555	1,676	1,865	1,986
Wald test[b]	1.662	0.900	3.378	2.527
P-value	(0.198)	(0.343)	(0.067)	(0.113)

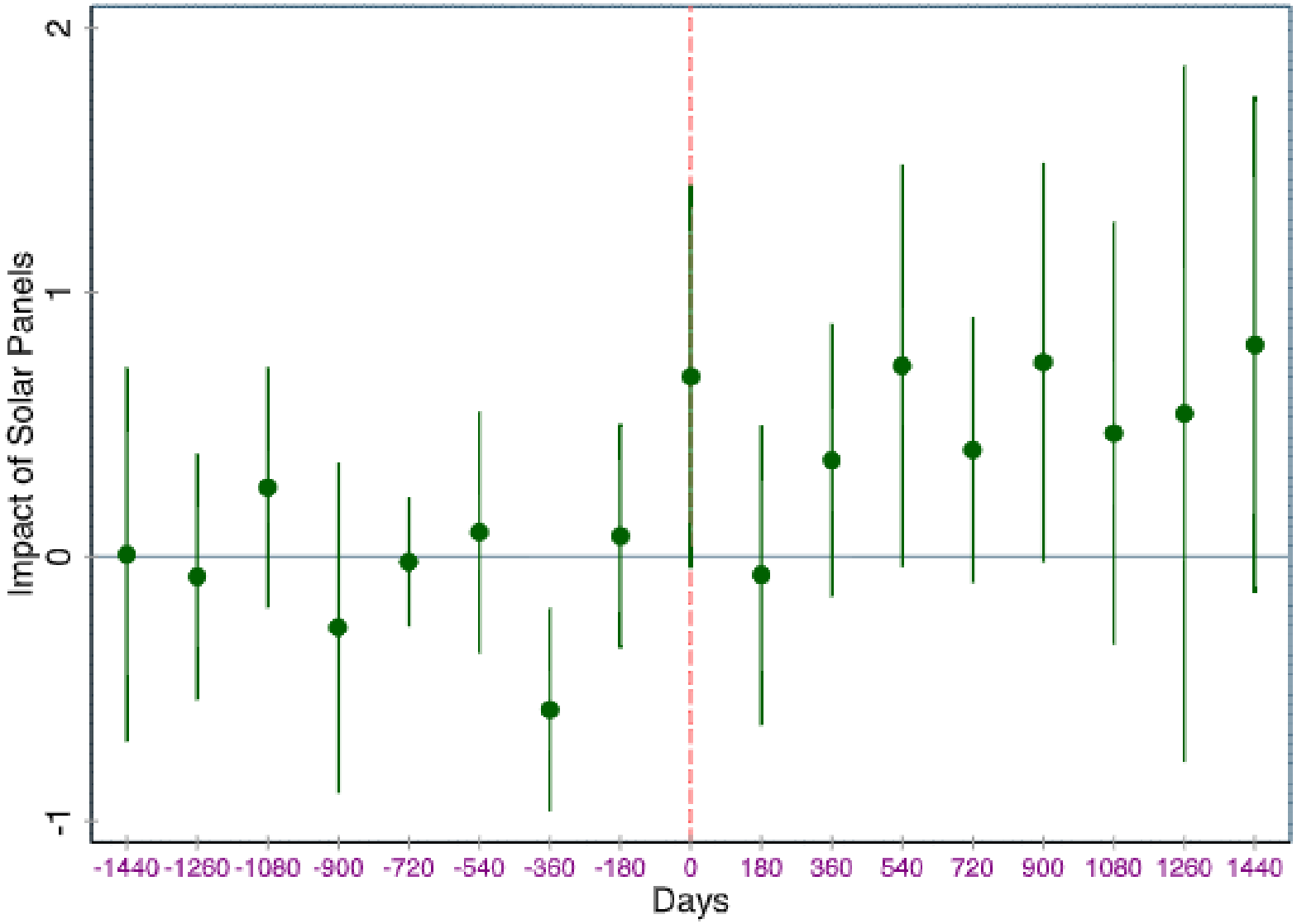
[a] The dependent variable is the natural log of sales price per acre. Agricultural land that sold between 2007 and 2019 and which are within 5 miles of the nearest solar farm are included in the sample. All models include all spatial and land characteristics as described in Table 3, as well as county-by-year fixed effects and solar farm fixed effects. Robust standard errors clustered at solar farm level are in parentheses, and *** p<0.01, ** p<0.05, and * p<0.1.

[b] Wald test is for ln *(dist_tl)* + ln *(dist_tl)* x *After* = 0, and the corresponding p-value is in the next row.

The impact of large-scale solar facilities on nearby farmland values in New York State

Nico Ma (Dyson MS Student)
Wendong Zhang

Proximity to solar farms do not necessarily bring premium for nearby parcels



Within 2 miles of solar farm or substations → premium for nearby farmland sales after solar farm construction, but not statistically significant

The Impact of Shared Renewable Policy on Farmland Values: Evidence from New York State

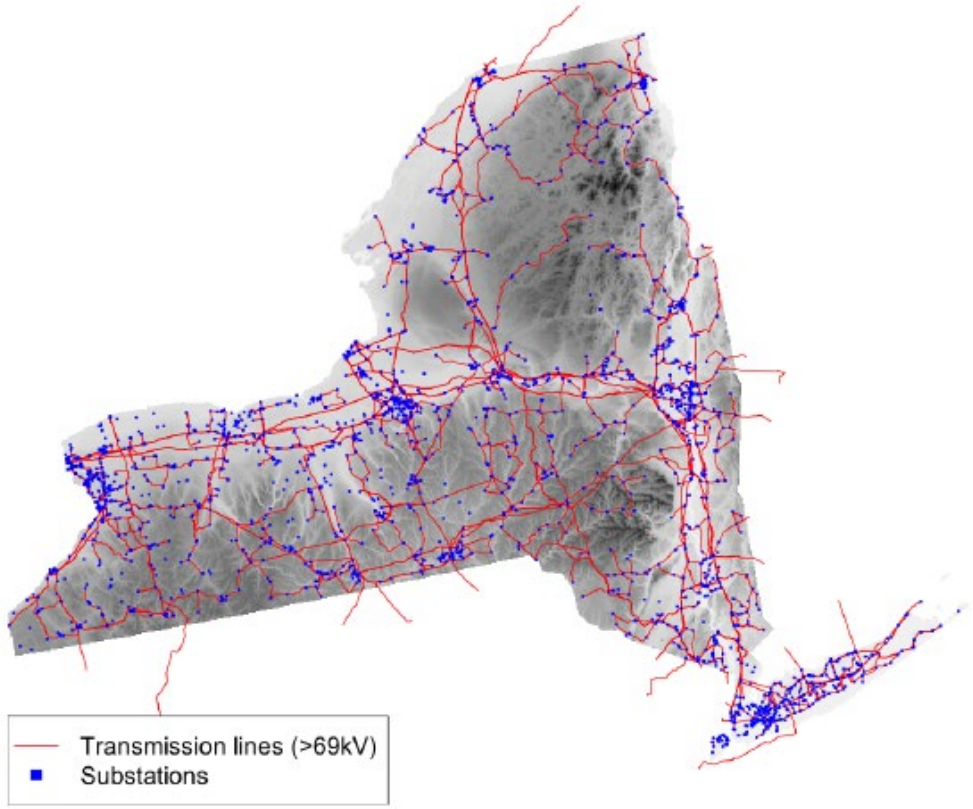
Zhiyun Li, Ariel Ortiz-Bobea, and Wendong Zhang *

This paper quantifies the impact of shared renewable policy on farmland values by using the parcel-level farmland transaction data from 2007 to 2022 and the uniform timing of the Shared Renewables Program (SRP) launched by New York state in 2015.

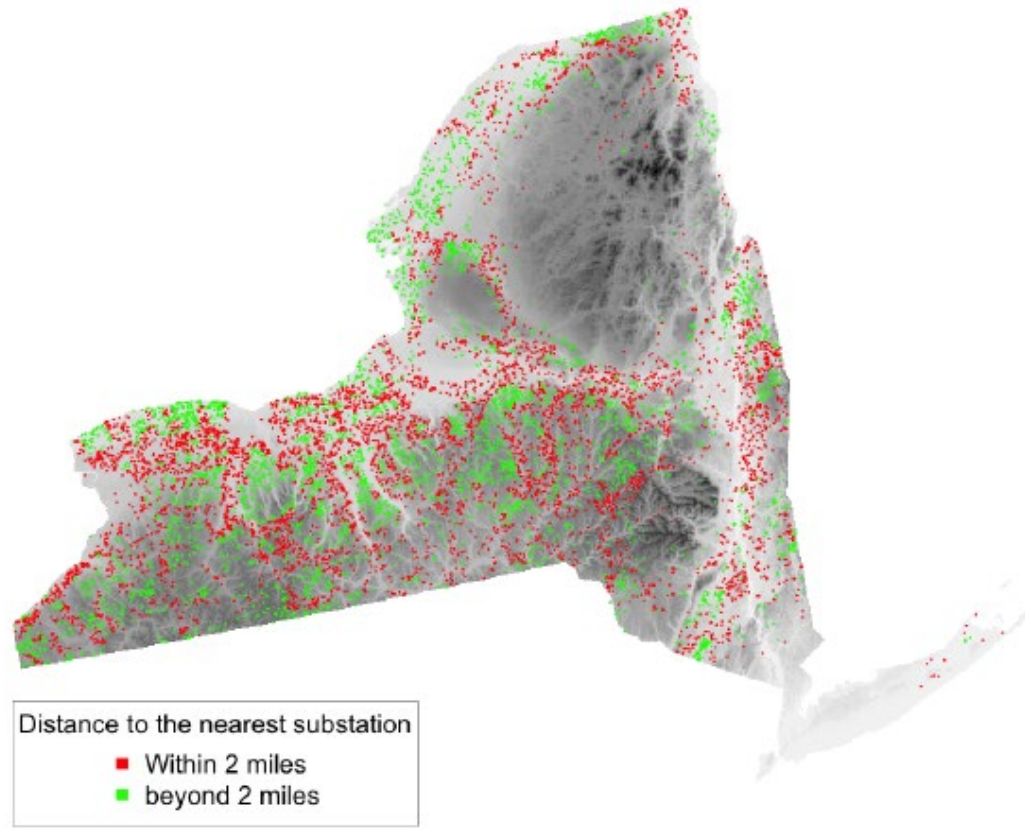
We examine how the SRP affects farmland prices across locations that are close or far away from transmission lines or substations. We observe a 15% higher price increase for farmlands within a 2-mile radius of electric grids compared to those situated farther away after 2019 when there was a substantial upsurge in community solar projects.

Moreover, we show that this effect is concentrated in regions with higher electric rates, making them more lucrative for solar development.

Transmission lines and substations



Transacted Agricultural land (2007-2022)



Parcels within 2 miles of TMLs or substations enjoyed 10-20% price premium, especially post 2020

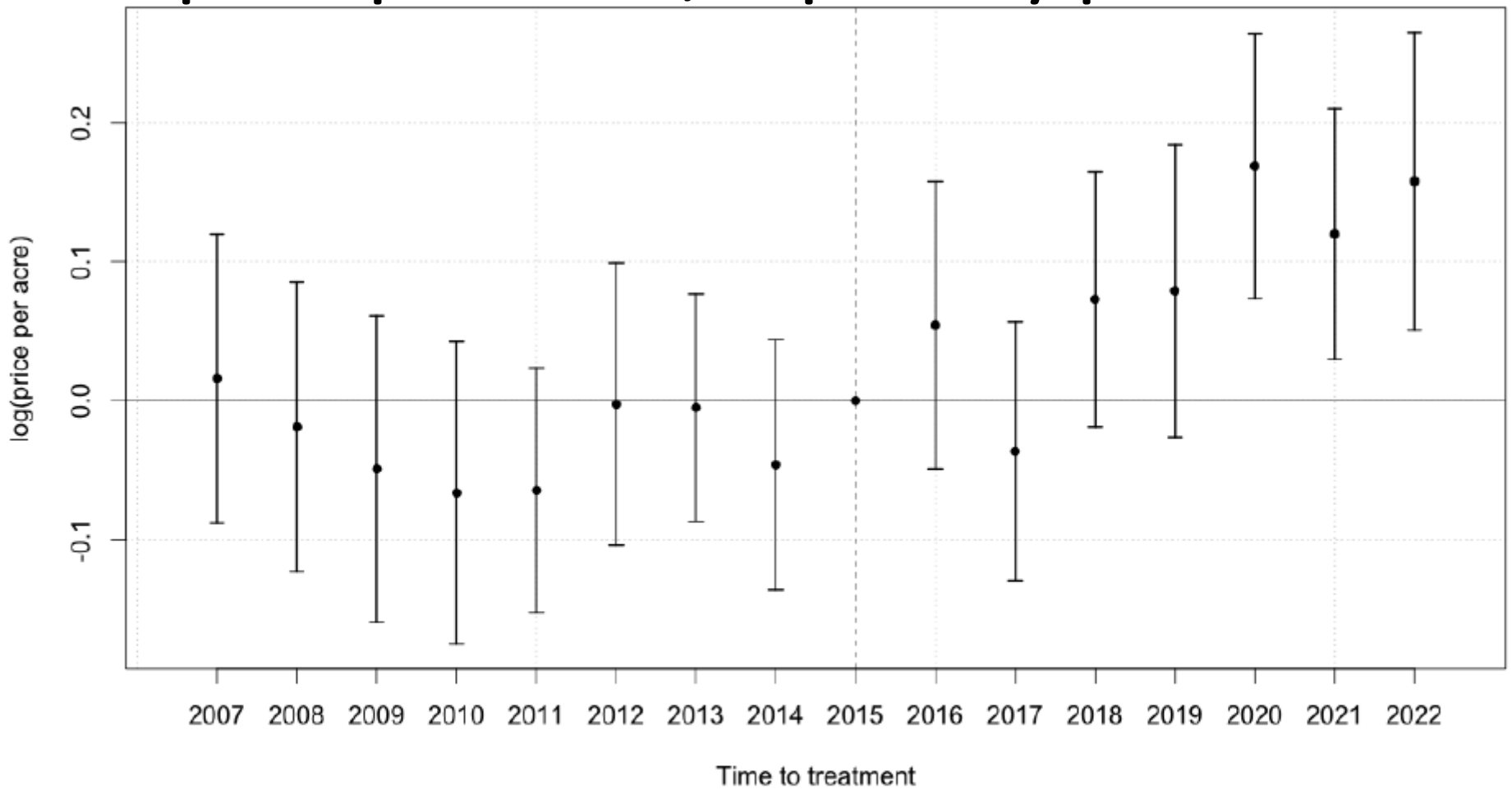


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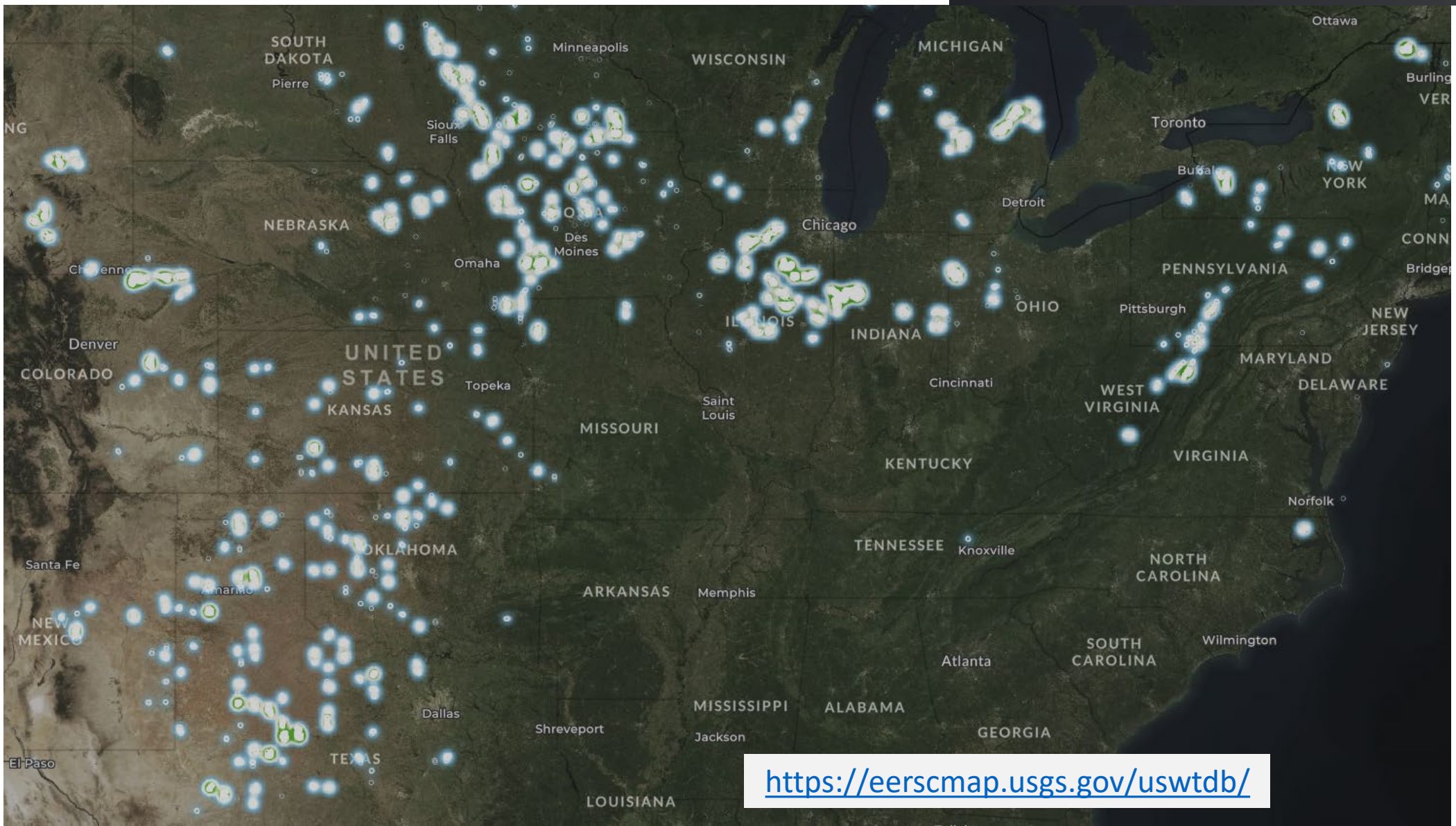
Figure 6: Impact of SHP on farmland values

2. Wind Turbines

USGS science for a changing world | BERKELEY LAB | AMERICAN CLEAN POWER

The U.S. Wind Turbine Database



https://eerscmap.usgs.gov/uswtdb/

The Influence of Wind Energy and Biogas on Farmland Prices

by Olena Myrna, Martin Odening and Matthias Ritter *

Department of Agricultural Economics, Humboldt-Universität zu Berlin, Phillippstr. 13, 10115 Berlin, Germany

* Author to whom correspondence should be addressed.

Land **2019**, *8*(1), 19; **https://doi.org/10.3390/land8010019**

Received: 11 December 2018 / Revised: 10 January 2019 / Accepted: 11 January 2019 / Published: 15 January 2019

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Abstract

In the context of the rapid development of renewable energy in Germany in the last decade, and increased concerns regarding its potential impacts on farmland prices, this paper investigates the impact of wind energy and biogas production on agricultural land purchasing prices. To quantify the possible impact of the cumulative capacity of wind turbines and biogas plants on arable land prices in Saxony-Anhalt, we estimate a community-based and a transaction-based model using spatial econometrics and ordinary least squares. Based on data from 2007 to 2016, our analysis shows that a higher cumulative capacity of wind turbines in communities leads to higher farmland transaction prices, though the effect is very small: if the average cumulative capacity of wind turbines per community doubles, we expect that farmland prices per hectare increase by 0.4%. Plots that are directly affected by a wind turbine or part of a regional development plan, however, experience strong price increases.

Keywords: farmland prices; wind energy; biogas; hedonic pricing model; spatial econometrics

Journal of Agricultural and Resource Economics 45(3):410–427
ISSN: 1068-5502 (Print); 2327-8285 (Online)

doi: 10.22004/ag.econ.302463

The On-Farm and Near-Farm Effects of Wind Turbines on Agricultural Land Values

Gabriel S. Sampson, Edward D. Perry, and Mykel R. Taylor

We estimate the effects of utility-scale wind turbines on agricultural land values in Kansas using parcel-level transaction data from 2001 to 2017 in a hedonic price model. By matching transaction data and wind turbine data at the common land units scale, we are able to ascertain on-farm effects as well as near-farm effects. Across all our analyses, the preponderance of results suggests that wind turbines do not affect agricultural property values, either on-farm or nearby, in a statistically significant way. Thus, our results cannot confirm that wind turbines will increase land values when installed on a parcel.

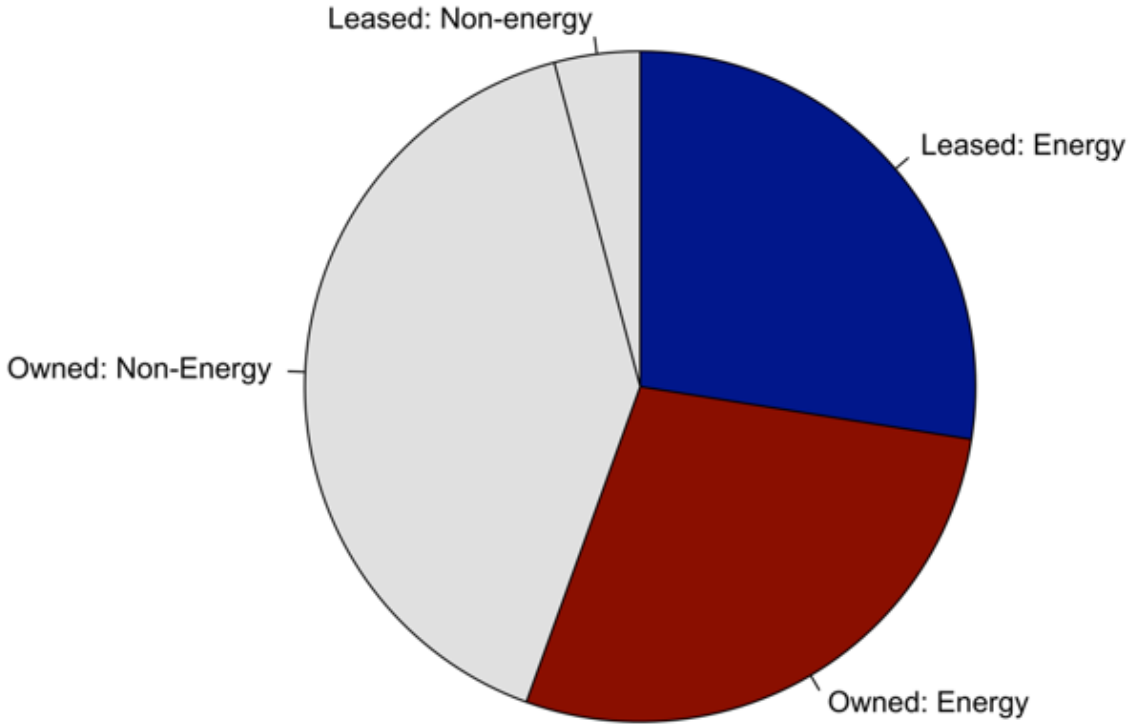
Key words: farmland, hedonic, land values, turbines, valuation, wind

CHOICES
AAEA Agricultural & Applied Economics Association
Volume 38, Quarter 4

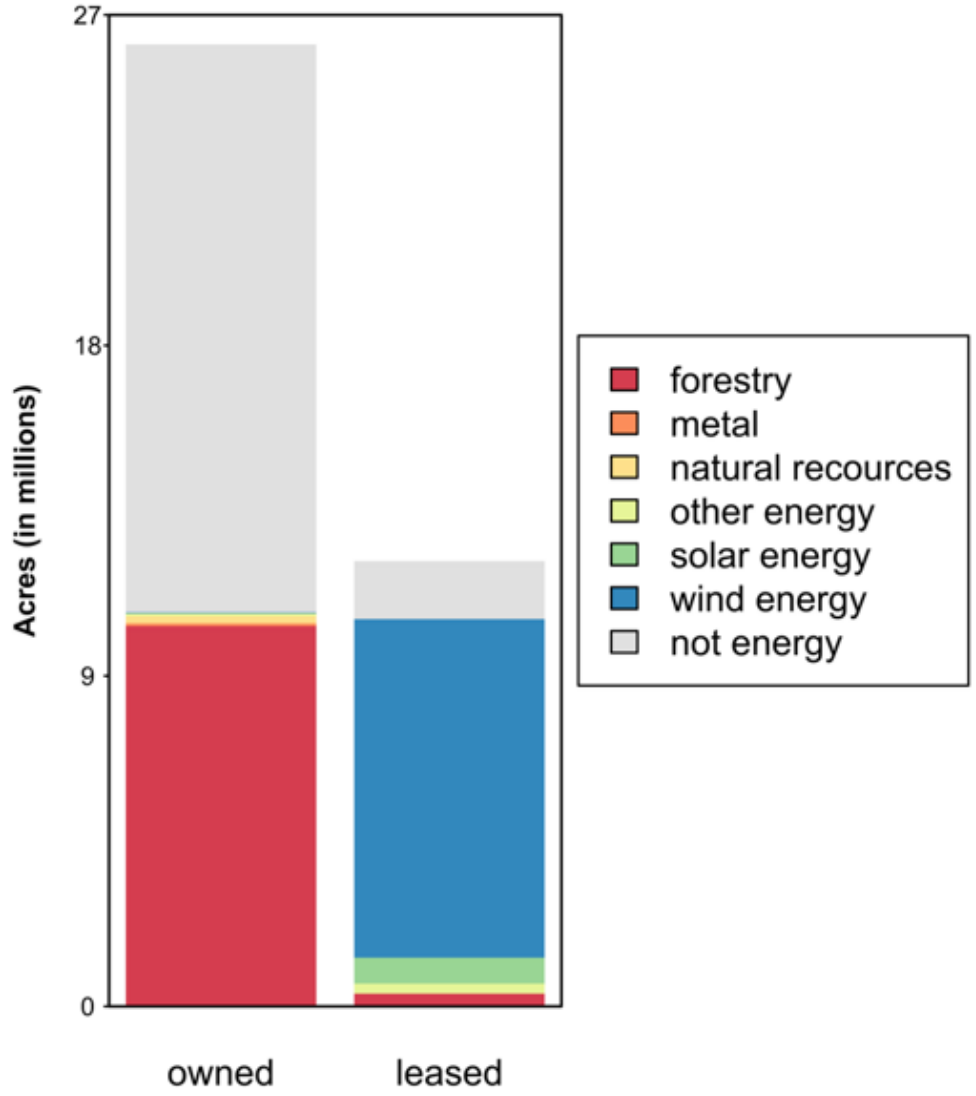
Foreign Interests in U.S. Agricultural Lands: The Missing Conversations about Leasing

Mykel R. Taylor, Wendong Zhang, and Festus Attah

JEL Classifications: Q15, Q18
Keywords: Foreign investment, Land, Policy, Lease



Energy represents a significant share of foreign interests, especially for leased land



3. Electricity Transmission Lines

ELSEVIER

Journal of Housing Economics

Volume 62, December 2023, 101968

Disamenity or premium: Do electricity transmission lines affect farmland values and housing prices differently? ☆

Qinan Lu [a] , Nieyan Cheng [b] , Wendong Zhang [c] , Pengfei Liu [d]

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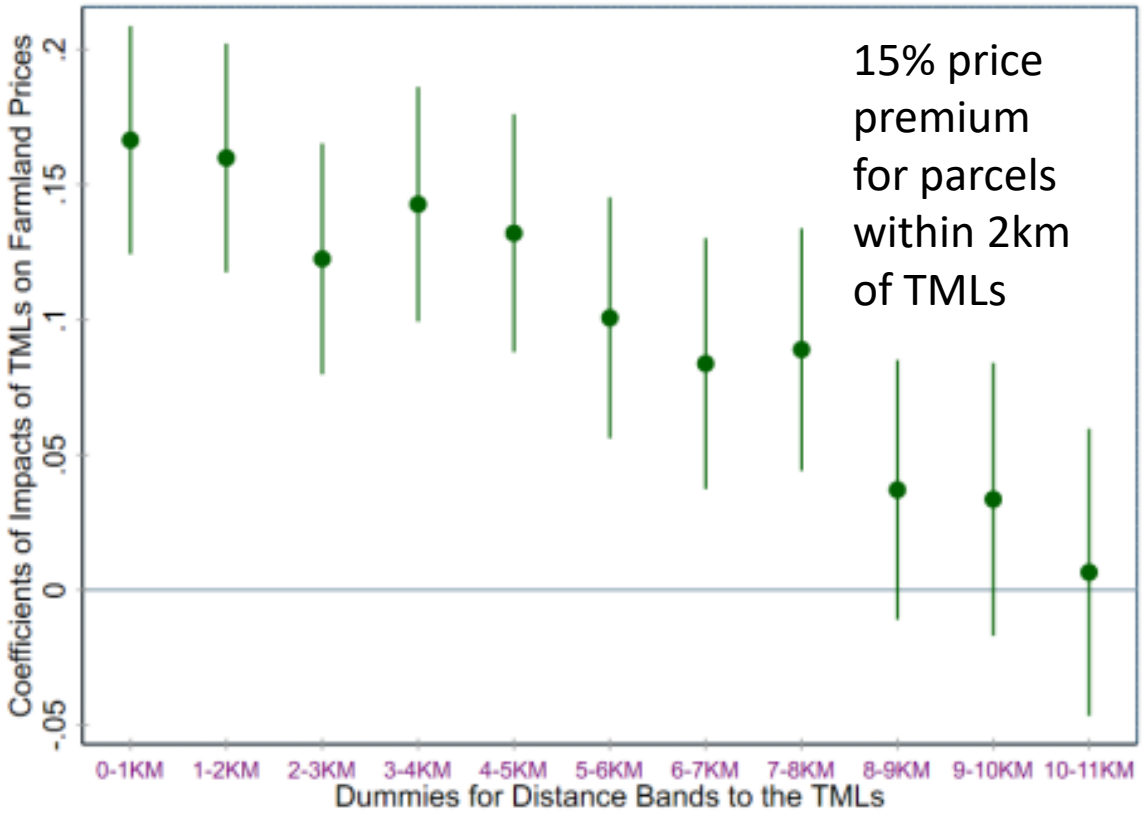
TMLs: premium for farmland prices disamenity for residential housing prices



(a) Nonlinear Effects of Proximity to TMLs on Farmland Prices

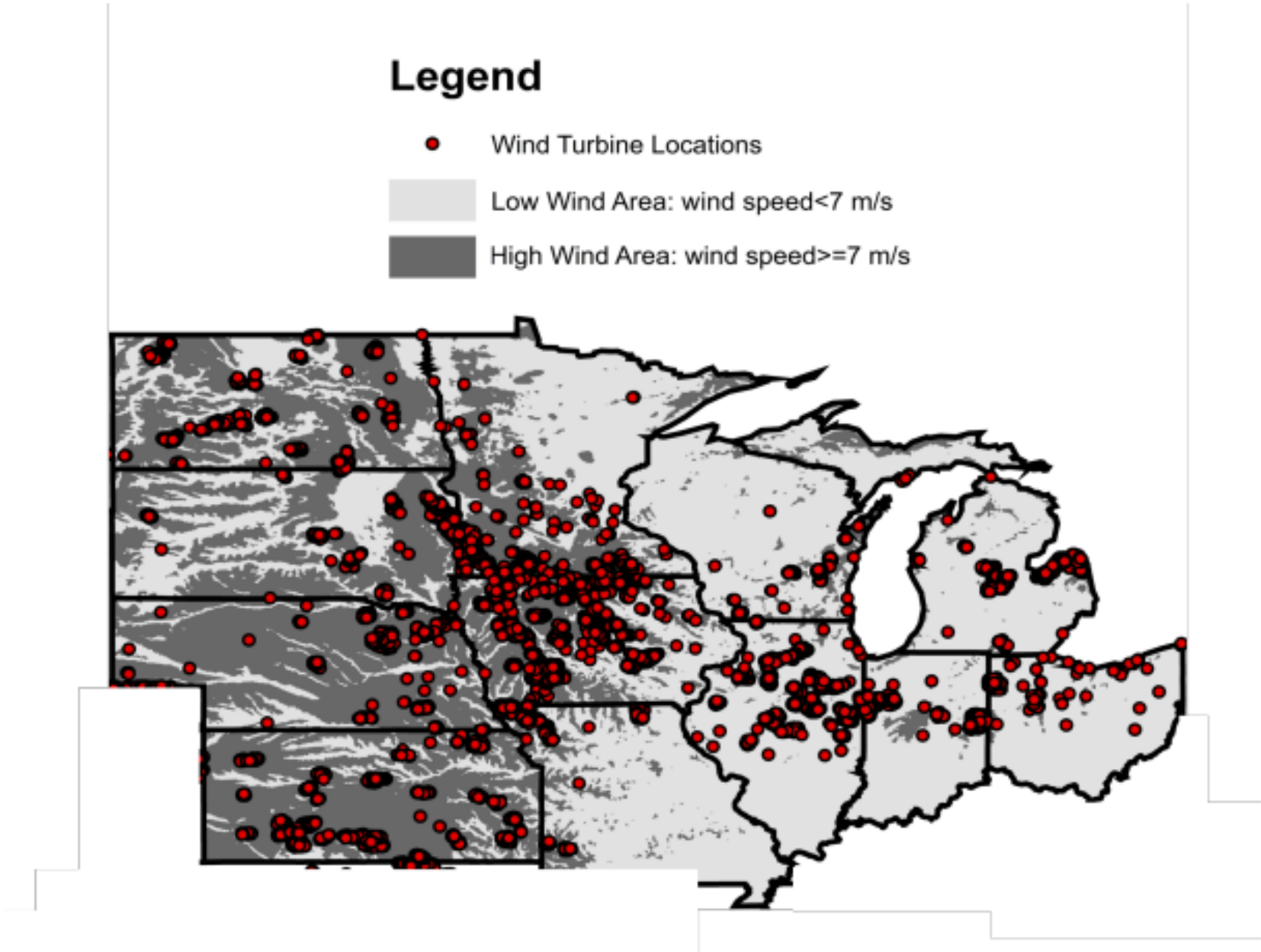
(b) Nonlinear Effects of Proximity to TMLs on Housing Prices

TMLs bring more premium in high-wind-potential areas

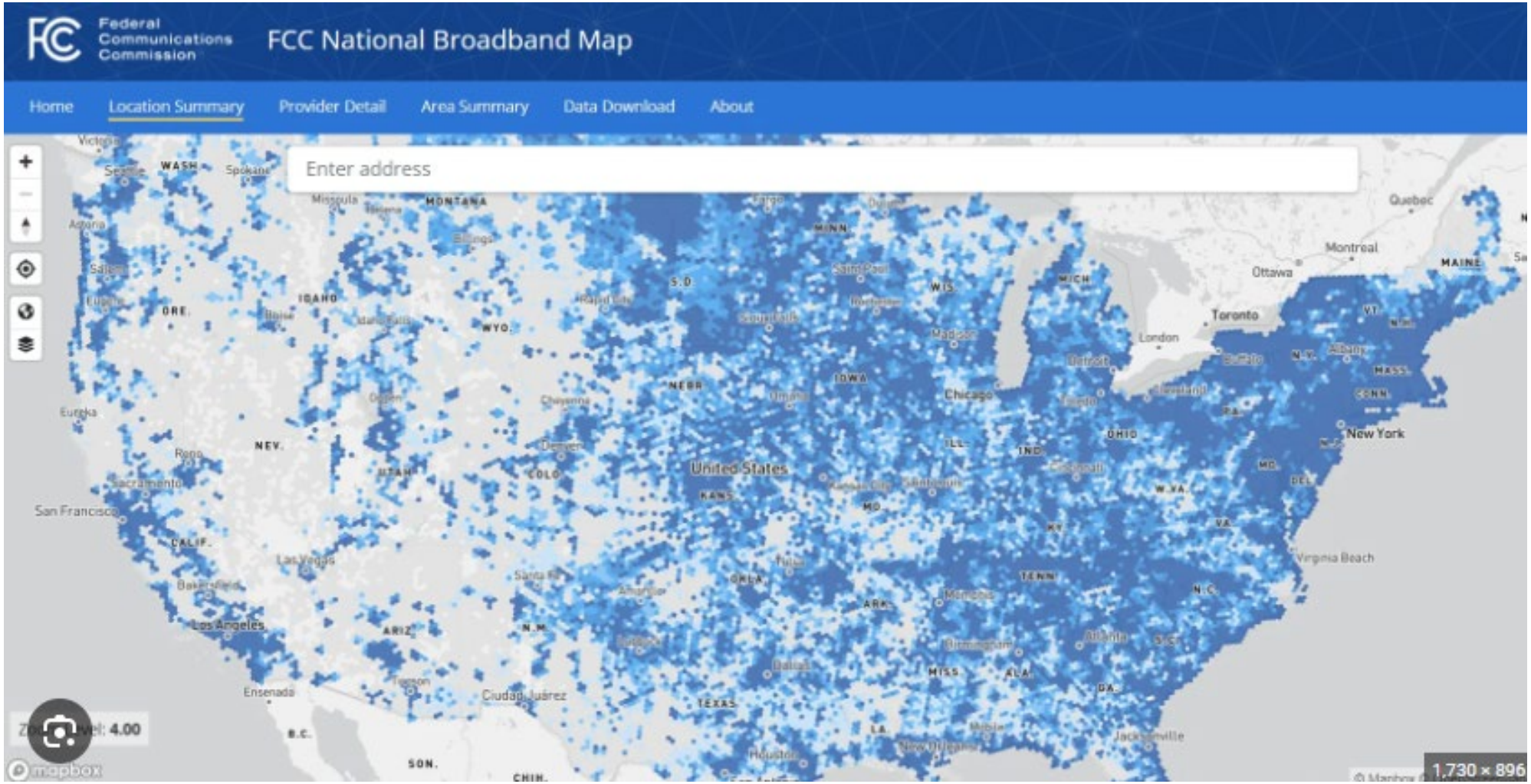
Table 2: Effects of Proximity to TMLs on Farmland Values

Dependent variable	Log of farmland prices					
	(1)	(2)	(3)	(4)	(5)	(6)
Distance to the nearest TML	-0.0105***					
	(0.0022)					
Distance band (0-2 km)		0.1042***	0.0794***	0.1085***	0.0681***	
		(0.0209)	(0.0237)	(0.0283)	(0.0224)	
Distance band (2-5 km)		0.0823***	0.0635***	0.0846***	0.0520**	
		(0.0194)	(0.0218)	(0.0262)	(0.0209)	
Distance band (5-8 km)		0.0542***	0.0310	0.0715***	0.0267	
		(0.0193)	(0.0224)	(0.0245)	(0.0229)	
Distance band (0-2 km) × High wind			0.0844*			
			(0.0464)			
Distance band (2-5 km) × High wind			0.0612			
			(0.0442)			
Distance band (5-8 km) × High wind			0.0757*			
			(0.0440)			
Located at high wind areas			-0.0539			
			(0.0409)			

Figure 2: Spatial Distribution of Wind Speed at 100-meter Hub Height with Existing Wind Turbines



4. Broadband Internet

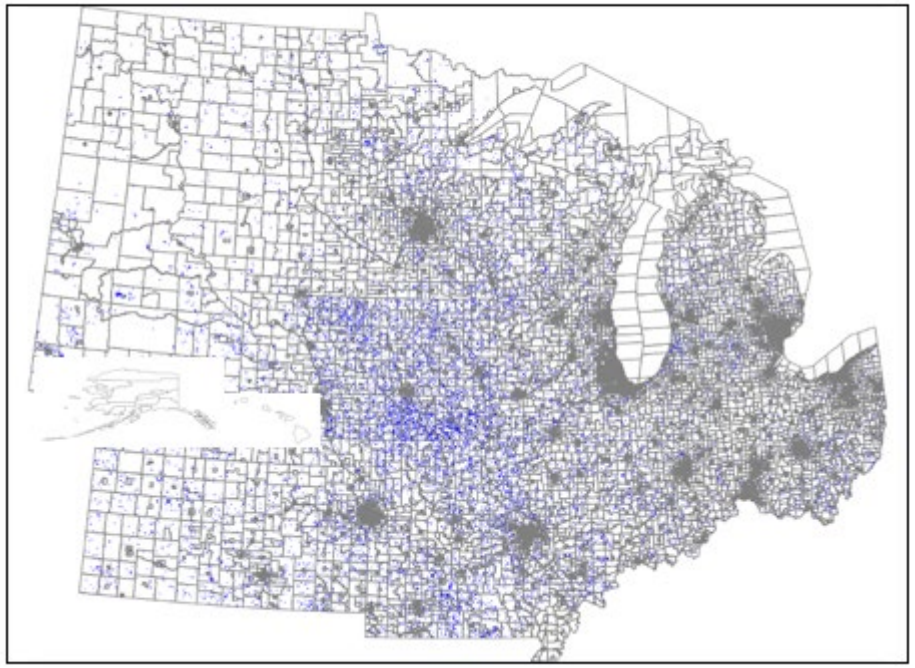


https://broadbandmap.fcc.gov/home

The Impact of Broadband Internet Speed Upgrades on U.S. Farmland Sale Prices and Cash Rents

Xiaorui Qu, Qinan Lu, Minghao Li, Wendong Zhang

Figure 1. Spatial distributions of farmland sales



- Our results indicate that a 1Mbps speed increase raises farmland sale prices by $13.81 per acre.
- Additionally, a 1 percentage point increase in the download speed growth rate leads to a 0.1 percentage point increase in the growth rate of cash rent.

5. Pipelines and Pipeline Accidents

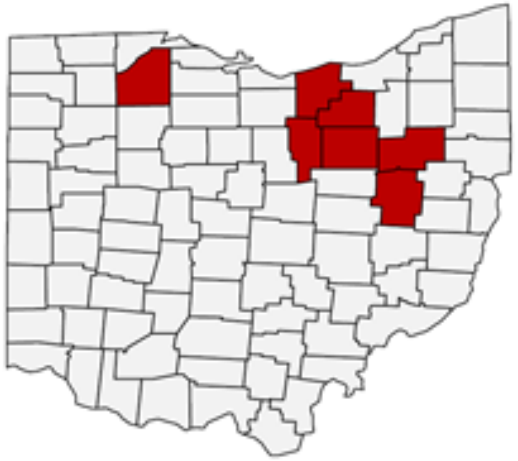
Pipeline Incidents and Property Values: A Nationwide Hedonic Analysis[†]

Nieyan Cheng[a], Minghao Li[b], Pengfei Liu[c], Qianfeng Luo[d], Chuan Tang[e,*], Wendong Zhang[f,g]

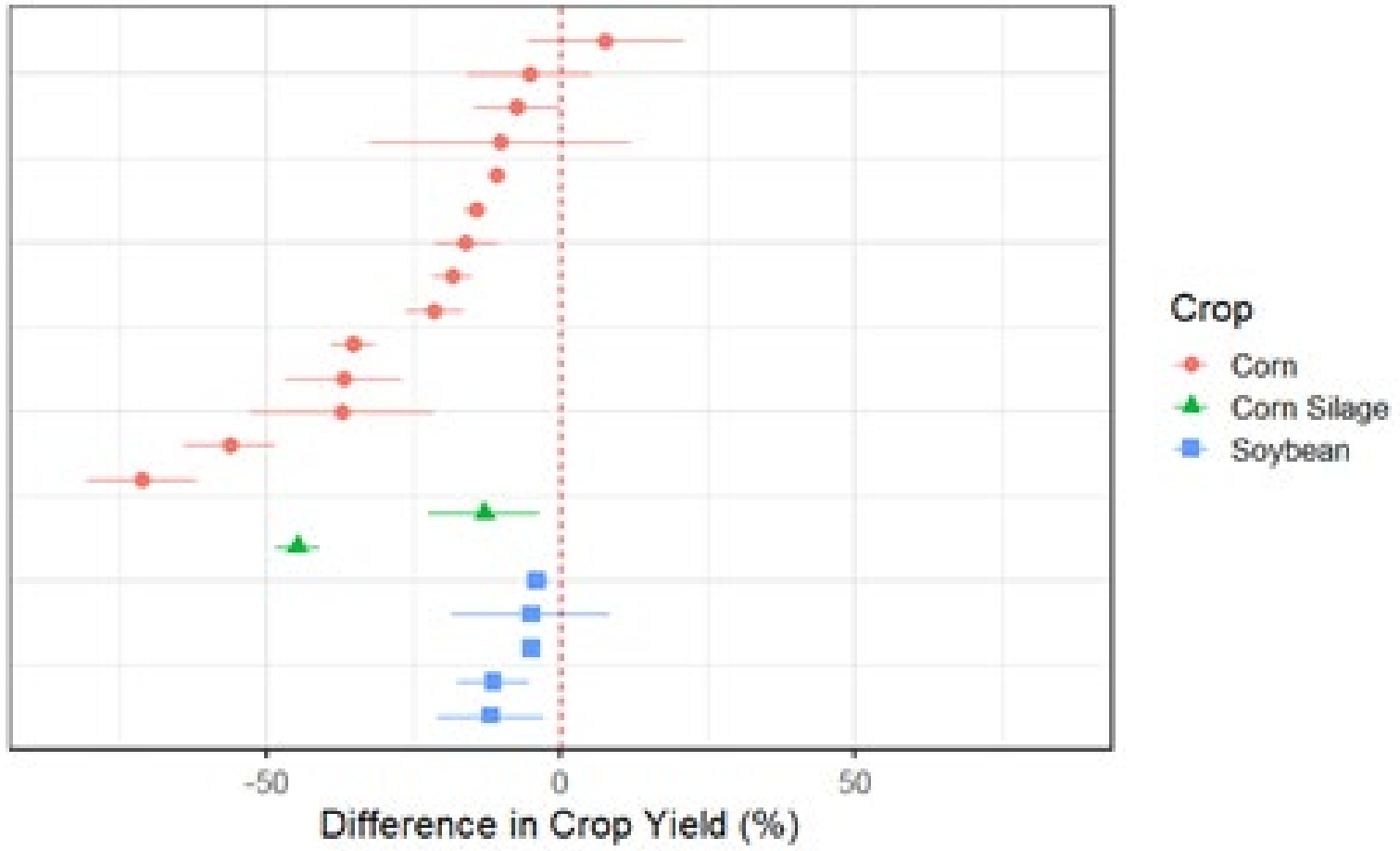
We provide the first nationwide assessment of the **residential housing price** impact of pipeline incidents based on 234 gas distribution pipeline incidents between 2010 and 2020. A difference-in-differences analysis finds that property values within 900 meters of an incident site plummet during the first 500 days of the incident, among which property values within 300 and 600 meters decrease by 12.4% significantly. We explore the heterogeneous impacts of pipeline incidents and find that incidents that raise broad public awareness due to evacuation, explosion, or ignition more severely impact housing values. Incidents in more conspicuous places, such as private land, above-ground, or high-dense population areas, lead to a larger drop in housing values.

The Ohio State University
https://agcrops.osu.edu › newsletter › corn-newsletter

Does Pipeline Installation have a Lasting Effect on Crop Yields?



On average, corn grain yields decreased an average of 23.8%, silage corn decreased an average of 28.8%, and soybean yield decreased an average of 7.4% over the pipeline compared with adjacent areas.



Thank you!

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