WIMBY: Wind In My Back Yard

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Abstract

Wind energy projects generate global environmental benefits that greatly exceed local property value losses. Yet county governments often reject proposed projects. To assess the electoral incentives of permit-issuing county officials, I link spatial variation in local costs and benefits to precinct-level election results in Illinois. Using a difference-in-differences design, I find that incumbent county officials lose vote share in precincts that incur property value losses following project approvals, but gain votes in precincts that benefit from higher school district property tax revenues.

1 Introduction

Wind power has grown from 1% of U.S. electricity generation in 2008 to 10% in 2023, substantially reducing air pollution and carbon emissions. However, local opposition presents a key barrier to new development. While the environmental benefits of wind power are shared broadly across society, the costs are borne locally. Wind turbines lower nearby property values by as much as 11 percent, with smaller effects at greater distances (Parsons and Heintzelman, 2022; Guo et al., 2024; Brunner et al., 2024). These concentrated costs have fueled opposition across the U.S. (Eisenson et al., 2024). In the past five years, nearly half of wind siting applications faced significant delays, with 30 percent outright cancelled, often due to local opposition or regulation (Nilson et al., 2024).

Alongside these costs, however, wind projects often generate significant local economic benefits. Wind projects can increase local government and school district tax revenues (Brunner & Schwegman, 2022; Brunner et al., 2022), lower local property tax rates (Brunner et al., 2022; M. E. Kahn, 2013), and boost local employment and earnings (Gilbert et al., 2024). As a result, local governments must weigh opposition from nearby landowners against fiscal benefits for the broader community.

This paper investigates why wind projects with broad social benefits often fail to win local approval, focusing on the political trade-offs faced by permitting authorities. The analysis proceeds in two stages. First, I estimate the local property value losses, local fiscal benefits, and diffuse environmental gains associated with proposed wind projects in Illinois. Using these estimates, I test whether ex-ante costs and benefits predict which proposed projects are ultimately built. Second, I examine the electoral consequences of approval for the county board members who control permitting, linking spatial exposure to costs and benefits with precinct-level election outcomes.

Illinois is uniquely well-suited for this analysis. Its standardized wind turbine taxation system allows for the precise measurement of local fiscal benefits for proposed projects anywhere in the state. In addition, because most local tax revenues flow to school districts, the boundaries of these districts generate variation in which communities benefit, even within the same county. Finally, permitting authority rests with elected county boards, mirroring the regulatory structure in much of the United States and enabling a direct examination of local political dynamics.

To conduct this analysis, I draw on several data sources. I identify the locations and characteristics of 97 proposed projects, of which 53 were built, using the Federal Aviation Administration (FAA) permit database.[1] To estimate costs and benefits, I combine the FAA data with detailed spatial datasets from the U.S. Census Bureau, the National Renewable Energy Laboratory, and the Illinois Department of Revenue. To study electoral outcomes, I assemble a new dataset of local election results and county board roll call votes from individual county records.

Across all projects, I find that environmental benefits substantially exceed property value losses. For the average project, I estimate that environmental benefits total $1 billion in present value compared to $9 million in property value damages. These environmental benefits are comprised of both global climate benefits from reductions in carbon emissions and public health benefits from reductions in air pollution. These health benefits accrue to the communities surrounding the fossil fuel plants displaced by wind generation, but not to the local communities hosting the wind projects themselves. Even under a conservative estimation approach that applies a high discount rate and excludes climate benefits, I still estimate that environmental gains exceed property value losses by more than a factor of twenty. As a result, project rejections driven by local opposition are likely socially inefficient.

At the same time, I estimate that local property tax revenues average $11 million per proposed project, similar in scale to local property value losses. Thus while all projects pass

[1]The FAA requires permits for all structures exceeding 200 feet above ground level, which includes commercial-scale wind turbines. Permits are typically obtained early in development, resulting in many projects cleared as presenting no hazard to aviation but never built.

a global cost-benefit test, many fail a local one. The relative magnitudes of these local costs and benefits also differ systematically between built and unbuilt projects. Sixty-six percent of proposed projects with net local benefits were ultimately built, compared to just 39 percent of projects with net local costs. In contrast, the broad-based environmental benefits are uncorrelated with project construction. These patterns are consistent with local political economy considerations playing an important role in project approval decisions.

To further examine the determinants of wind project approval and rejection, I study the electoral consequences of project approvals for the county board members responsible for permitting decisions. Using a stacked difference-in-differences design, I compare incumbent performance across voting precincts with varying exposure to the local costs and benefits of wind development. Following project approval, incumbent vote shares fall by 13 percentage points in precincts that primarily incur costs but rise by 7 percentage points in precincts that primarily receive benefits, relative to control precincts in the same county. I show that differences in challenger entry rates help explain these vote share patterns. Additionally, vote share changes are muted in precincts where incumbents voted against project approval, suggesting that voters respond to the actions of their elected representatives.

Overall, my findings highlight the political challenges of deploying renewable energy in a decentralized regulatory system. Concentrated local costs can create electoral pressures for local government officials to reject wind projects with broad environmental value. At the same time, local fiscal benefits can incentivize voter support for incumbent board members. These dynamics suggest policies that deliver compensation to host communities could help offset local opposition and better align local incentives with national environmental goals.

1.1 Related Literature

Several prior studies examine how wind development affects electoral outcomes, with mixed findings. Studies in Ontario (Stokes, 2016) and Germany (Germeshausen et al., 2022) show that parties supporting wind power lost votes in areas surrounding new turbines, while a U.S. study (Urpelainen & Zhang, 2022) finds a positive electoral response at the broader congressional district level. I extend this literature in two ways. First, I focus on electoral outcomes for the local officials directly responsible for project approval. The electoral incentives for these officials are especially consequential for wind development outcomes, but have not been previously studied. Second, by showing that voter responses vary with the distribution of local economic impacts, my results help reconcile the mixed findings in earlier work.

My work is also closely related to Jarvis (2023), who shows that proposed wind energy projects in the United Kingdom with high local property damages are less likely to be approved. By focusing on the U.S. context, I can examine a broader set of political dynamics. In particular, unlike in the United Kingdom, the U.S. property tax system channels direct fiscal benefits to local communities, creating an opportunity to study how these local benefits influence support for wind development. While prior survey-based research has linked favorable attitudes toward wind development to perceptions of economic benefit (Hoen et al., 2019; Rand & Hoen, 2017), no existing study, to my knowledge, has tested whether local benefits shape realized project outcomes or voter behavior.

More broadly, this paper contributes to work on NIMBYism, local political incentives, and the siting of locally undesirable facilities. While I focus on wind power, many other infrastructure projects face local opposition or a similar mismatch between the geographic distribution of their impacts and the jurisdictions responsible for their approval. Prior work shows that governments often site polluting facilities near jurisdictional borders or away from politically influential constituencies (Hamilton, 1993; Helland and Whitford, 2003; Morehouse and Rubin, 2021). Research on housing demonstrates that local opposition and regulation can block new development and impose substantial economic costs (Glaeser et al., 2005; Gyourko and Molloy, 2015).

By examining how voters respond to project approvals, this paper links the siting literature to theories of electoral accountability (Ashworth, 2012; de Benedictis-Kessner & Warshaw, 2020; Healy & Malhotra, 2013) and to Fischel's (2001) hypothesis that "homevoters" act politically to protect their housing wealth. While prior studies confirm that homeowners vote in line with property value interests (Brunner & Sonstelie, 2003; Brunner et al., 2001; Dehring et al., 2008), this paper makes two new contributions. First, because wind projects impose both concentrated housing costs and broad property tax benefits, this setting allows me to test how voters trade off these competing local impacts when evaluating their representatives. Second, I provide new evidence on local political incentives in the context of the clean energy transition, a policy domain where large global gains are often constrained by local opposition.

2 Background on Wind Siting

County governments play a central role in regulating wind energy in the U.S. This section provides institutional background on local permitting and taxation systems, with a focus on Illinois.

2.1 Permitting and Local Regulation

In the U.S., wind energy projects are typically subject to local county government regulation. Many counties require wind projects to obtain discretionary permits from county or zoning boards. Counties may also adopt zoning ordinances specific to wind energy that constrain where projects can be sited, most commonly through setback requirements from property lines or buildings. The number of counties with separate wind ordinances and permitting systems has increased rapidly in the past two decades (Lerner, 2022; Winikoff, 2022). The proliferation of such local regulations may present a barrier to the future growth of the wind industry, in part by reducing the land area available for development (Lopez et al., 2021). In a recent survey, 80 percent of wind developers cited local zoning ordinances as a top reason for project delay and cancellation, and more than 60 percent cited local opposition broadly (Nilson et al., 2024).

2.2 Taxation and Fiscal Impacts

The taxation of wind turbines varies widely across states. In most states, turbines are assessed as real property and taxed at standard local property tax rates. Some states set these valuations centrally, while others allow local assessors to determine value (Kent, 2019). Four states levy production-based taxes, but in all others, local tax revenue from wind is decoupled from actual electricity generation (Brunner et al., 2022). Some states encourage payments in lieu of taxes (PILOTs) from wind developers to local governments, but these arrangements are not standardized.

In addition to paying taxes, wind developers can increase local economic benefits in a community by making donations to local institutions such as libraries, schools, or little league teams. However, in practice these payments appear to be somewhat limited. The largest wind developer in the U.S., NextEra Energy Resources, report that they contributed $1.5 million to community organizations in 2017. The next largest developer, Invenergy, reports $1.7 million in donations in 2021. For comparison, a back-of-the-envelope calculation suggests that these companies paid more than $200 million in property taxes in 2019.[2]

2.3 Illinois as a Case Study

Illinois has several features that make it an especially useful setting for studying the local political economy of wind energy development. In particular, the state has a standardized system of wind turbine taxation which allows for clear measurement of local fiscal impacts, a local permitting structure that is common across much of the U.S., and a large number of

[2]Calculation based on the wind industry paying $912 million in local taxes in 2019 (AWEA) and NextEra and Invenergy owning approximately 23 percent of U.S. wind capacity.

both built and proposed wind projects.

The Illinois property tax code offers two key advantages for analysis. First, turbine assessment is standardized statewide at $360,000 per megawatt of nameplate capacity. As a result, I can calculate the expected local tax revenues from a proposed project anywhere in the state. This also ensures expected tax revenues are predictable to local government officials and community members. Second, because actual tax revenue depends on the local property tax rate, there is substantial variation in local fiscal benefits across similar projects. These revenues are also distributed unevenly within a county due to the boundaries of overlapping taxing authorities, especially school districts.

Some other states also have standardized tax systems, most notably those using production taxes. However, these tend to generate limited variation in local revenue. States with PILOT arrangements or county-by-county assessments do produce revenue heterogeneity, but their reliance on local discretion makes it difficult to predict expected revenue from a proposed project.

Almost all counties in Illinois require wind projects to obtain discretionary permits from local elected officials (Winikoff, 2022). Under this system, elections for these officials are a clear channel for voters to respond to project approval. This local governance structure is common across the U.S. Winikoff (2022) documents similar county-level permitting systems across ten Midwestern and Plains states. More broadly, at least 22 states, accounting for approximately 60 percent of U.S. wind capacity, give primary authority over wind turbine siting to local governments. Only four states (with less than 1 percent of capacity) give primary control to state governments, while the remaining states use a hybrid system involving both local and state regulators (J. Kahn and Shields, 2020). Thus the local political dynamics studied in Illinois are likely to be relevant in many other states.

Finally, Illinois ranks fifth nationally in installed wind capacity, with more than 50 operating projects spanning almost 4,000 turbines. Nearly as many additional projects have been proposed but not built, providing a sufficently large sample for analysis.

2.4 Political Salience and Local Elections

County government decisions to approve or reject wind project permits are often contentious and highly visible local issues.[3] Public meetings on wind siting frequently draw large crowds, and local media provide extensive coverage. School officials often testify in support of proposed projects, highlighting expected tax revenues for their districts.[4] Consequently, wind development can become a salient issue in county board elections. In several documented cases in Illinois, county board races have effectively become referenda on proposed wind projects.[5] These patterns motivate this paper's focus on the relationship between local elections and the distribution of local costs and benefits.

3 Theoretical Framework for Local Permitting

To guide the empirical analysis, I develop a stylized model of the wind project permitting process. The model adapts a standard probabilistic voting framework, in the spirit of Lindbeck and Weibull (1987), to capture the key features of the wind energy setting. The model proceeds in three stages: (1) a developer chooses whether to propose a project in a county, (2) the county board approves or rejects the project, and (3) voters hold the incumbent county board members accountable. Appendix A provides a full description of the model, though I summarize the key components and results below.

[3] Gelles, David. 2022. The U.S. Will Need Thousands of Wind Farms. Will Small Towns Go Along? *The New York Times*.

[4] For example, from the Kankakee County Board Meeting Minutes, August 11, 2015: "Mr. Jeff Bryan, Superintendent of the Tri-Point Schools, spoke in favor of the Kelly Creek Wind Farm expansion. He anticipated a little over $400,000 a year in tax revenues for the school district and urged the board to support this project."

[5] See, for example:
Lydersen, Kari. 2018, November 5. How a county election in rural Illinois became a referendum on wind energy. *Energy News Network*.
Woods, Gordon. 2020, November 5. Four challengers win county board seats. *Clinton Journal*.

Setting and board approval. For a given site, county residents fall into three groups: those incurring nearby property-value losses (share θ, cost C), those receiving school-district tax benefits funded by the developer (share λ, benefit B), and unaffected voters (share $1-\theta-\lambda$). Consistent with the probabilistic voting literature, voter support is shifted by a countywide sentiment shock ($\delta \sim \text{Unif}\big[-\frac{1}{2\psi}, \frac{1}{2\psi}\big]$) and idiosyncratic shocks ($\sigma_i \sim \text{Unif}\big[-\frac{1}{2\phi}, \frac{1}{2\phi}\big]$). The board observes the countywide shock δ and approves if, in expectation, a majority of voters would support the project. This yields an approval probability

$$P(B,C) \;=\; \tfrac{1}{2} \;+\; \psi(\lambda B - \theta C)\,,$$

which is increasing in total local fiscal benefits λB and decreasing in total local damages θC.

Developer application. The developer's expected profit from applying is

$$\mathbb{E}[\Pi(B,C)] \;=\; P(B,C)\,[R - \lambda B] - F.$$

where $T = \lambda B$ is the total local tax payment, F is a fixed application cost, and R is project revenue net of all other costs. Expected profits are strictly decreasing in C because higher C only lowers approval odds via $P(B,C)$. However, the effect of tax payment $T = \lambda B$ is ambiguous. Higher λB raises probability of approval $P(B,C)$ but reduces the prize $R - \lambda B$ if approved. Expected profit is strictly concave in T and there is a unique interior threshold in T below which increases in T raise expected profit and thus likelihood of application.

Retrospective voting. After project approval, incumbents face re-election. Voters in group g support the incumbent if their net utility from the project is positive, i.e. with probability $\Pr(\sigma_i \le U_g - \delta)$. Thus relative to unaffected voters incumbent vote share changes by

$$\Delta v_b = \phi B, \qquad \Delta v_c = -\phi C,$$

Predictions. To summarize, the model implies: (1) higher local fiscal benefits and lower local costs raise likelihood of approval; and (2) after approval, incumbents lose vote share in cost-exposed precincts and gain in benefit-exposed precincts. These predictions guide the empirical analysis below.

4 Estimating Project Costs and Benefits

In the first part of the analysis, I estimate the local costs, local fiscal benefits, and broader external benefits associated with proposed wind projects in Illinois. Specifically, I quantify property value losses to nearby residents, tax revenue accruing to local school districts, and the health and climate benefits from reduced emissions. While local tax revenue is a transfer from wind developers to local governments and not an externality, it is important to the local political economy of project approval. Overall, I find that the estimated health and climate benefits of wind projects are significantly larger than the estimated property value damages for all proposed projects in Illinois, suggesting that local opposition can result in inefficient project rejections.

These estimates rely on a number of assumptions and parameter values from prior research. Appendix B presents sensitivity analyses demonstrating that the main findings are robust to alternative assumptions.

4.1 Identifying Proposed Projects

The FAA requires permits for all structures in the U.S. exceeding 200 feet above ground level, which includes all commercial scale wind projects built in Illinois. Wind developers typically undertake this permitting process early in project development, often before local permits are procured. As a result, the FAA permit database includes a large number of proposed projects that were cleared as presenting no hazard to aviation but never built. I do not observe the reasons these projects were not built. Local permitting and zoning challenges are one hurdle, though other factors such as project economics or grid interconnection could also halt development. Altogether, I identify 97 proposed wind projects in Illinois encompassing over 10,000 individual turbines. Only 53 of these projects were ultimately built.[6]

4.2 Health and Climate Benefits

Wind energy generates health and climate benefits by displacing power production from existing gas or coal plants. Reduced power production from these plants leads to lower emissions of particulate matter and other local air pollutants which harm the health of downwind communities. Additionally, reduced power production from fossil fuel plants leads to lower emissions of carbon dioxide (CO_2), which contributes to global climate change.

I estimate the health and climate benefits of each project as a function of estimated electricity production and the estimated emissions displaced by that production. To estimate electricity production for each project, I start by estimating the nameplate capacity and capacity factor for each turbine. Nameplate capacity refers to the maximum output of a generator while it is producing electricity. Capacity factor refers to the ratio of the actual output of a generator to its nameplate capacity over a given period of time. For wind projects, the capacity factor is heavily dependent on wind speed and consistency at the project location.

The FAA database lacks information on turbine nameplate capacity but includes turbine height, which correlates strongly with capacity. Using the USGS U.S. Wind Turbine Database, which includes all built turbines, I estimate the relationship between height and capacity. I use this relationship to estimate nameplate capacity for each turbine in the FAA database[7] Next, I assign each turbine a capacity factor using estimates of wind turbine capacity factors at the 10 kilometer grid cell level across the U.S. (National Renewable Energy

[6] Because the FAA dataset was not designed to track wind projects specifically, significant cleaning was required to make it usable, as described in the data appendix.

[7] See Figure 13 in the data appendix. Height and its square explain 73% of capacity variation across turbines in the USGS database.

Lab, 2023). Finally, I estimate the annual electricity generation for each project as a function of the estimated nameplate capacity and capacity factor for each turbine:

$$\text{ElectricityGen (MWh)} \quad = \quad \text{NameplateCapacity (MW)} \times \text{CapacityFactor} \times 365 \left(\frac{\text{days}}{\text{year}}\right) \times 24 \left(\frac{\text{hours}}{\text{day}}\right) \tag{1}$$

I then map these estimates of annual power output to health and environmental benefits using existing estimates of the value of wind generation. In particular, I rely on the U.S. DOE's estimate that the marginal MWh of wind energy produces \$37 of health benefits from reduced air pollution (Wiser et al., 2023). These health benefits accrue downwind of the gas or coal power plants whose power production is displaced by wind generation, not to the local community where the wind project is sited. Additionally, I rely on Fell and Johnson (2021), who estimate that one MWh of wind generation reduces CO_2 emissions by 0.65 tons in the Midwest.[8] I combine this estimate of CO_2 reductions with year-specific EPA estimates of the social cost of carbon (SCC) (EPA, 2023) to calculate the climate benefits of each project. The EPA estimates the SCC as \$190 per ton in 2020, rising to \$310 per ton by 2050.

Finally, I convert annual estimates to present value by discounting at a 2 percent rate over a 30 year project lifespan.[9] Equations 2 and 3 summarize the calculations.

$$\text{PV of Health Benefits} = \sum_{t=1}^{30} \left[\frac{\text{ElectricityGen (MWh)} \times \$37\,/\,\text{MWh}}{(1+0.02)^t}\right] \tag{2}$$

$$\text{PV of Climate Benefits} = \sum_{t=1}^{30} \left[\frac{\text{ElectricityGen (MWh)} \times 0.65 \left(\frac{\text{tCO}_2}{\text{MWh}}\right) \times \text{SCC}_t \left(\frac{\$}{\text{tCO}_2}\right)}{(1+0.02)^t}\right] \tag{3}$$

[8]The estimate of avoided emissions is based on a regression analysis of coal and natural gas generation on hourly wind generation.

[9]I use a 2 percent discount rate to be consistent with the Office of Management and Budget's current Circular A-4 guidance for regulatory analysis. Appendix B demonstrates robustness to OMB's previously recommended high-end discount rate of 7 percent

4.3 Local Tax Revenue

Illinois standardized its tax treatment of wind turbines beginning in 2007. The state sets the fair cash value of each turbine at $360,000 per megawatt of nameplate capacity, which is then adjusted annually using a year-specific trending factor and a standardized depreciation schedule (Illinois Department of Revenue, 2024). For tax purposes, the assessed value is defined as one-third of the fair cash value, which is taxed at the local property tax rate within the turbine's jurisdiction. Using the estimated nameplate capacity for each project and Illinois's standardized assessment formula, I calculate each project's assessed value in each year. I then multiply these values by the relevant school district tax rate in the year of the permit application to estimate project tax revenues.[10]

Because school districts often span multiple counties, I adjust the revenue estimate to isolate the share that accrues to the county responsible for permitting. Specifically, I multiply each wind project's school district tax revenue by the share of housing units in the school district that are located within the county containing the project. This adjustment ensures that I focus on the tax revenue that benefits the residents of the county responsible for project permitting. Finally, I calculate the present value of the stream of revenues over a 30-year project lifespan, discounted at 2 percent. Equations 4 and 5 summarize the calculations.

$$\text{AssessedValue}_t = \text{ProjCapacity (MW)} \times \$360{,}000 \times \frac{1}{3} \times \text{TrendFactor}_t \times \text{DeprFactor}_t \tag{4}$$

$$\text{PV of Tax Revenue} = \sum_{t=1}^{30} \left[\frac{\text{TaxRate}_1 \times \text{AssessedValue}_t \times \text{CountyPct}}{(1+0.02)^t} \right] \tag{5}$$

4.4 Housing Damages

To estimate housing damages for each project, I identify the number of housing units within U.S. Census blocks zero to one miles from each project and one to two miles from each project

[10] I collected tax rates by year from the Illinois Department of Revenue.

in the same county. I then assign a housing value to the housing units in each block based on the average housing value in the corresponding Census block group[11]. Finally, I use estimates from Brunner et al. (2024) to calculate the expected property value losses associated with each project. Brunner et al. (2024) estimate that wind projects reduce property values within one mile by 11 percent and property values within one to two miles by 4 percent. These estimates are based on a difference-in-differences analysis of all commercial wind projects and residential property transactions in the U.S. from 2005 to 2020.

$$\begin{aligned}\text{Housing damages} \quad &= \quad \text{HousingUnits (0-1 miles)} \times \text{AvgValue (0-1 miles)} \times -11\% \\ &\quad + \text{HousingUnits (1-2 miles)} \times \text{AvgValue (1-2 miles)} \times -4\% \qquad (6)\end{aligned}$$

4.5 Comparison of Costs and Benefits

I find that the average proposed project would reduce local housing values by $9 million, generate $11 million in school district tax revenue, and produce over $1 billion in health and climate benefits. Figure 1a compares the estimated housing damages to the estimated local tax revenue for each project. Each bar represents a proposed project, with the green portion representing the estimated local tax revenue and the red portion representing the estimated housing damages. Projects are sorted from highest to lowest estimated local tax revenue. While local tax revenues exceed housing damages on average, revenues and damages vary considerably by project, and in many cases housing damages exceed local tax benefits.

Figure 1b swaps out the local tax revenue for the estimated health and climate benefits. As the figure shows, estimated health and climate benefits are substantially larger than housing damages. In fact, the red bars representing housing damages are barely visible for most projects. Even for the least favorable proposed project, the environmental benefits are

[11] Census block groups are smallest geographic unit for which the Census Bureau reports housing value data

still more than ten times larger than the housing damages.

Next, I examine differences in estimated costs and benefits across projects that were built and projects that were not built. In Figure 1c, I plot the local net benefits for each project, defined as local tax revenues minus local housing damages. Faded bars represent proposed projects that were not built. As the figure shows, nearly two-thirds of projects with positive local net benefits were built, compared to only 39 percent of projects with negative local net benefits.[12] In Figure 1d, I plot the global net benefits for each project, defined as health and climate benefits minus local housing damages. As the figure shows, all proposed projects have positive global net benefits, and there is no clear relationship between global net benefits and whether a project was built. These cross-project patterns are consistent with the idea that local costs and benefits, but not broader external benefits, influence project approval decisions.

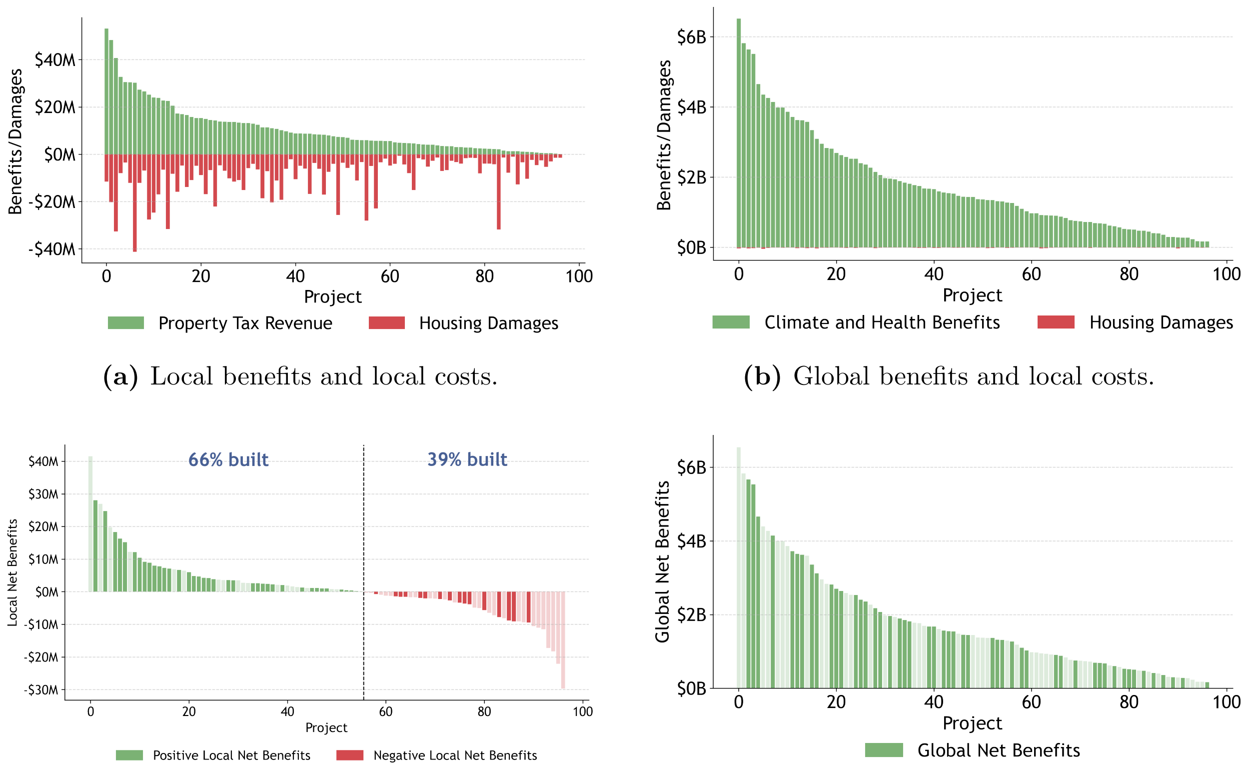
Appendix B demonstrates that these results are robust to alternative assumptions about discount rates, project lifespans, and the magnitude of health and climate benefits. Even under conservative assumptions, estimated health and climate benefits exceed estimated housing damages for all proposed projects in Illinois.

To further examine how estimated costs and benefits relate to project construction, I regress an indicator for whether a proposed project was ultimately built on external health and climate benefits and per-household measures of local costs and local fiscal benefits. I use per-household measures to account for the fact that the same costs and benefits have different implications for local communities of different sizes.

$$\text{Built} = \alpha + \beta_1 \text{HousingDamages} + \beta_2 \text{TaxRevenue} + \beta_3 \text{ExternalBenefits} + \varepsilon \tag{7}$$

Table 1 summarizes the results. Column 1 presents the baseline specification, while Col-

[12] A two-sample t-test confirms that this difference is statistically significant ($p < 0.01$).



(a) Local benefits and local costs.

(b) Global benefits and local costs.

(c) Net local benefits.

(d) Net global benefits.

Figure 1: Comparison of local and global benefits and costs of proposed wind projects.

Notes. Each bar represents a proposed wind project; present values discounted at 2%. **Sorting:** (a) by property tax revenue; (b) by climate and health benefits; (c) by local net benefits; (d) by global net benefits. **Definitions:** (c) Local net benefits = property tax revenue − housing damages; (d) Global net benefits = climate & health benefits − housing damages. **Visualization:** (c–d) Faded bars indicate projects that were not built.

umn 2 adds year fixed effects and a control for average wind speeds at the project location [13]. Across both specifications, projects with higher estimated property tax revenue per household and lower housing value losses per household are more likely to be built. Specifically, I find that a \$100 increase in estimated local property tax revenue per household is associated with an approximately 5 percentage point increase in the likelihood of project construction, while a \$100 increase in estimated housing damages per household is associated with a 5 percentage point decrease in the likelihood of project construction. In contrast, external climate and health benefits show no relationship with project construction. For comparison,

[13] Year fixed effects account for year specific factors that might influence project construction, such as changes in federal tax credits or financing conditions. Wind speed is a key determinant of project profitability.

the average proposed project in the sample has estimated local housing damages of \$270 per household and estimated local tax revenues of \$310 per household.

Column 3 includes estimates of the housing damages and property tax revenues that accrue outside the county with permitting authority. Specifically, these out-of-county variables capture the estimated housing damages to residents of neighboring counties within two miles of the project, as well as the estimated property tax revenues accruing to residents of neighboring counties that are part of the same school district as the project. These out-of-county variables serve as a placebo test. If county boards are primarily motivated by the costs and benefits experienced by their own constituents, then these out-of-county variables should have little relationship with project construction. In contrast, if unobserved spatial characteristics are confounding the results, then these out-of-county variables might show similar correlations to the within-county variables.

The estimated coefficients on the within-county housing damages and tax revenues remain statistically significant and similar in magnitude to prior specifications. The estimated coefficient on out-of-county school district tax revenue is close to zero, while the estimated coefficient on out-of-county housing damages is positive, the opposite of the sign on the within-county housing damages. Neither relationship is statistically significant. Overall, these findings are consistent with a model in which local permitting authorities respond to the concentrated costs and benefits experienced by their own constituents, but not necessarily the impacts that accrue outside of their jurisdiction, either to neighboring counties or to society broadly.

Table 1: Determinants of wind project construction

	Dependent variable: *Built*		
	(1) Baseline	(2) + Controls	(3) + Out-of-county
Housing damages ($100s per capita)	-0.060***	-0.052***	-0.058***
	(0.017)	(0.019)	(0.020)
Out-of-county			0.108
			(0.085)
Tax revenues ($100s per capita)	0.044***	0.056***	0.055***
	(0.016)	(0.018)	(0.019)
Out-of-county			-0.009
			(0.039)
Climate and health benefits ($ billions)	-0.016	0.021	0.030
	(0.040)	(0.049)	(0.063)
Wind speed (m/s)		0.360	0.358
		(0.379)	(0.385)
Observations	97	97	97
R-squared	0.094	0.368	0.378
Year FE	No	Yes	Yes
Mean built	0.55	0.55	0.55

Notes: Observations at proposed project level. Out-of-county refers to local housing damages or tax revenues that accrue outside the county responsible for project approval. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5 Local Election Results

In the preceding analysis I show that proposed wind projects in Illinois generate large environmental benefits relative to local costs, but many are not built. Additionally, I show that many projects have high local costs relative to local fiscal benefits, and that these projects are less likely to be built. To further explore the role of local costs and benefits in the political economy of wind project approval, I now turn to the local election results for the county board members responsible for project permitting.

Using a difference in differences framework, I analyze changes in vote shares for incumbent county board members before and after wind project approval. Specifically, I test whether incumbents lose vote share in precincts that incur local costs and gain votes in precincts that receive local fiscal benefits. This approach provides direct evidence on the electoral incentives facing local decision makers.

5.1 Data

I assemble a novel dataset of county board election results at the precinct level in Illinois. This required the collection and standardization of results from individual county websites in a variety of formats. The data appendix describes this process in detail.

County board structures vary across Illinois counties. The number of representatives serving a county board district ranges from one to ten, and the number of seats up for election varies by board district and election year. Most counties stagger elections, with roughly half of the board elected every two years, though typically all seats are up for election following the decennial redistricting process. Within a district, all candidates are competing for the same set of seats and voters can cast votes for as many candidates as there are seats up for election. As a result, candidate vote shares are not directly comparable across districts or even across years within the same district.[14] To measure incumbent performance over time, I thus do not rely on raw vote shares for individual candidates. Instead, I measure aggregate incumbent performance by calculating the total vote share received by all incumbents within a given precinct and election year.[15] This approach provides a consistent measure of incumbent performance that is comparable across districts with different numbers of seats up for election.

So far, I have collected county board election results for 36 wind projects in Illinois. There are approximately 15 additional wind projects in Illinois for which I have not yet been able to obtain data, either because (1) the project is too recent for post-approval election results to be available, or (2) the county has not publicly posted precinct-level election results for the relevant years.[16]

[14]For example, earning 10 percent of the vote in a district with 10 seats up for election is more impressive than earning 10 percent of the vote in a district with 1 seat up for election.

[15]Appendix D provides results using alternative measures of incumbent performance.

[16]Some counties only publish election results for recent years, while others only publish aggregate results

For each wind project in my dataset, I estimate the per-household property value losses and school district tax revenues in each precinct within the host county. I derive these estimates using the same methods and assumptions previously outlined for calculating project-level costs and benefits. Based on these estimates, I assign each precinct within a county to one of four groups:

- **Cost:** Precincts with estimated damages greater than $1,000 per household and estimated tax revenue less than $1,000 per household.
- **Benefit:** Precincts with estimated tax revenue greater than $1,000 per household and estimated damages less than $1,000 per household.
- **Cost-Benefit:** Precincts with estimated damages and tax revenue greater than $1,000 per household.
- **Control:** Precincts with estimated damages and tax revenue less than $1,000 per household.

The $1,000 per-household threshold ensures that treatment assignment is restricted to precincts with meaningful exposure to costs and benefits. This threshold excludes precincts with only minimal exposure, such as those where only a few homes lie within 2 miles of a turbine. Results are robust to alternative thresholds (Appendix C.1).

Figure 2 demonstrates the assignment of precincts to the four groups for a single wind project in DeWitt County, Illinois. The top row of maps shows a two mile buffer around the project (left) and the boundary of the benefiting school district (right). The second row shows the estimated per-household dollar value of housing damages (left) and tax revenues (right) by precinct, based on overlap with the buffer and school district. The third row applies the $1,000 threshold, removing precincts with minimal exposure. The final row

without precinct-level detail. I reached out to all counties that do not publish precinct-level results to inquire about data availability. Several counties did not respond to initial attempts at contact or did not have access to the data. I plan to continue to follow up with these counties.

displays the resulting treatment groups: precincts with significant exposure to costs (red), benefits (green), both (yellow), or neither (white). This classification forms the basis for the main difference-in-differences analysis.

Discretizing treatment offers several advantages. First, a TWFE regression with discretized treatment produces a straightforward estimate of the average ATT over all treatment 'dosages' within each group. In contrast, TWFE with a continuous treatment variable lacks a clear causal interpretation, as it implicitly assigns negative weights to treatment effects for units with below-average doses (Callaway et al., 2024). Second, precinct-level costs and benefits are estimated imperfectly from a variety of inputs. Grouping treatments into coarse bins reduces sensitivity to the specific assumptions underlying these estimates. Finally, discretization limits the influence of extreme values and avoids imposing restrictive functional form assumptions on the dose–response relationship.

To examine heterogeneity by exposure intensity, I estimate specifications that subdivide each discrete treatment group based on the estimated dollar value of local costs and benefits, as described in Section 5.4. Appendix C.5 also presents results using continuous treatment measures.

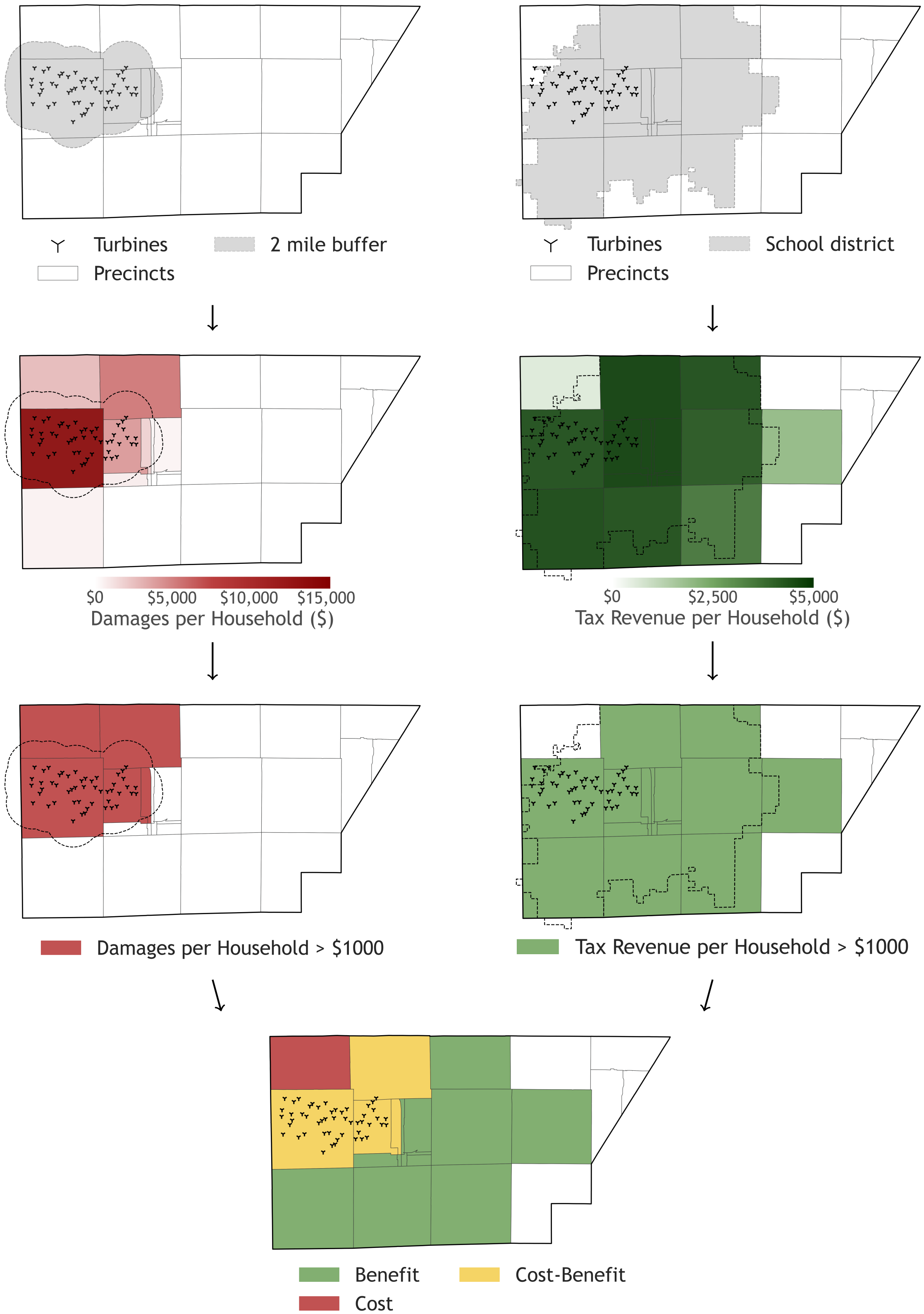


Figure 2: Precinct assignment for a single wind project in DeWitt County, Illinois

5.2 Estimating Voter Responses to Local Costs and Benefits

I begin by estimating a baseline stacked difference-in-differences model to test whether county board incumbents gain or lose vote share following wind project approval in precincts exposed to local costs and benefits. I then test for pre-trends using an event study framework, explore heterogeneity within treatment groups, test for challenger entry as a mechanism, and assess whether voter responses vary with board member support for the project.

To implement the baseline analysis, I construct a panel of incumbent vote shares at the precinct level for the two elections before and after each wind project approval. For each project, this panel includes all precincts within the project's county, regardless of whether they are directly affected by the project. I then stack these precinct-level observations into a single dataset indexed by election cycle relative to project approval and estimate the following stacked difference-in-differences model:

$$Y_{ptj} = \gamma_{pj} + \delta_{tj} + \beta_1 \text{Cost}_{ptj} + \beta_2 \text{Benefit}_{ptj} + \beta_3 \text{CostBenefit}_{ptj} + \varepsilon_{ptj} \tag{8}$$

The outcome variable Y_{ptj} is the combined vote share for incumbent county board candidates in a given precinct (p) and election year (t) for a given project (j). The treatment variables are indicators for whether a precinct falls into the Cost, Benefit, or Cost-Benefit groups in the post-approval period. Precincts in the same county that fall into none of these groups serve as the control group for each project. γ_{pj} and δ_{tj} are precinct $\times$ project fixed effects and event time $\times$ project fixed effects, respectively. The inclusion of these fixed effects ensures that the results are identified off of within-project variation in precinct-level election results over time.

This design relies on the parallel trends assumption that, absent treatment, precincts receiving costs or benefits would have experienced similar changes in incumbent support as untreated precincts in the same county. By focusing exclusively on within-project variation, this approach avoids potentially problematic comparisons between early- and late-treated units that can arise in traditional TWFE designs with staggered treatment timing (Cengiz et al., 2019; Baker et al., 2022).

Column (1) of Table 2 presents the results of this baseline regression. Following project approval, incumbent vote shares fall by 13 percentage points in Cost precincts and rise by 7 percentage points in Benefit precincts, relative to control precincts in the same county. The average incumbent vote share across the sample is approximately 68% with a residualized standard deviation of 25%. Thus, incumbent vote shares fall by roughly 0.5 standard deviations in Cost precincts and increase by nearly 0.3 standard deviations in Benefit precincts. The coefficient on the CostBenefit term is close to zero, which is consistent with either offsetting effects of costs and benefits within these precincts or heterogeneous treatment effects that average out to zero. These possibilities are examined further below.

5.3 Testing for Pre-Trends via Event Study

Next, I estimate an event study stacked regression to visually inspect for pre-trends. This specification replaces the single post-approval treatment indicators in Equation 8 with a series of event time indicators interacted with each treatment group. The election cycle immediately prior to project approval serves as the omitted category. The regression is specified as follows:

$$\begin{aligned} Y_{ptj} = \gamma_{pj} + \delta_{tj} + \sum_{\tau \neq 0} \big(& \beta_{1,\tau} \, \text{Benefit}_{pj} \, \mathbf{1}\{t = \tau\} + \beta_{2,\tau} \, \text{Cost}_{pj} \, \mathbf{1}\{t = \tau\} \\ & + \beta_{3,\tau} \, \text{CostBenefit}_{pj} \, \mathbf{1}\{t = \tau\} \big) + \varepsilon_{ptj} \end{aligned} \tag{9}$$

Figure 3 plots the results. The x-axis indicates the election cycle relative to project approval, where "0" marks the last election prior to approval. The y-axis shows the estimated change in incumbent vote share relative to control precincts. Each point represents

Table 2: Effects of Wind Project Exposure on Incumbent Vote Share

	(1) Baseline	**(2)** Split Mixed Exposure	**(3)** Add Indirect Effects
	Combined Incumbent Vote Share		
A. Cost Exposure			
Cost precinct	−0.135**	−0.136**	−0.134**
	(0.057)	(0.057)	(0.057)
Share other Cost precincts in district			−0.021**
			(0.009)
B. Benefit Exposure			
Benefit precinct	0.071***	0.070***	0.062***
	(0.021)	(0.021)	(0.022)
Share other Benefit precincts in district			0.058
			(0.036)
C. Mixed Exposure (Cost + Benefit)			
CostBenefit precinct	0.017		
	(0.027)		
Net Cost precinct (Cost > Benefit)		−0.038	−0.043
		(0.033)	(0.034)
Share Net Cost precincts in district			−0.009
			(0.008)
Net Benefit precinct (Benefit > Cost)		0.072*	0.066
		(0.041)	(0.043)
Share Net Benefit precincts in district			0.005
			(0.012)
Mean incumbent vote share	0.68	0.68	0.68
Observations	3,608	3,608	3,608
R-squared	0.617	0.618	0.620

Notes: Vote shares observed at the precinct × election level. All models include event time × project and precinct × project fixed effects. Indirect effects are measured using leave-one-out shares of other treated precincts in the same district-election. These shares are standardized to have mean zero and standard deviation one for ease of interpretation. Standard errors, shown in parentheses, are clustered at the precinct level. * $p < 0.05$.

a coefficient estimate, with vertical lines indicating 95% confidence intervals. The figure disaggregates results by treatment group. Looking back an additional election cycle prior to project approval (cycle -1), all groups exhibit point estimates near zero, suggesting no significant pre-treatment trends in incumbent vote share. Post-approval, the treatment effects diverge significantly. Incumbent vote shares decline in Cost precincts and increase in Benefit precincts. In Cost-Benefit precincts, the point estimates are near zero and confidence intervals overlap both positive and negative values.

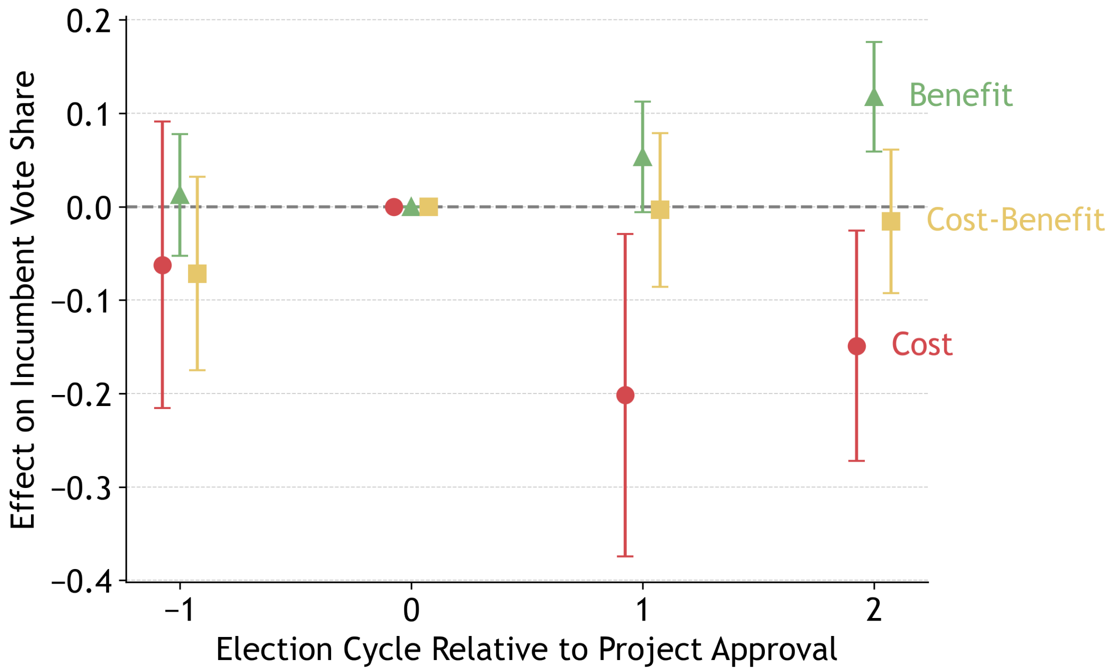


Figure 3: Event study of incumbent vote share by precinct group

Note: Coefficients from an event study regression of incumbent vote share on wind project exposure. Vote shares observed at the precinct × election level. The x-axis represents relative election cycle, with 0 indicating the last election prior to project approval. Vertical bars show 95% confidence intervals. Y-axis reflects vote share changes relative to the control group in Cost, Benefit, and Cost-Benefit precincts.

5.4 Heterogeneity by Cost and Benefit Intensity

To explore heterogeneity by cost and benefit intensity, I first disaggregate the CostBenefit group. All precincts in this group experience both local costs and benefits, though the relative magnitudes vary across precincts. To allow for differential treatment effects based on the net balance of costs and benefits, I disaggregate CostBenefit precincts into two subgroups: those where estimated local tax revenue exceeds estimated property value losses (net benefit precincts) and those where property value losses exceed local tax revenue (net cost precincts). I estimate an additional regression that includes these two new indicators in place of the original CostBenefit indicator.

Column (2) of Table 2 presents the results of this regression. This specification reveals divergence within the mixed-exposure group. In precincts where estimated benefits outweigh costs, incumbents gain roughly 7 percentage points in vote share following project approval. In contrast, incumbent vote share falls by nearly 4 percentage points in precincts where costs outweigh benefits. The 95% confidence intervals for both estimates include zero, though a t-test rejects the null hypothesis that the two coefficients are equal ($p = 0.03$).

To further examine how voters trade off costs and benefits, I pool all treated precincts and sort them into quartiles of estimated net benefits (tax revenue gains minus property value losses). I then estimate a stacked difference-in-differences regression with indicators for each quartile in the post-approval period:

$$Y_{ptj} = \gamma_{pj} + \delta_{tj} + \sum_{q=1}^{4} \beta_q \, \text{NetBenefitQuartile}_{ptj} + \varepsilon_{ptj} \tag{10}$$

Figure 4 presents the results. The plotted points represent the estimated effect of project approval on incumbent vote share for each quartile, while the vertical lines show the corresponding 95% confidence intervals. Incumbent vote shares fall in the first quartile, where average net benefits are roughly –\$5,000 per household, and increase in the fourth quartile, where average net benefits are roughly +\$10,000 per household. The middle quartiles fall in between, with confidence intervals that include zero. Overall, these results suggest that voters respond systematically to the net balance of local costs and benefits.

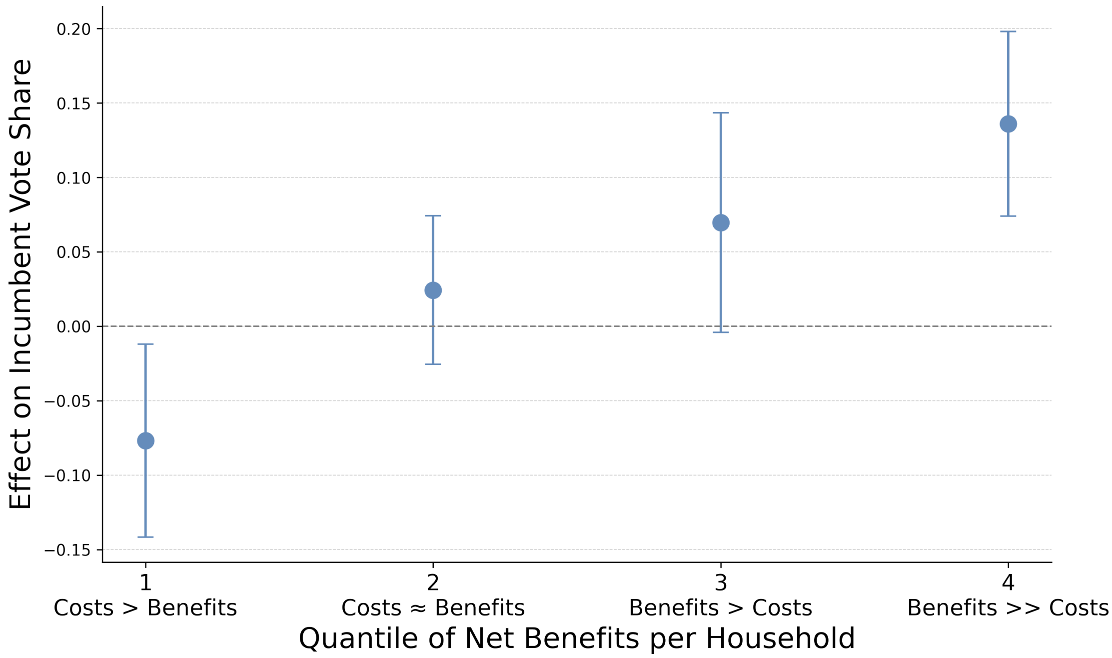


Figure 4: Treatment Effects by Net Benefit Quartiles

Note: Vote shares observed at the precinct × election level. Each treatment group is divided into quartiles based on estimated per-household net benefit (tax revenue minus property value loss). Effects are estimated via a stacked difference-in-differences model with precinct × project and event time × project fixed effects. Bars show point estimates with 95% confidence intervals.

5.5 Challenger Entry

One potential mechanism driving the observed changes in incumbent vote share is the entry rate of challengers following wind project approval. For example, a wind project that produces high costs in a precinct might motivate a challenger to enter the race, drawing votes away from the incumbent. I test for challenger entry by estimating a regression of the number of challengers per seat in each precinct on treatment exposure. I define challengers per seat as the number of non-incumbent candidates running for county board seats in a given precinct, divided by the number of seats up for election in that precinct. I use a per seat measure to account for the fact that the number of seats up for election varies across precincts and election years.

Table 3 presents the results. I find that the cost precincts see an increase of 0.2 challengers per seat following project approval, while benefit precincts see 0.13 fewer challengers per seat.

In Cost-Benefit precincts, the net cost subgroup sees a small increase in challengers per seat, while the net benefit subgroup sees a decrease similar in magnitude to the benefit precincts. These findings indicate that changes in challenger entry are one mechanism through which local costs and benefits influence incumbent vote share.

Table 3: Effects of Wind Project Exposure on Challenger Entry

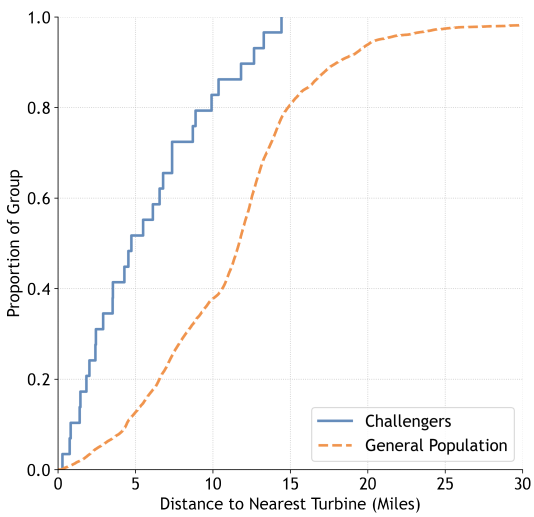
	Challengers per seat
Cost	0.197*
	(0.110)
Benefit	−0.124***
	(0.037)
CostBenefit (Net Cost)	0.063
	(0.050)
CostBenefit (Net Benefit)	−0.133*
	(0.068)
Mean challengers per seat	0.58
Observations	3,608
R-squared	0.652

Notes: Observations at the precinct × election level. All models include event time × project and precinct × project fixed effects. Standard errors, shown in parentheses, are clustered at the precinct level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

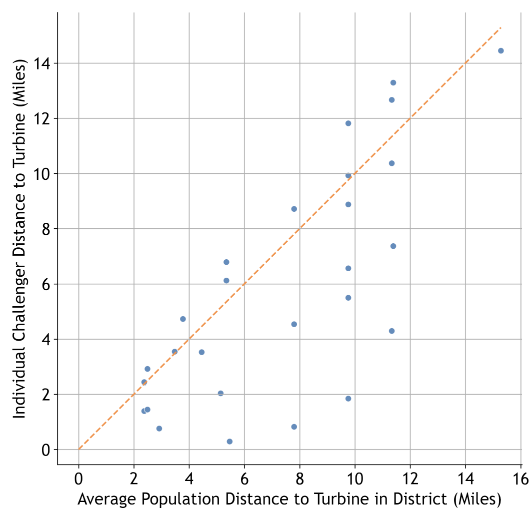
To investigate this mechanism further, I focus on the relative increase in challengers in precincts that bear project costs. Specifically, I test whether these challengers are individuals who are themselves disproportionately exposed to these costs by comparing their home addresses to those of the general population. I collect challenger home addresses from public county assessor records, while for the general population I rely on high-resolution gridded data from the Oak Ridge National Laboratory LandScan Program (Rose et al., 2017).

I find that after project approval, challengers in districts bearing costs are systematically located closer to turbines than other district residents. Figure 5a presents the empirical CDFs for the distance to the nearest turbine for both challengers and the general population. The challenger distribution is shifted to the left of the general population's distribution, indicating that a larger proportion of challengers live within any given distance of a turbine. In particular, 21% of challengers live within two miles of a turbine, where property value losses are most likely, compared to only 4% of the general population in the same districts.

Figure 5b further illustrates this point by plotting each challenger's distance to a turbine against the average population distance in the same electoral district. The 45-degree line represents parity, where a challenger's distance equals the district average. The concentration of points below this line demonstrates that challengers are systematically located closer to turbines than the average constituent in the districts they seek to represent. Together, this geographic evidence supports the hypothesis that increased challenger entry is at least in part a direct response to local project costs.



(a) Cumulative Distribution of Distance to Nearest Turbine



(b) Challenger vs. Population Average Distance to Nearest Turbine

Figure 5: Geographic Distribution of Challengers Relative to Turbines

Notes. Charts show the geographic distribution of county board challengers relative to wind turbines in districts incurring project costs. Panel (a) presents empirical cumulative distribution functions of the distance to the nearest turbine for all challengers in these districts compared to overall general population in these districts. Panel (b) plots each challenger's distance to the nearest turbine against the average distance for their electoral district.

5.6 Incorporating Spillover Effects

If wind project approval changes the entry decisions of potential challengers, then the effects of treatment exposure may extend beyond the precincts that are directly affected by costs and benefits. For example, if high costs in a precinct induce a challenger to enter the race, this challenger appears on all ballots in the district. Thus, the challenger's entry may reduce incumbent vote share in all precincts of the district, not just those directly exposed to project costs.

To account for these potential spillover effects, I extend the baseline regression to include measures of indirect treatment exposure at the district level. Specifically, I construct leave-one-out measures of the share of other precincts within the same electoral district that are exposed to each type of treatment. The extended regression that estimates these spillover effects is as follows:

$$
\begin{aligned}
Y_{ptj} = \gamma_{pj} + \delta_{tj} + \beta_1 \text{Cost}_{ptj} + \beta_2 \text{CostShare}_{ptj} + \beta_3 \text{Benefit}_{ptj} + \beta_4 \text{BenefitShare}_{ptj} \\
+ \beta_5 \text{CostBenefit}_{ptj} + \beta_6 \text{CostBenefitShare}_{ptj} + \varepsilon_{ptj} \qquad (11)
\end{aligned}
$$

This specification allows me to separately identify whether incumbent vote share changes based on a precinct's own treatment status (direct effects), or based on the broader level of treatment across the district (spillover effects). Column (3) of Table 2 shows the regression results. The direct treatment effects remain statistically significant and similar in magnitude to the baseline results. However, I find that indirect treatment exposure also affects incumbent support. A one standard deviation increase in the share of cost-exposed precincts in a district reduces incumbent vote share by 2 percentage points, while a one standard deviation increase in the share of benefit-exposed precincts raises it by nearly 6 percentage points. These findings suggest that precinct-level costs and benefits can shape the district-wide political environment, consistent with the challenger entry mechanism discussed above.

5.7 Voter Response by Board Member Support

Wind project approval requires a majority vote of the county board. As a result, even approved projects may have both supporters and opponents among incumbent board members. For a subset of projects, I compiled data on individual board members' votes from board meeting minutes and local news reports.[17] For these projects, I examine which board members support or oppose wind projects and assess whether voter responses differ based on board member support.

5.7.1 How do board members vote?

First, I explore how board members vote based on the types of precincts they represent as well as their political party affiliation. Each county board member represents an electoral district that typically includes multiple precincts. I start by aggregating estimated precinct-level property value losses and school district tax revenues to the board member district level. Then, I classify each district as either Cost, Benefit, Cost-Benefit, or Control using the same $1,000 per-household threshold used for precincts. Because board member districts are larger than precincts, they rarely include only costs. As a result, the sample includes only 2 cost districts, with many cost precincts falling into Cost-Benefit districts instead.

Figure 6a presents the average share of county board members voting in favor of project approval, disaggregated by district type. On average, more than 70 percent of county board members in control or benefit districts voted in favor of each project, compared to 50 percent of board members in cost-benefit or cost districts. Figure 6b further disaggregates these results by party affiliation. Democratic board members are more likely to vote in favor of wind project approval than Republican board members across all district types. Democratic board member votes also differ less across district types, with nearly 95 percent of Democratic board members voting in favor of project approval regardless of district type.[18] In contrast,

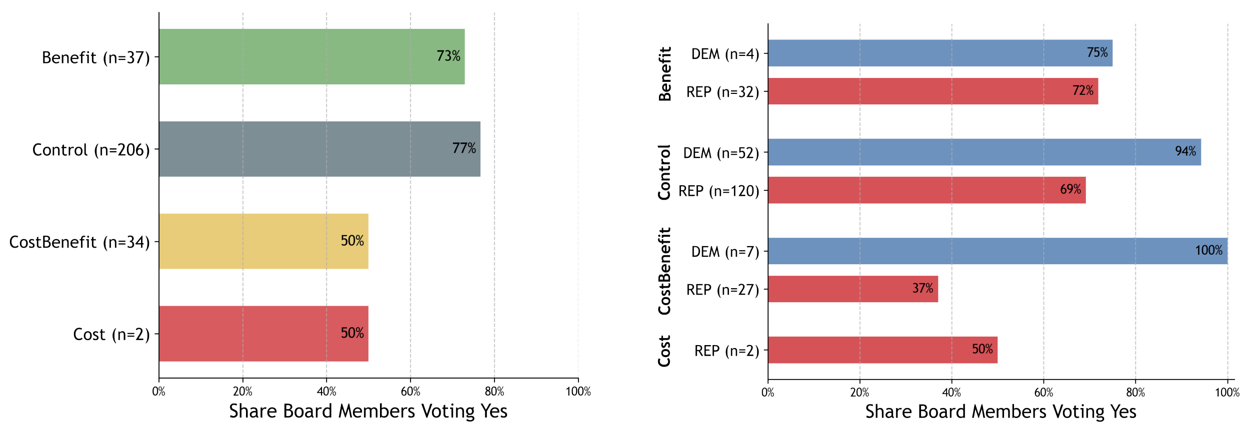
[17]For some projects, I was unable to locate public records of individual votes. I plan to contact the relevant counties to inquire about the availability of this information.

[18]Only about 25 percent of board members are Democrats, so sample sizes are small in some subgroups.

Republican board members show more variation in their support across district types.

To formally test these patterns, I estimate a regression of board member vote on indicators for district type and Democratic party affiliation. I include project fixed effects to absorb heterogeneity in board member support across projects. Thus, the estimated coefficients capture variation in voting behavior across board members representing different district types within the same county. As shown in Table 4, the results confirm the patterns observed in the aggregate statistics. Board members representing Cost-Benefit districts are 28 percentage points less likely to vote in favor of project approval, relative to board members representing control districts voting on the same project. Board members from cost districts are also less likely to support approval, though the estimate is not statistically significant, while the coefficient for benefit districts is close to zero. Democratic board members are 18 percentage points more likely to vote in favor of project approval.

Figure 6: Average County Board Member Support for Wind Project Approval



(a) By district type **(b)** By district type and party

Note: Observations at the board member × project level. The figure shows the share of board members voting in favor of wind project approval, across all projects with available vote data. The left panel disaggregates by district type; the right panel further disaggregates by party affiliation.

Table 4: Effects of Wind Project Exposure on Share Voting "Yes"

	(1) Yes Vote
Cost district	-0.171
	(0.453)
Benefit district	-0.018
	(0.093)
CostBenefit district	-0.282***
	(0.093)
Democrat	0.179***
	(0.060)
Mean Yes Vote	0.73
Project FE	Yes
Observations	279
R-squared	0.177

Notes: Observations at the board member × project level. The dependent variable is an indicator for whether the board member voted in favor of project approval. Robust standard errors shown in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5.7.2 Do voter responses vary based on board member support?

All of the results presented in Table 2 relate the effects of wind project exposure to aggregate incumbent vote share. However, these aggregate results may mask heterogeneity in the electoral response to wind project approval in precincts with incumbents that supported versus opposed projects.

To formally assess whether voter responses vary based on how their representatives voted, I extend the stacked difference-in-differences framework by interacting each precinct's treatment group with an indicator for whether at least one board member representing the precinct voted against the project. The estimating equation is:

$$Y_{ptj} = \gamma_{pj} + \delta_{tj} + \beta_1 \text{Cost}_{ptj} + \gamma_1 \left(\text{Cost}_{ptj} \times \text{VoteNo}_{pj}\right) \tag{12}$$

$$+ \beta_2 \text{Benefit}_{ptj} + \gamma_2 \left(\text{Benefit}_{ptj} \times \text{VoteNo}_{pj}\right) \tag{13}$$

$$+ \beta_3 \text{CostBenefit}_{ptj} + \gamma_3 \left(\text{CostBenefit}_{ptj} \times \text{VoteNo}_{pj}\right) + \varepsilon_{ptj} \tag{14}$$

where VoteNo_{pj} is equal to one if at least one board member representing precinct p voted against wind project j. Table 5 presents the results of this regression. Column (1) replicates the baseline specification from Table 2 for the subsample. Column (2) adds the interaction terms between the treatment groups and the VoteNo indicator. I find that incumbents representing cost precincts see a smaller decline in their vote share when at least one board member voted against the project, though the difference is not statistically significant. Conversely, incumbents in benefit precincts see smaller increases in their vote share when at least one board member voted against the project. These results suggest that voters are not responding solely to the presence of a project, but also to the behavior of their elected representatives.

Table 5: Effects of County Board 'No' Votes on Incumbent Vote Share

	(1) Baseline	**(2)** Add Interactions
	Combined Incumbent Vote Share	
A. Cost Exposure		
Cost precinct	-0.263^{***}	-0.327^{***}
	(0.080)	(0.090)
Cost precinct × Vote no		0.205
		(0.128)
B. Benefit Exposure		
Benefit precinct	0.078^{***}	0.108^{***}
	(0.028)	(0.040)
Benefit precinct × Vote no		-0.076^{**}
		(0.037)
C. Mixed Exposure (Cost + Benefit)		
Cost-Benefit precinct	0.007	-0.032
	(0.039)	(0.044)
Cost-Benefit precinct × Vote no		0.090^{**}
		(0.041)
Observations	2,341	2,341
R-squared	0.626	0.630

Notes: Vote shares observed at the precinct × election level. All models include event time × project and precinct × project fixed effects. Vote no indicates that at least one board member in the precinct voted against project approval. Standard errors, shown in parentheses, are clustered at the precinct level. * $p < 0.05$.

6 Policy Implications and Recent State Legislation

The Production Tax Credit (PTC) has long been the main federal policy supporting wind energy development. The PTC is a tax credit that wind developers can claim in proportion to the electricity produced by a wind project over its first 10 years of operation. The PTC was originally set at $15/MWh in 1992, and has grown with inflation indexing to $27.5/MWh in 2023. I estimate the present value of the PTC for each proposed project in Illinois using the estimates of power production described in Section 4.2 and a 2 percent discount rate. As Figure 7 shows, the PTC subsidy greatly exceeds housing damages for almost all projects. The PTC cost to the federal government averages over $100 million across wind projects in Illinois, compared to an average of $9 million in estimated housing damages. As a result, reallocating even a small share of the PTC subsidy toward host communities could ensure that every project generates net local benefits.

Such a program would not be entirely without precedent. Several longstanding federal programs direct payments to local governments to offset the local costs of other nationally beneficial land uses. For example, the Payments in Lieu of Taxes (PILT) program compensates counties for the presence of tax-exempt federal lands, and Forest Service programs return a portion of revenues from timber harvesting and other activities to counties to fund public schools and roads (Headwaters Economics, 2015). A federal program designed to compensate communities for hosting wind energy projects could follow a similar model.

At the state level, several governments have recently moved to reform wind siting policy in response to concerns about local opposition. Some states have directly limited local authority over wind project permitting. For example, in 2023, Illinois started requiring local governments to approve projects that meet statewide standards, preempting more restrictive local regulations. Other states have instead adopted incentive-based approaches that provide direct financial benefits to communities that permit or host renewable energy projects. In 2021, New York began providing electricity bill credits to communities that host wind

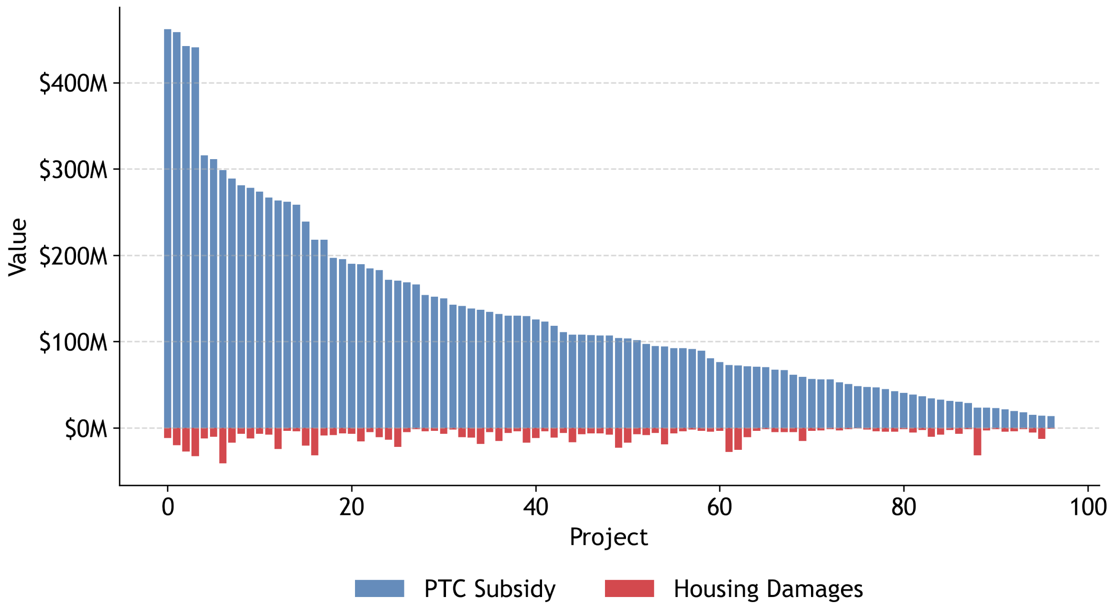


Figure 7: Estimated PTC Subsidy vs. Housing Damages

Note: Each bar represents a proposed wind project; present values discounted at 2%. Sorted by estimated PTC subsidy.

projects, funded by fees on developers. Michigan adopted a hybrid approach in 2024, allowing developers of large projects to pursue state-level permitting if local regulations are too restrictive, while also providing direct financial grants from state funds to communities that host wind projects. While these programs are too new to evaluate directly, my findings in Illinois suggest that such increases in local fiscal benefits could help reduce political barriers to wind development.

Notably, the New York approach of funding local incentives through developer fees could reduce project profitability, potentially discouraging new investment. However, these added fees could also indirectly benefit developers by easing local opposition and improving the odds of project approval. The overall effect of higher taxes or fees on developer incentives is therefore ambiguous (see model in Appendix A). Although I do not directly test which effect dominates, I find that Illinois school districts with higher property tax rates are more likely to host wind projects, even after accounting for other siting determinants (see Appendix A.8). This pattern is at least consistent with the idea that local developer payments are not a deterrent to wind development, at least at current levels in Illinois.

Whether the marginal subsidy dollar is better spent on local incentives or on the PTC is beyond the scope of this paper. However, it is worth noting that the PTC is likely claimed by many projects that would remain profitable even without subsidy. Aldy et al. (2023) estimate plant-level profits for U.S. wind farms built 2009–2012, and find that roughly two-thirds would have entered even without federal subsidy.[19] Since 2012, the estimated Levelized Cost of Energy (LCOE) for unsubsidized wind has fallen by 70 percent (Lazard, 2024), suggesting that an even larger share of recent projects may be profitable without subsidy.

Furthermore, because the environmental benefits of wind energy are so large, even modestly effective community compensation schemes would likely pass a cost benefit test. For example, even when I only consider health benefits (excluding global climate benefits) and discount at 7 percent, I estimate that the average wind project in Illinois generates benefits roughly 25 times larger than estimated housing damages. As a result, a policy that compensated communities for hosting wind projects at their estimated housing damages would need to increase wind energy development by only four percentage points to break even from a utilitarian cost-benefit perspective.

7 Conclusion

Wind energy projects in the U.S. are increasingly facing opposition and regulation at the local level. This opposition is often driven by concerns about localized costs, such as reduced property values. However, based on an analysis of proposed wind projects in Illinois, I find that these local costs are small relative to the broadly distributed health and climate benefits. As a result, local county government decisions to delay or reject wind projects are likely to be inefficient from a utilitarian social welfare perspective.

This paper provides new evidence that voters respond to the local costs and benefits of

[19] See Figure 7b in Aldy et al. (2023)

wind energy development. Following wind project approval, incumbent county board vote shares decline in precincts located near wind projects but outside the tax districts receiving most of the fiscal benefits. In contrast, incumbents gain votes in precincts that benefit from increased school district tax revenues. I find that these changes in vote share can in part be explained by the entry of challengers in response to wind project approval. Furthermore, I find some evidence that voter responses are muted in precincts where incumbents voted against project approval, suggesting that voters are responding to the behavior of their elected representatives.

Together, these findings highlight how the distribution of local costs and benefits can shape political support for renewable energy projects. Even when projects generate large net social benefits, concentrated local costs can create political barriers to development. At the same time, local fiscal benefits can help sustain support for incumbents that approve wind projects. These findings suggest that compensating communities for hosting wind energy projects may help align local political incentives with broader environmental goals.

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A Probabilistic–Voting Model of Wind Project Approval

I develop a simple probabilistic voting model of local wind project approval and electoral response, based on the Lindbeck and Weibull (1987) framework. I model the decision of a wind developer to propose a project in a county, as well as the support for or opposition to that project among different groups of individuals in that county.

A.1 Economic environment and timing

1. **Site primitives.** Nature draws a potential project site in the county. Normalize the county mass to one. Based on the site location, county voters fall into three mutually exclusive groups $g \in \{c, b, 0\}$ for Cost, Benefit, and Control. Let the population shares be θ, λ, and $1 - \theta - \lambda$, respectively. Let τ denote the fixed property tax rate in the local school district and V the assessed value of the project set by state law.

2. **Local costs and benefits.** If the project is built, the developer pays property taxes $T = V\tau$ to the local school district. Voters in group b receive a share of these tax benefits given by $B = T/\lambda$, voters in group c incur property value losses of $-C$, and those in group 0 are unaffected directly. Thus $U_c = -C$, $U_b = +B$, and $U_0 = 0$. This is common knowledge to voters, the developer, and the county board.

3. **Developer application.** The developer decides whether to apply, paying a fixed cost $F > 0$ if they apply. If the application is approved and the project is built, the developer earns profit $\pi(R, T)$, where R is revenue net of all costs except property tax payment T.

4. **Project-specific shocks.** If the developer applies, a countywide sentiment shock about the project, $\delta \sim \text{Unif}\big[-\frac{1}{2\psi}, \frac{1}{2\psi}\big]$ with $\mathbb{E}[\delta] = 0$, is realized and observed by the board. Additionally, each voter experiences a project-specific idiosyncratic shock $\sigma_i \sim \text{Unif}\big[-\frac{1}{2\phi}, \frac{1}{2\phi}\big]$, IID across i and independent of δ and (B, C).

5. **County board decision.** The board chooses Approve ($A = 1$) or Reject ($A = 0$) to maximize expected support in the next election, taking (B, C) and the realized δ as given.

6. **Payoffs and election.** If approved, the project is built. Voters then reward or punish the incumbent in the next election based on their net utility change from the project.

A.2 Voter support

Voters support a wind project if their direct utility gain from approval exceeds the sum of the countywide and idiosyncratic shocks, i.e. if:

$$U_g \;\geq\; \delta + \sigma_i.$$

Given the uniform distribution of σ_i, the probability that a representative voter in group g supports the project is:

$$\Pr(\sigma_i \leq U_g - \delta) \;=\; \frac{1}{2} + (U_g - \delta)\,\phi$$

This also represents the expected support share in group g. Thus, the overall voter support share for the project is:

$$\begin{aligned} v_{support} &= \theta\left[\frac{1}{2} + (-C - \delta)\phi\right] + \lambda\left[\frac{1}{2} + (B - \delta)\phi\right] + (1 - \theta - \lambda)\left[\frac{1}{2} + (0 - \delta)\phi\right] \\ &= \frac{1}{2} + \phi\,(\lambda B - \theta C - \delta) \end{aligned}$$

A.3 Board decision

The board approves whenever a majority of voters support the project. Thus the overall probability of approval before the shocks are realized is:

$$P(B,C) = \Pr\big(v_{support} \geq \tfrac{1}{2}\big) = \Pr\big(\delta \leq \lambda B - \theta C\big) = \frac{1}{2} + \psi\big(\lambda B - \theta C\big). \tag{15}$$

This probability is increasing in the total benefits λB (equal to tax payment T) and decreasing in total costs θC.

A.4 Developer decision

With fixed application cost F and profit $\pi(R,T)$ if approved, the developer applies when:

$$\mathbb{E}[\Pi] = P(B,C)\pi(R,T) - F \geq 0.$$

Developer profits if the project is approved are given by:

$$\pi(R,T) = R - T$$

where $T = \lambda B$ is the total tax payment that benefits households in group b, and R is project revenue net of all other costs. Substituting this and (15) into the expected profit condition gives:

$$\mathbb{E}[\Pi] = P(B,C)\pi(R,T) - F = \left(\frac{1}{2} + \psi\big(T - \theta C\big)\right)(R-T) - F$$

Thus, the developer applies when:

$$\left(\frac{1}{2} + \psi\big(T - \theta C\big)\right)(R-T) - F > 0$$

Or rewriting:

$$\frac{1}{2} + \psi\big(T - \theta C\big) \geq \frac{F}{R - T}$$

Higher local costs C or share of cost-exposed voters θ reduce the probability of approval, and thus reduce expected profits and probability of application. The relationship between local tax payment T and application is more complex, as higher T increases the probability of approval (as $T = \lambda B$ raises local benefits) but also reduces profits conditional on approval.

A.5 Comparative statics in tax payment T

Interior assumption. I focus on parameter values such that both approval and group support probabilities are strictly between 0 and 1 without truncation. Specifically,

$$\big|T - \theta C\big| < \tfrac{1}{2\psi} \quad \text{and} \quad \big|U_g - \delta\big| < \tfrac{1}{2\phi} \quad \text{for all } g,$$

which ensure

$$P(B, C) = \tfrac{1}{2} + \psi(T - \theta C) \in (0, 1) \quad \text{and} \quad \tfrac{1}{2} + \phi(U_g - \delta) \in (0, 1).$$

Derivatives of expected profits. Expected profits are:

$$\mathbb{E}[\Pi] = P(B, C)\pi(R, T) - F$$

Differentiating with respect to T:

$$\frac{\partial \mathbb{E}[\Pi]}{\partial T} = \underbrace{\frac{\partial P}{\partial T}}_{=\psi} (R - T) \; + \; P(B, C) \, \underbrace{\frac{\partial (R - T)}{\partial T}}_{=-1} \tag{16}$$

$$= \psi(R - T) - P(B, C) \tag{17}$$

$$= \psi R + \psi \theta C - \tfrac{1}{2} - 2\psi T. \tag{18}$$

Differentiating again:

$$\frac{\partial^2 \mathbb{E}[\Pi]}{\partial T^2} = -2\psi \ < \ 0, \tag{19}$$

so $\mathbb{E}[\Pi](T)$ is strictly concave in T on the interior. Hence the sign of $\frac{\partial \mathbb{E}[\Pi]}{\partial T}$ changes at most once and there is a unique threshold T^* below which expected profits are increasing in T:

$$\frac{\partial \mathbb{E}[\Pi]}{\partial T} > 0 \quad \Longleftrightarrow \quad T \ < \ T^* \ \equiv \ \frac{R + \theta C - \frac{1}{2\psi}}{2}. \tag{20}$$

Comparative statics of the threshold T^*. From (20),

$$\frac{\partial T^*}{\partial R} = \frac{1}{2} > 0, \quad \frac{\partial T^*}{\partial C} = \frac{\theta}{2} > 0, \quad \frac{\partial T^*}{\partial \theta} = \frac{C}{2} > 0, \quad \frac{\partial T^*}{\partial \psi} = \frac{1}{4\psi^2} > 0,$$

Thus, higher R, C, θ, or ψ expand the range over which profits are increasing in T.

Economic intuition. Raising the developer's tax payment T has two opposing effects on expected profits. On the one hand, there is a *political return*: each extra dollar of T raises the approval probability at the rate $\frac{\partial P}{\partial T} = \psi$. On the other hand, there is a *financial cost*: each additional dollar of T directly reduces profits if approved. Expected profits increase in T when the political return outweighs the financial cost. As T rises, the prize-if-approved $(R - T)$ shrinks while the probability of approval $P(B, C)$ rises, so the net effect of raising T on expected profits changes sign at most once at T^* by concavity (19).

A.6 Retrospective voting

Following project approval, voters in group g support the incumbent with probability:

$$\Pr(\sigma_i \leq U_g - \delta) = \frac{1}{2} + (U_g - \delta)\,\phi.$$

Thus the change in expected incumbent vote share in groups b and c relative to 0 is:

$$\Delta v_b = \phi B, \qquad \Delta v_c = -\phi C$$

A.7 Discussion

This simple model produces two key empirical predictions:

- **Approval likelihood.** Sites with higher T or lower C are more likely to be approved.
- **Retrospective voting.** Incumbents lose vote share in precincts that experience local costs and gain vote share in precincts that experience local benefits following project approval.

I find empirical support for both predictions in the data, as presented in Tables 1 and 2. The model also generates additional testable predictions about developer application behavior with respect to local tax rates. In particular, because higher tax rates increase the probability of project approval, in some cases developers will prefer high tax jurisdictions even though they reduce profits conditional on approval. Section A.8 below tests this prediction and finds some evidence that wind projects are more likely to be built in school districts with higher property tax rates, consistent with the model.

A.8 Empirical test of tax rate effects on project siting

To test the prediction that developers are more likely to build in high–tax jurisdictions, I estimate linear probability models of the form:

$$\text{Turbines}_{sd} \;=\; \alpha \;+\; \beta\,\text{TaxRate}_{sd} \;+\; X'_{sd}\gamma \;+\; \mu_c \;+\; \varepsilon_{sd} \tag{21}$$

where Turbines_{sd} is an indicator for whether at least one wind turbine has been built in school district sd, TaxRate_{sd} is the school district property tax rate, X_{sd} is a vector of school district controls, and μ_c are county fixed effects.

Table 6 reports the results. Column (1) shows a bivariate regression of wind turbine presence on the tax rate. Column (2) adds a series of controls for wind resource quality, available land area, socioeconomic characteristics, and transmission infrastructure. Column (3) adds county fixed effects to account for unobserved county-level factors that may influence wind project siting. Across all specifications, the coefficient on the tax rate is positive and significant. In the fully specified model with county fixed effects (Column 3), a one–percentage–point higher property tax rate is associated with a 5.8 percentage point higher likelihood of hosting at least one wind turbine.

Table 6: Determinants of Wind Project Siting in Illinois School Districts

	(1) Any Turbines	(2) Any Turbines	(3) Any Turbines
Tax Rate (%)	7.05***	7.44***	5.75***
	(1.63)	(1.51)	(1.72)
Average Wind Speed (m/s)		0.156***	0.223***
		(0.053)	(0.080)
Area (10 sq. miles)		0.0046**	0.0087***
		(0.0020)	(0.0027)
Median House Value ($10k)		0.0128***	0.0101***
		(0.0029)	(0.0036)
Median Income ($10k)		-0.0528***	-0.0531**
		(0.0180)	(0.0235)
% Farmland		0.331***	0.186*
		(0.062)	(0.097)
Voter Turnout Rate		-0.344*	-0.106
		(0.191)	(0.250)
Transmission Length (km)		0.00013*	0.00001
		(0.00007)	(0.00010)
County Fixed Effects	No	No	Yes
Observations	467	467	467
R-squared	0.043	0.203	0.487

Notes: Observations at the school district level. The dependent variable indicates whether at least one wind turbine has been built in the district. Tax rate is the property tax rate in the school district. Standard errors, shown in parentheses, are clustered at the county level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

B Sensitivity of Project Cost and Benefit Estimates

B.1 Environmental benefits

I assess the sensitivity of estimated environmental benefits from proposed wind projects to alternative valuation assumptions. The baseline specification applies a 2% real discount rate, values health benefits at $37/MWh, and monetizes climate benefits using the EPA's social cost of carbon (SCC). Figure 1b in the main text displays the baseline distribution of environmental benefits across projects. In this appendix, I consider two deliberately conservative scenarios that produce lower total benefits.

Scenario A (Higher discounting, no climate benefits). I raise the discount rate to 7% and exclude climate benefits entirely, retaining only health benefits. By excluding climate benefits, which accrue globally, this scenario focuses only on benefits that accrue within the U.S. The Office of Management and Budget previously recommended 7% as a high-end discount rate for cost-benefit analysis. Under these assumptions, the average project still generates national benefits nearly 25 times the local costs (Figure 8).

Scenario B (Higher discounting, no climate benefits, declining health benefits). I further assume that health benefits decline linearly to zero over the first ten years of operation. This assumption captures the possibility that health benefits fall as fossil-fuel emissions decline over time. Even under this more conservative specification, the average project yields roughly 10 times more in national health benefits than local costs (Figure 9).

Taken together, these checks indicate that the qualitative conclusion is robust: environmental benefits exceed local costs by a wide margin.

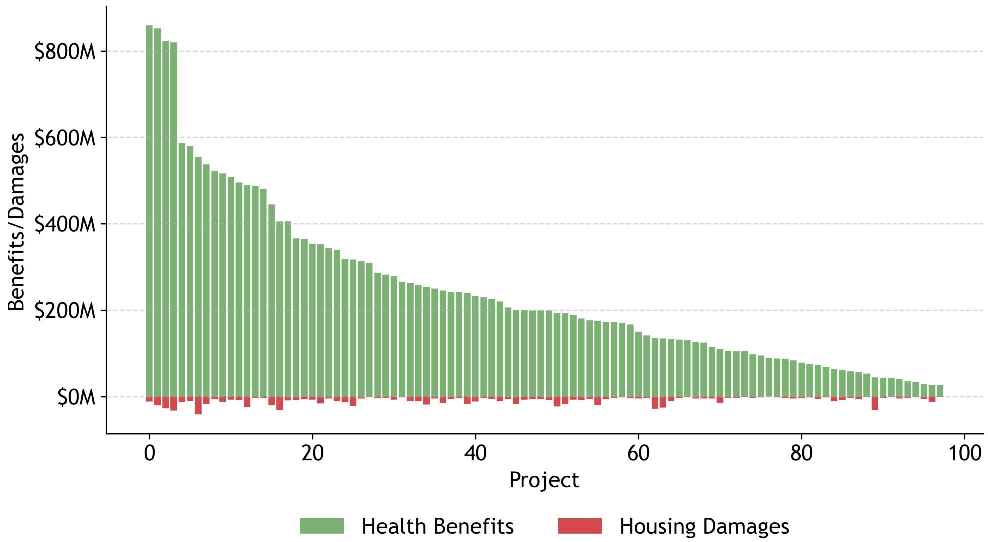

Figure 8: Environmental Benefits and Costs of Wind Projects in Illinois (No Climate Benefits, 7% Discount Rate)

Figure 9: Environmental Benefits and Costs of Wind Projects in Illinois (No Climate Benefits, 7% Discount Rate, Declining Health Benefits)

B.2 Local fiscal benefits

Next, I present estimates of local benefits calculated using alternative 3 and 7 percent discount rates, consistent with prior OMB guidance. Figures 10 and 11 plot the results for each project. The higher the discount rate, the greater the proportion of projects with negative net local benefits. However, under all rates, projects with positive net local benefits are 20 to 30 percentage points more likely to be built than projects with negative net local benefits.

Table 7 presents regression results analogous to Table 1 using the alternative discount rates. The results are again similar to the main analysis, with local fiscal benefits positively associated with project construction under all discount rates.

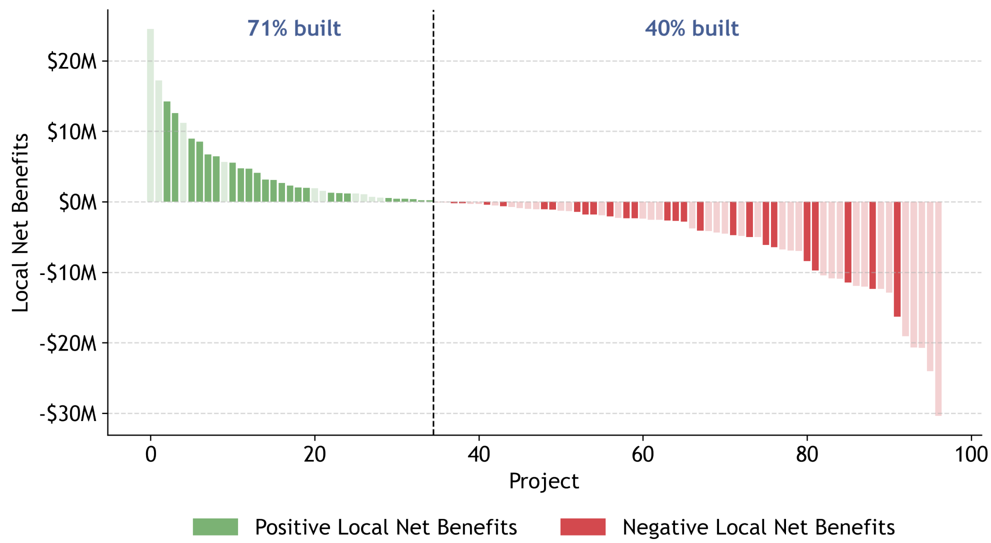

Figure 10: Local Benefits and Costs of Wind Projects in Illinois (7% Discount Rate)

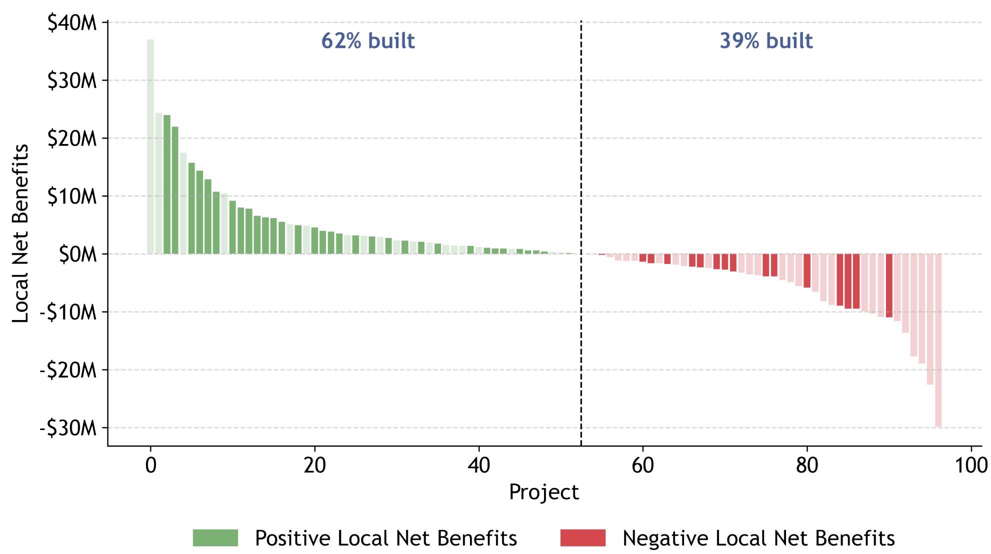

Figure 11: Local Benefits and Costs of Wind Projects in Illinois (3% Discount Rate)

Table 7: Determinants of Project Construction (Alternative Discount Rates)

	Built		
	(1)	(2)	(3)
Housing damages ($100s per capita)	-0.052^{***}	-0.052^{***}	-0.052^{***}
	(0.019)	(0.019)	(0.019)
Tax revenues ($100s per capita)	0.056^{***}	0.061^{***}	0.082^{***}
	(0.018)	(0.019)	(0.026)
Climate and health benefits ($ billions)	0.021	0.024	0.037
	(0.049)	(0.056)	(0.089)
Wind speed (m/s)	0.360	0.360	0.360
	(0.379)	(0.379)	(0.379)
Discount rate for benefits	2%	3%	7%
Year FE	Yes	Yes	Yes
Observations	97	97	97
R-squared	0.368	0.368	0.368

Notes: Observations at proposed project level. Robust standard errors in parentheses.
* $p < 0.05$.

C Sensitivity of Vote Share Results

C.1 Alternative Treatment Thresholds

The main specification assigns precincts to treatment groups using a $1,000 per-household cutoff for predicted housing damages and school-district revenues. To demonstrate robustness to this choice, I re-estimate the baseline stacked DiD while varying the cutoff from $100 to $5,000 per household.

Figure 8 plots the resulting treatment effects. At the very low ($100) cutoff, both Cost and Benefit estimates are near zero, consistent with many lightly exposed precincts being included. From $500 and up the treatment effects in benefit precincts are consistently positive and the treatment effects in cost precincts are consistently negative.

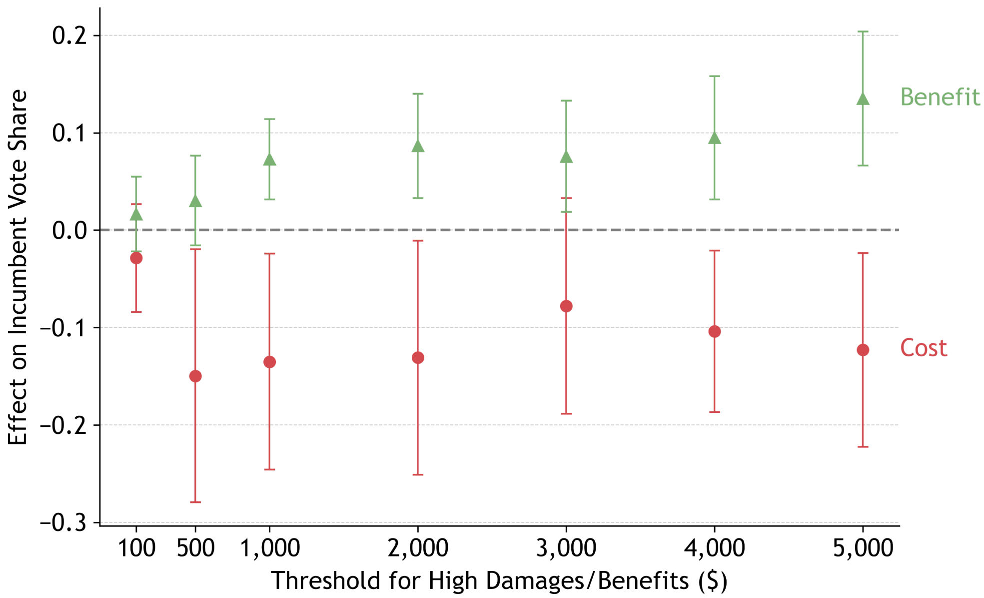

Figure 12: Sensitivity of Treatment Effects to Threshold Choice

C.2 House Price Impacts

The baseline analysis assumes that housing prices decline by 11% within 1 mile of a wind project and 4% within 1–2 miles, following Brunner et al. (2024). This study is the most comprehensive and up-to-date analysis of U.S. wind projects, using nationwide transaction-level data to estimate property value effects.

As a robustness check, I consider alternative estimates from the most recent meta-analysis of wind turbine property value impacts (Parsons & Heintzelman, 2022). This review synthesizes results from 18 core studies published between 2011 and 2021. Parsons and Heintzelman (2022) report average declines of 5.0% within 1 km, 4.0% within 1–2 km, 2.6% within 2–3 km, and 1.2% within 3–4 km.

I re-estimate the stacked DiD regression using these alternative values. Table 8 compares the results: Column (1) shows the baseline specification using Brunner et al. (2024), while Column (2) uses the Parsons and Heintzelman (2022) estimates. The results are highly similar, suggesting that the main findings are not sensitive to the choice of property value impact estimates.

C.3 Discount Rate

The baseline analysis assumes a 2% real discount rate when calculating the present value of local school district revenues, consistent with the Office of Management and Budget's current Circular A-4 guidance for regulatory analysis. I re-estimate the stacked DiD regression using treatment groupings based on local benefits calculated under a 7% discount rate. Table 8 compares the results: Column (1) shows the baseline specification using a 2% discount rate, while Column (3) uses a 7% discount rate. The results are similar, with both specifications showing positive and statistically significant effects of local benefits on incumbent vote share. The coefficient is slightly larger under the 7% discount rate, consistent with precincts with relatively low local tax revenues dropping out of the Benefit treatment group.

C.4 Revenue Capitalization into Housing Prices

In the baseline analysis, I rely on estimates from Brunner et al. (2024) that property values decline by 11% within 1 mile of a wind project and 4% within 1–2 miles. If these changes in property values already reflect capitalization of new school district revenues into home prices, then adding school-district revenues as a separate local benefit could double count some portion of the fiscal gains.

The estimates in Brunner et al. (2024) are based on a comparison of homes 0-3 miles from a wind project (treated) to homes 3-5 miles from the project (control). Thus, potential capitalization of increased school-district revenues into home prices will only bias my results to the extent that these rings differ in their exposure to school-district revenues. If both rings are fully contained within the benefiting school district, then any capitalization of revenues into home prices will be fully differenced out in the authors' difference-in-differences design.

To investigate this, I identify the school districts in which each wind project in Brunner et al. (2024) is located, and then calculate the population share of the 0-3 and 3-5 mile rings that lie within these school districts. I find that on average across all projects, 90% of the 0-3 mile ring lies within a benefiting school district, compared to 70% of the 3-5 mile ring. This suggests that at most 20% of school-district revenues could be capitalized into the price difference between the treatment and control rings.

Next, I conduct a sensitivity analysis to assess how my baseline results change if I assume that 20% of estimated school-district revenues are already fully capitalized into home prices. Specifically, I increase the estimated housing damages in each precinct by 20% of the precinct's per-household school-district revenue estimate. I then reassign precincts to the Cost, Benefit, and Cost-Benefit treatment groupings and re-estimated the baseline stacked DiD regression. Column (4) of Table 8 presents the results. The coefficients on the treatment groups remain similar after this adjustment. The Cost coefficient is essentially unchanged, the Benefit coefficient is slightly smaller, and the Cost-Benefit coefficient is slightly larger. These minor changes reflect the fact that some precincts previously classified as "Benefit" are now classified as "Cost-Benefit" due to the inflated damage estimates. However, the core patterns remain intact.

C.5 Continuous Treatment

This section presents complementary results using continuous measures of treatment intensity in place of the discrete treatment groups used in the main analysis. First, I estimate a stacked regression that includes continuous measures of estimated costs (housing damages) and benefits (school district tax revenues) per household in each precinct. Table 9 presents the results. Column (1) shows that a \$1,000 increase in estimated housing damages is associated with a 0.55 percentage point decrease in incumbent vote share, while a \$1,000 increase in estimated school district tax revenues is associated with a 0.8 percentage point increase in incumbent vote share.

	Combined Incumbent Vote Share			
	(1)	(2)	(3)	(4)
Cost	−0.135**	−0.166**	−0.132***	−0.136**
	(0.057)	(0.065)	(0.046)	(0.057)
Benefit	0.071***	0.064***	0.098***	0.060**
	(0.021)	(0.020)	(0.028)	(0.026)
CostBenefit	0.017	0.023	0.031	0.039
	(0.027)	(0.030)	(0.028)	(0.023)
Mean vote share	0.68	0.68	0.68	0.68
Observations	3,608	3,608	3,608	3,608
R-squared	0.617	0.617	0.618	0.617
Price impact source	Brunner	Parsons	Brunner	Brunner
Discount rate	2%	2%	7%	2%
Capitalization adjustment	No	No	No	Yes

Notes: Vote shares observed at the precinct × election level. All models include event time × project and precinct × project fixed effects. Standard errors, shown in parentheses, are clustered at the precinct level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 8: Sensitivity of Vote Share Results to Key Assumptions

Next, I combine these two measures into a single continuous measure of net benefits per household, defined as estimated school district tax revenues minus estimated housing damages. Column (2) shows the results of a stacked regression on this net benefits measure, while Column (3) adds a quadratic term to allow for non-linearities in the relationship between net benefits and vote share. I find that a $1,000 increase in net benefits per household is associated with an approximately 0.7 percentage point increase in incumbent vote share. Additionally, the quadratic term in column (3) is negative, suggesting that the marginal effect of net benefits on vote share diminishes as net benefits increase. Figure 13 plots the marginal effects of net benefits on incumbent vote share from the quadratic specification, showing a positive relationship at low and negative net benefits that becomes statistically indistinguishable from zero above approximately $15,000 in net benefits per household (around the 97th percentile of the net benefits distribution for treated precincts).

Table 9: Continuous Cost/Benefit and Net Benefit Effects on Incumbent Vote Share

	Combined Incumbent Vote Share		
Costs ($1,000s)	−0.0055		
	(0.0031)		
Benefits ($1,000s)	0.0080*		
	(0.0032)		
Net Benefits ($1,000s)		0.0069*	0.0077*
		(0.0024)	(0.0026)
Net Benefits ($1,000s)^2			−0.00009
			(0.00009)
Mean vote share	0.68	0.68	0.68
Observations	3,608	3,608	3,608
R-squared	0.62	0.62	0.62

Notes: Vote shares observed at the precinct × election level. All models include event time × project and precinct × project fixed effects. Standard errors (in parentheses) are clustered at the precinct level. * $p < 0.05$.

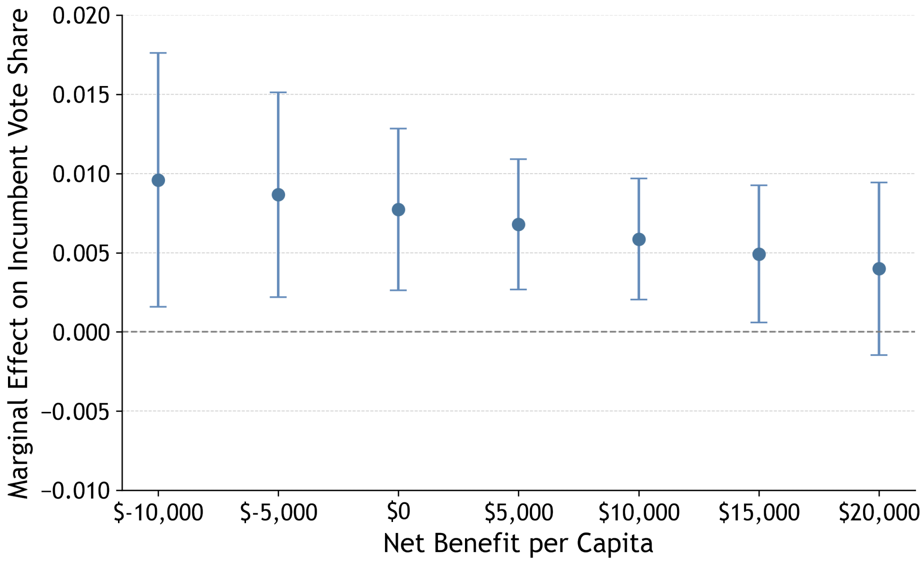

Figure 13: Marginal Effects of Net Benefits on Incumbent Support.

Notes: Point estimates and 95% confidence intervals from a stacked regression of incumbent vote share on precinct-level net benefits and net benefits squared with project × event time and precinct × project fixed effects. Vote shares are observed at the precinct × election level. Standard errors are clustered at the precinct level.