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Tourist Preferences and Externalities of Views of Wind Turbines

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APPLIED ECONOMICS & STATISTICS

ABSTRACT

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Keywords: Visual disamenities; Wind turbines; Tourism; Field experiment

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Highlights

- Whether views of wind turbines effects tourism is not known.
- This field experiment involves tourists making purchasing stays at local hotels.
- Hotel rooms varied in quality, and by their distance and view of a large wind turbine.
- Tourists prefer not being located near wind turbines or having a turbine view.

Abstract

Previous research about the potential visual disamenity of wind turbines has used stated preference methods or hedonic studies of home prices. This study uses a field experiment of tourists on a ferry to evaluate the impact of wind turbines on tourism. Tourists are given an opportunity to purchase a chance for a weekend hotel stay that varied in quality and by its distance from and view of a large turbine. Results from a within-subject study of 65 tourists suggest that tourists prefer higher quality hotel rooms, being farther from the turbine (up to 1.5 miles), and views that do not include the turbine. Thus, the placement of on-shore turbines may have a larger negative economic impact that previously estimated.

JEL Classification: D12; Q26; Q42

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1. Introduction

While wind energy is a promising source of renewable energy, it continues to make up a small fraction of the world's energy supply (Hau, 2005). The placement of wind turbines has elicited public concerns related to their impact on wildlife, as well as their negative impact on scenic vistas (USDE, 2015). The economic impact of wind turbines has mostly focused on residential property values through hedonic value studies that focus on the relation between property price and the density of turbines on residents (Heintzelman and Tuttle 2012, Ladenburg 2009, Poletti, 2005; Sterzinger, 2003). Other research uses stated-preference methods to measure the impact of off-shore wind turbines (Gee 2010, Landry et al. 2012, Krueger et al. 2011).

Despite the economic importance of tourism to coastal areas, the effect of wind turbines on the tourism industry has received less attention. This research uses a within-subject field experiment, which offered participants the opportunity to buy a chance for a weekend stay at one of several hotels in Lewes, Delaware, a popular coastal tourist coastal community that has a turbine visible from nearby hotels. This field experiment estimated willingness to pay (WTP) for hotel rooms as distance, quality, and existence of a turbine view was varied. Table 1 describes the full set of hypotheses.

Table 1. Hypotheses and Results

	Hypothesis	Statement	Result	Description
1	WTP is the same for hotel rooms regardless of distance to a turbine.	H_0: $\beta_{Near} = 0$ H_1: $\beta_{Near} \neq 0$	*Reject* p = 0.003	WTP is less for hotel rooms closer to a turbine.
2	WTP is the same for hotel rooms with or without turbine views.	H_0: $\beta_{Turbine} = 0$ H_1: $\beta_{Turbine} \neq 0$	*Reject* p = 0.007	WTP is less for hotel rooms with turbine views.
3	WTP is same for hotels with different star rating.	H_0: $\beta_{Three\text{-}star} = 0$ H_1: $\beta_{Turbine} \neq 0$	*Reject* p = 0.000	WTP is more for three-star hotel than a one-star hotel.
4	WTP for rooms with turbine views does not vary with distance up to 1.5 miles.	H_0: $\beta_{TurbXNear} = 0$ H_1: $\beta_{TurbXNear} \neq 0$	*Fail to reject* p = 0.557	No significant difference in WTP for turbine views was detected.
5	WTP for rooms with turbine views does not vary by the hotel's qualtiy.	H_0: $\beta_{TurbX3Star} = 0$ H_1: $\beta_{TurbX3Star} \neq 0$	*Fail to reject* p = 0.330	WTP for turbine views is not influenced by the hotel's quality.

This field experiment used the Becker-DeGroot-Marschak (BDM) (1964) mechanism to obtain a measurement of WTP. Participants bid on six lotteries for a weekend stay. The volunteer participants were recruited from passengers on the Lewes-Cape May Ferry traveling between the coastal vacation towns of Lewes, Delaware, and Cape May, New Jersey. Participants earned an average of $45 ($20 participation fee and $25 in the experiment).

The one-way trip lasted about 85 minutes. Singe sessions with groups of participants were run per ferry trip. During the practice, low-stakes part of the experiment, participants sat at a central table and were allowed to ask questions publicly of the administrators. For the second high-stakes part, bidding on a weekend stay, participants were separated at different tables to ensure privacy. Communication between participants was not allowed. The experiment took approximately 60 minutes.

The low-stakes part familiarized participants with the BDM mechanism and the randomization procedures used in the experiment. Participants first bid on a pen. Next they bid on two lottery tickets to win either a pencil or a pen. For each bid, participants received an initial endowment of one dollar. Because the final selection of which bid for the lottery tickets was binding was random, participants were encouraged to make each bid as if that was the choice that would be ultimately selected. For the selected ticket the participant had a 1-in-10 chance of winning. If the participant had purchased the ticket, they would win the item if they rolled a "seven" on a ten-sided die.

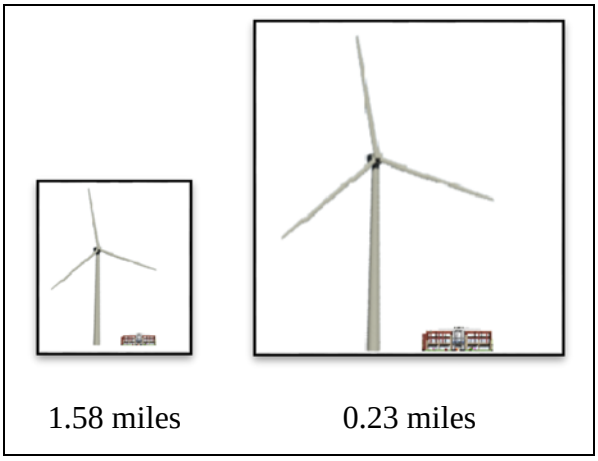
Prices were determined by dropping a marker onto a random number table. If a participant's bid was above the determined price, she received her initial endowment, bought the lottery ticket and paid the determined price. If her bid was below the price, then she kept her initial endowment but did not receive the lottery ticket. For the low-stakes part, participants received a follow-up explanation and had the opportunity to ask questions.

In the second part, participants received an initial endowment of $23. They placed independent bids on lotteries for a weekend stay in six different hotel rooms. Participants could make a weekend reservation for the hotel anytime in the following six months. The hotel rooms were identical except that one had a view of a 2-megawatt wind turbine and the other did not. The hotels varied by quality and their distance from the wind turbine. Installed

in 2010, the turbine is approximately 400 feet tall and 300 feet wide (diameter across rotors) and is visible from all three hotels.

Participants were provided with the hotel's name along with its quality (star) rating and distance from the turbine. The Virden Center is a one-star hotel, 0.23 miles from the turbine. The Beacon Motel is a one-star hotel, 1.58 miles away. Hotel Blue is a three-star hotel, 1.53 miles away.[1] Participants bid on a room with and without turbine views. To illustrate scale, participants were provided with a computer-generated graphic showing the turbine at each distance compared to a three-story office building (figure 1).

Figure 1. Images of a turbine at various distances



Then the implemented hotel room choice and price were randomly determined. For those who purchased a lottery, they also rolled a die in private and if a seven was rolled the participant won the weekend stay. All participants were paid privately.

2. Results

[1] Since this field experiment involved choices for actual hotels, we were not able to test for impacts greater than 1.5 miles as no hotel in the area met that criterion.

Only three participants (4.6%) were familiar with of any of the three hotels. This ameliorates concerns on participants' pre-familiarity with the experiment items, which was particularly important since the image of the turbine was a key control used in this field experiment.[2] Among the 65 participants, only 12.3% bid higher for hotel rooms with turbine views. On average, bids were significantly higher for the three-star hotel, and significantly lower for rooms with turbine views. The lowest average WTP ($4.86) was for the weekend stay at the Virden Center in a room with turbine views. The highest average bid was 60% higher, as participants bid an average of $7.78 for a weekend stay at Hotel Blue in a room without turbine views.

Because the weekend stay was were offered in a lottery, the magnitude of point estimates depends on assumptions about risk preferences. For example, if we assume risk neutrality, a bid of $7.78 can be interpreted as a WTP of $77.80 for a weekend at Hotel Blue without turbine views. If a participant is risk averse, $77.80 captures the lower bound of her WTP. The differential becomes larger when the curvature of utility function, measuring risk aversion, increases. While these WTP estimates may seem low for a weekend stay, recall that the values are averages and participants whose WTP was zero.

Our main interest concerns how wind turbines affect tourists' preferences. As shown in table 2, tourists have lower WTP (at the 1% level) for hotel rooms with turbine views or are closer to the turbines. Intuitively, tourists express a higher WTP for a three-star hotel than a one-star hotel. Additionally, all the interaction terms are found to be statistically insignificant.[3]

Assuming risk neutrality, this equates to an externality cost of around $11.27 per visit for being close to the turbine, and a cost of $8.31 for having turbine views.

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[2] The analysis was conducted with and without these three participants and the results were not substantially different. The results from the larger sample are presented here.

[3] Interestingly, of all demographic variables tested, only age has a significantly positive effect at the 1% level. Other demographic and attitude variables, including gender, education, income and environmental preferences are not significant at the 5% level.

Table 2. Coefficient Estimates and Marginal Effects of Tobit estimate of Mean WTP.

Parameters	Coefficient Estimates	Standard Error	Marginal Effect	Standard Error
Constant	6.7841***	0.9107		
Turbine View	-0.8309***	0.3568	-0.0282***	0.0108
Turbine Near	-1.1268***	0.3737	-0.0392***	0.0139
Three-Star	3.3116***	0.3749	0.1048***	0.0163
Turbine View * Near	0.3614	0.6473	0.1209	0.0062
Turbine View * Three-Star	-0.6319	0.6485	-0.0220	0.0233

Note: ***1% significance level.

3. Conclusion

This study, to our knowledge, is the first to use a within-subject field experiment to examine the visual externalities of wind turbines on tourism. The results suggest that tourists prefer a weekend stay in a hotel room without turbine views. These finding are consistent with the literature that wind turbines generate negative visual externalities to local beach communities (Ladenburg et al., 2005). The influences of turbine views on WTP do not differ by the distance to the turbine or vary by hotel quality.

Interestingly, 12.3% of the tourists had a higher WTP for hotel rooms with a turbine view even when the turbines were close (0.23 miles), indicating that wind turbines could provide positive visual externalities to some tourists. Although our sample size does not allow us to specifically analyze such behavior, it calls for future research to bring attention to studying this group of tourists' preferences.

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