# A HEDONIC ANALYSIS OF THE DISAMENITY VALUE OF WIND FARM DEVELOPMENT IN IRELAND

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## (1) Introduction:

In recent years the generation of renewable energy become a very important policy goal for Governments around the world, with the industry's development being seen as a key step in the formulation of any climate change policy. In March 2007, the EU launched an ambitious plan for tackling climate change. Specifically in Ireland (the case study system for this research), this directive has translated into a country specific target of 16% gross renewables contribution in the energy sector, and in the electricity sector, of 40% from renewables by 2020. Onshore wind is to account for roughly 80% of Ireland's renewables contribution, which will result in an installed capacity of approximately 6,000MW[1].

Critics of wind energy have tended to focus on the negative impacts that it has on surrounding areas and residents, with the most prevalent argument being that turbines have a negative aesthetic impact on an area (Tsoutsos *et al.*, 2006). It is also argued that wind energy has a detrimental effect on local wildlife, especially bats and migratory birds while it is said to have a negative effect on human health with wind turbines being accused of causing health problems such as abnormal heartbeats, insomnia, headaches, nausea, and visual blurring (Heintzelman & Tuttle, 2011). Such negative effects would in theory lead to a negative impact on local property prices.

In this paper we carry out a hedonic analysis of the impact of wind farms on property prices in Ireland to determine if there is a negative effect. We use a combination of housing characteristic variables (physical characteristics, type of dwelling), environmental variables (which will capture the distance from and number of nearby turbines for each house in addition to information on local amenities) and data on house prices to carry out this study.

## (2) Methodology - The Hedonic Model:

Hedonic regressions allow us to statistically estimate the relationship between a property's characteristics and its market value. An econometric analysis is used to separate out the marginal willingness to pay for individual characteristics, this is also known as the implicit price. If we are able to estimate the effect that a marginal change in one characteristic has on housing expenditure, holding all other characteristics fixed, we can then interpret this as its implicit price. This is done by regressing (some transformation of) the property price, while controlling for unobserved time and area effects, on the set of variables which measure quality (Mayor et al. 2012).

Housing is seen as a differentiated or heterogeneous commodity, i.e. a commodity where the characteristics are fundamental to its value in the marketplace. Thus we can define the mathematical form as:

$$P = f(X)$$

The characteristics are combined to make $f(X)$ into a linear function:

$$P(House) = \beta_0 + \sum_{j=1}^{J} \gamma_j \left(\text{house characteristics}_j\right) + \sum_{q=1}^{Q} \delta_q \left(\text{area characteristics}_q\right) +$$

$$\beta_1 \left(\text{distance to wind turbine}\right) + \beta_2 \left(\text{distance to electricity pylon}\right) + \sum_{i=1}^{n} \alpha_i d_i + e$$

Weights are assigned to the attributes, such as house or area characteristics, and $e$ represents the error term. If the first attribute representing house characteristics was to change ,i.e. house size increase by one square foot, then the price of the property will increase by $\gamma$ euro. It is not necessary to include the characteristics of either the seller or the buyer, as all potential buyers collectively set the market price (Palmquist, 1991).

[1] www.seai.ie

The housing characteristics modelled in this paper include the floor space, measured in square metres; the number of bedrooms; the number of bathrooms; if the house has a garden; and the house's Building Energy Rating (BER). The type of dwelling is also included as well as in what period the house was built. The data set used in this paper consists of residential property transactions, covering all 26 counties of the Irish Republic in the period 2010-2012.

Area characteristic data such as road and rail networks has been acquired. While data giving the location of wind farms and the power line grid in Ireland has been received in a GIS friendly format and will allow for accurate mapping and more precise results.

Unobserved heterogeneity in area characteristics is allowed for through the use of locality dummy variables and quarterly dummy variables are included to control for house price inflation. The inclusion of dummy variables for each calendar month helps to account potential seasonality in house pricing. Locality dummies are used to account for locality fixed effects and each dummy variable consists of one electoral district.

## (3) Conclusions:

While the results of this research are still in progress, there has been some variation in findings across previous literature with Jorgenson (1996) finding that homes near a single turbine are on average €2,174 cheaper than other houses in the vicinity. Firestone et al. (2004) also found wind facilities to have a negative effect on house prices, sometimes by as much as 43%. Other studies such as Hoen et al. (2006 & 2009) failed to find a significant impact from being within viewing range of wind turbines. However the sample size in both instances was extremely small and neither controlled for regional characteristics. While there is a dearth of literature available on this topic, a good reference point is Locke (2012), which found that houses located within 1,000 feet of communication antennas sell for 7.9% less than a comparable house more than 3,000 feet away.

## References:

Heintzelman, M. & Tuttle, C. (2011) 'Values in the Wind: A Hedonic Analysis of Wind Power Facilities'. *Land Economics, 88(3): 571-588.*

Mayor, K. Lyons, S. Duffy, D. and Tol, R. (2012) 'A Hedonic Analysis of the Value of Rail Transport in the Greater Dublin Area'. *Journal of Transport Economics and Policy, 46(2): 239-261.*

Kuminoff, N. Parmeter, C. and Pope, J. (2010) 'Which hedonic models can we trust to recover the marginal willingness to pay for environmental amenities'. *Journal of Environmental Economics and Management, 60: 145-160.*

Tsoutsos, T. Gouskos, Z. Karterakis, S. and Peroulaki, E. (2006) 'Aesthetic Impact from Wind Parks'. *Chania, Greece: Technical University of Crete (2006).*