



Wind Project Effects on Kansas Counties' Property Values

Executive Summary

The Center for Economic Development and Business Research, a part of the W. Frank Barton School of Business at Wichita State University, conducted this study on behalf of the Hutchinson/Reno County Chamber of Commerce to examine the effects of the construction of wind power projects on the appraised rural property values in Kansas counties.

For this analysis, the data used included the completion dates of 23 wind projects across Kansas from 2005 to 2015, and county-level appraised rural residential property values for Kansas from 2002 to 2018 for all Kansas counties, excluding the five metropolitan core urban counties, since no wind power projects were completed in any Kansas core urban county during this period.

A difference-in-differences regression estimator was used to estimate if Kansas counties with wind power projects experienced changes in the growth rate of their total value of rural residential properties after the construction of wind power projects, relative to a comparison group of Kansas non-urban counties that did not construct any wind power projects in that time. The difference-in-differences estimator measures how the total rural residential property value growth rate changed in the wind project counties before and after the wind projects' completions, and then compares that change to the change in the property value growth rate in the comparison group over the same time period to arrive at the final difference-in-differences estimation. Thus, this estimator provides an estimate of how the trend in property value growth rate in wind projects counties changed relative to the control group of non-wind-project counties, after the wind power projects were completed in each county.

Three-year averages of the rural residential property value growth rate in each county before and after the projects' construction were used as the dependent variable to allow for the potential that the effects of wind power projects on county-level property values may occur over a multi-year period, rather than immediately.

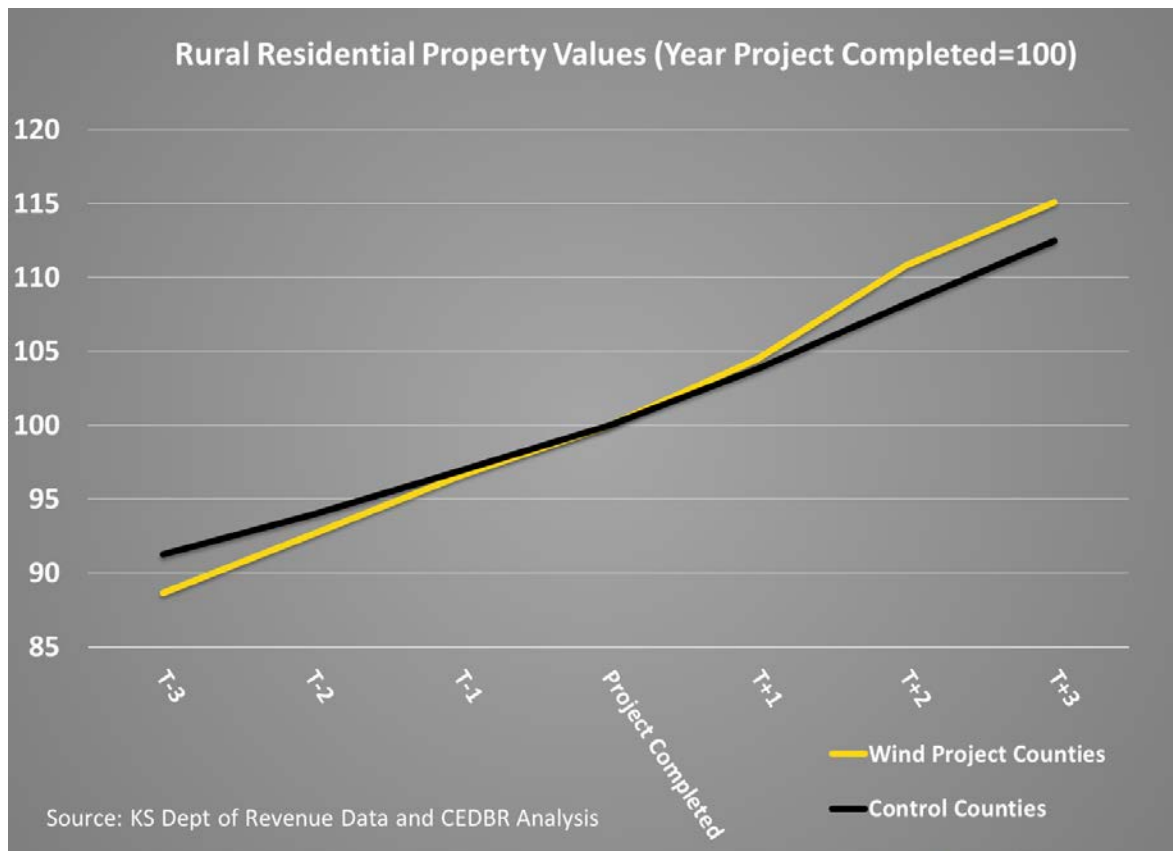
Core Findings

- The difference-in-differences regression results estimated that the growth rate in overall rural residential property value within a county increased by an annual average of 0.3 percentage points for the three years following wind project completion in that county, relative to the

growth rate for control group of non-wind-project counties, as compared to the growth rate of the previous three years for each set of counties. However, this finding was statistically insignificantly different from zero at a 95 percent confidence level, indicating there is not statistically significant evidence that wind power projects either increase or decrease rural residential property values in a county in the three years after their construction.

- The graph below illustrates the growth pattern of rural residential property values in both wind power and non-wind power project counties, using individual year data on rural residential property values three years prior to and three years after the construction of each project for each wind project county and the non-wind-project control counties.

If there was a substantial effect of wind power projects on their counties property values, we would expect to see a change in the slope of the wind project counties line relative to the control counties following the year the wind projects were completed, but here the slopes of both lines remain relatively stable before and after the projects' completions. Wind power counties' rural residential property values grow modestly more quickly both before and after the construction of the wind power projects, without any substantial change in that growth pattern following the completion of the wind power projects.



Methodology

A difference-in-differences estimator was employed to estimate how wind power projects affected the growth of rural residential property values in the counties in which they were constructed. Appraised rural residential property value data by county was provided by the Kansas Department of Revenue from 2002 to 2018, and data on the construction completion dates of 25 wind power projects across 21 different Kansas counties was provided by the Kansas Corporation Commission. Two wind power projects were excluded from the dataset due to their small size of less than 15 megawatts, while all wind power projects examined were between 40 and 470 megawatts.

Due to the wind power project completion dates occurring across multiple years, the following regression model was used to estimate the difference-in-differences estimator:

$$Y_{it} = \sum_{t=2005}^{2015} (\alpha_t + \gamma_t Wind_i + \delta_t * After_{it}) + \beta_1 * Wind_i * After_{it} + \varepsilon_{it}$$

Where Y_{it} was the three year average growth rate in rural residential property values either before or after the year a wind power project was completed, $Wind_i$ indicates if a county had a wind power project completed in that specific year, and $After_{it}$ indicates if the average is from before or after specific year the wind power project was completed. This model allows for flexibility in the property value growth averages from year to year, differences in growth averages between wind power and non-wind power counties prior to the construction of the project from year to year, and differences in the growth rates before and after that specific year. Each county was weighted by its rural residential property value in the regression to provide a better representation of the effects on overall rural residential property values, rather than giving equal weight in the regression to counties with differing property values.

The comparison counties used in each year were all Kansas counties that did not have another wind power project overlapping either three-year average, excluding the five core urban counties of the five metropolitan areas in the state.

This model provides an estimate of effects of wind power project construction on the growth rate of rural property values, but this estimate does not provide a causal link for how wind power projects affect property values. The estimate could potentially be biased if another unknown factor, correlated with the timing of wind power project construction across Kansas counties, caused appraised total rural residential property values to increase or decrease. Additionally, if the effects of wind power projects on property values take more than three years after project completion to be realized, then those longer-term effects will not be captured in this analysis, since this analysis only examines three-year averages before and after the project.

Annual Rural Residential Property Values (Wind Power Projection Completion is time T)

Year	County Type	T-3	T-2	T-1	Project Completed	T+1	T+2	T+3
2005	Wind Power	\$ 777,735,913	\$ 816,494,287	\$ 867,646,574	\$ 911,496,234	\$ 957,242,982	\$ 1,053,742,252	\$ 1,115,158,226
2005	Control	\$ 9,119,300,113	\$ 9,697,796,137	\$ 10,289,975,759	\$ 10,934,276,091	\$ 11,771,995,165	\$ 12,634,774,267	\$ 13,310,795,391
2008	Wind Power	\$ 123,534,156	\$ 131,983,026	\$ 141,776,391	\$ 150,844,104	\$ 159,864,253	\$ 167,131,773	\$ 176,079,200
2008	Control	\$ 10,669,090,658	\$ 11,485,344,471	\$ 12,332,377,858	\$ 12,989,844,904	\$ 13,283,241,802	\$ 13,473,644,280	\$ 13,680,632,141
2009	Wind Power	\$ 48,886,982	\$ 51,826,139	\$ 54,624,504	\$ 55,668,069	\$ 57,918,983	\$ 59,221,148	\$ 65,034,983
2009	Control	\$ 11,272,113,315	\$ 12,109,023,841	\$ 12,749,600,034	\$ 13,032,812,837	\$ 13,214,422,802	\$ 13,409,924,280	\$ 13,543,723,973
2011	Wind Power	\$ 117,783,626	\$ 123,208,061	\$ 127,063,200	\$ 131,091,383	\$ 134,603,896	\$ 141,277,435	\$ 147,538,391
2011	Control	\$ 12,270,659,755	\$ 12,527,731,933	\$ 12,686,995,837	\$ 12,851,983,506	\$ 12,961,587,799	\$ 13,168,660,503	\$ 13,559,970,403
2012	Wind Power	\$ 853,308,183	\$ 883,344,399	\$ 911,337,706	\$ 921,214,714	\$ 957,951,270	\$ 1,020,439,103	\$ 1,056,825,653
2012	Control	\$ 13,367,648,280	\$ 13,525,599,315	\$ 13,694,675,194	\$ 13,812,172,287	\$ 14,010,838,825	\$ 14,399,505,863	\$ 14,858,871,726
2013	Wind Power	\$ 301,980,478	\$ 322,603,235	\$ 336,183,035	\$ 350,322,331	\$ 372,311,852	\$ 389,237,731	\$ 404,516,817
2013	Control	\$ 13,339,725,141	\$ 13,500,607,811	\$ 13,612,270,574	\$ 13,805,850,973	\$ 14,187,633,889	\$ 14,638,323,891	\$ 15,149,427,285
2015	Wind Power	\$ 793,913,024	\$ 823,075,461	\$ 849,930,722	\$ 882,949,539	\$ 915,909,662	\$ 940,596,392	\$ 952,328,982
2015	Control	\$ 13,205,683,296	\$ 13,404,372,564	\$ 13,783,197,523	\$ 14,239,130,143	\$ 14,741,958,537	\$ 15,319,842,723	\$ 15,938,135,826

Relative Rural Residential Property Values (Project Completion Year = 100)

Year	County Type	T-3	T-2	T-1	Project Completed	T+1	T+2	T+3
2005	Wind Power Counties	85.3	89.6	95.2	100.0	105.0	115.6	122.3
	Control Counties	83.4	88.7	94.1	100.0	107.7	115.6	121.7
2008	Wind Power Counties	81.9	87.5	94.0	100.0	106.0	110.8	116.7
	Control Counties	82.1	88.4	94.9	100.0	102.3	103.7	105.3
2009	Wind Power Counties	87.8	93.1	98.1	100.0	104.0	106.4	116.8
	Control Counties	86.5	92.9	97.8	100.0	101.4	102.9	103.9
2011	Wind Power Counties	89.8	94.0	96.9	100.0	102.7	107.8	112.5
	Control Counties	95.5	97.5	98.7	100.0	100.9	102.5	105.5
2012	Wind Power Counties	92.6	95.9	98.9	100.0	104.0	110.8	114.7
	Control Counties	96.8	97.9	99.1	100.0	101.4	104.3	107.6
2013	Wind Power Counties	86.2	92.1	96.0	100.0	106.3	111.1	115.5
	Control Counties	96.6	97.8	98.6	100.0	102.8	106.0	109.7
2015	Wind Power Counties	89.9	93.2	96.3	100.0	103.7	106.5	107.9
	Control Counties	92.7	94.1	96.8	100.0	103.5	107.6	111.9
		T-3	T-2	T-1	Project Completed	T+1	T+2	T+3
Overall*	Wind Project Counties	88.6	92.6	96.6	100.0	104.5	110.8	115.1
	Control Counties	91.3	93.9	96.9	100.0	103.8	108.2	112.5

*Overall averages for both wind project and control counties are weighted by the value of wind power projects in each year