SOWING THE WIND AND REAPING THE WHIRLWIND? THE EFFECT OF WIND TURBINES ON RESIDENTIAL WELL-BEING

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Overview

Not just since the Fukushima-Daiichi nuclear disaster, there has been a world-wide trend towards renewable energy. Among others, wind power plays an ever increasing role in the renewable energy portfolio of many developed and developing countries. In Germany, for example, over 20,000 wind turbines supplied more than 7% of electricity consumed in 2012 (Fraunhofer IWES, 2013). The basic economic rationale underlying this trend are counteractions against environmental externalities: local emissions of noxious fumes and hazardous global climate change triggered by fossil fuel combustion, or inestimable costs incurred by low-probability events of nuclear disasters.

Although general public approval of wind power in this spirit is consistently found to be high throughout the world (i.a. Ladenburg et al, 2013, Eltham, 2008, Zoellner et al. 2008), wind turbines also entail external costs, which for a balanced assessment have to be quantified. While large centralized conventional plants tend to foster out-of-sight-out-of-mind attitudes, spatially dispersed wind turbines increase the salience of energy supply (Pasqualetti, 2000). The literature identified potential unpleasant noise emissions, negative impacts on biodiversity, and, predominantly, the impacts on landscape aesthetics as intrusions typically triggered by the physical presence of wind turbines (i.a. Devine-Wright, 2005, Wolsink, 2007, Molnarova et al., 2012).

In our paper, we aim to quantify these externalities by using the life-satisfaction approach (LSA), which constitutes an established method of quantifying environmental external costs and has been used to analyze, among others, air pollution (i.a. Ambrey et al., 2014) and climate change (i.a. Maddison and Rehdanz, 2011). To this end, we collected an extensive dataset on wind turbines in Germany, comprising their exact geographical position and date of operation, and matched it with panel data from the German Socio-Economic Panel Study (SOEP). Using a difference-in-difference regression design, we are able to econometrically show a causal effect of the presence of wind turbines on residential well-being.

Methods

In order to establish a clean difference-in-difference design, we attributed households into a treatment and control group, depending on whether a wind turbine is present within a specified distance radius around their places of residence. Pursuing the most conservative approach, we prevented potential bias due endogenous sorting into treatment and control group by discarding individuals who moved during the observation period 2000-2012. Moreover, we excluded all households living close to turbines for which we do not have a full set of relevant attributes.

After having specified a treatment radius, a household was attributed to the treatment group if a wind turbine was newly erected within this radius and no turbine had been present before. All other households for which no wind plant was built were allocated to the control group. As the assignment into groups happens on a basis exogenous to the relevant variables in the model, biases due to endogenous sorting are prevented, and we can establish a clear-cut causality. Exploiting the panel structure of our data, we get rid of unobserved heterogeneity between individuals and estimate the model in a fixed effects framework using time dummies and a large set of established covariates. The causal effect of the wind turbine treatment on residential well-being is then given by the difference in differences – that is the change in life satisfaction arising from being treated while accounting for the change that might have happened over time in case no treatment occurs.

To explore a broad picture, we employ multiple dependent variables such as satisfaction with life, with the domicile or with health, as well as various indicators on mental health and well-being. Moreover, beyond analyzing a simple treatment effect, we investigate the intensity of the treatment – that is, whether multiple turbines have been built

around the household or whether wind turbines have been built in particular close proximity to the place of residence.

Results

First results suggest that the erection of wind turbines has no significantly negative or even a significantly positive effects on the life satisfaction of individuals. This is in line with the particularly high appreciation of the *Energiewende*, the large-scale transition to renewable electricity generation in Germany. In this vein, wind turbines can be seen as a sign of progress and responsibility for the environment, and also of being part of a sustainable society-wide project. Moreover, these findings contradict the widespread NIMBY (not in my back yard) narrative, stating that – despite general approval for a certain project – individuals are assumed unwilling to be particularly involved in its implementation. On the other hand, however, we do find some evidence that the effect of erecting wind turbines on health in general, and on diverse indicators for mental health in particular, is negative. Although being basically welcomed, some negative externalities appear to be present.

Conclusions

Collecting a novel and comprehensive dataset on wind turbines in Germany, featuring finely granulated information on their geographical and temporal pattern, and matching it with established large-scale panel data on well-being from the German Socio-Economic Panel (SOEP), we aim at establishing causal effects of wind turbines on residential well-being. Exploiting the panel structure of the data, we employ a fixed effects difference-in-difference design. Our first results do not provide evidence for any NIMBY attitudes towards wind power. Nevertheless, negative external effects, particularly on mental health, can be isolated.

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