



Wind farm externalities and public preferences for community consultation in Ireland: A discrete choice experiments approach



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HIGHLIGHTS

- We measure the effect of wind farm externalities on local residents in Ireland
- We examine the impact of these externalities if community consultation is provided
- A community rep significantly increases the acceptance of wind farm developments
- Moderate changes in setback distance also increases acceptance
- The inclusion of a rep and adjustments to setback are recommended for policymakers

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ABSTRACT

In Ireland the deployment of onshore wind turbines has become progressively more difficult in some areas because of the potential negative externalities associated with their operation. Using a discrete choice experiment (DCE) we employ a willingness to accept framework to estimate the external effects of wind turbines on local residents with the inclusion of community consultation and to quantify the compensation required to permit wind farms to be built in Ireland. Our findings reveal that the majority of respondents are willing to make (monetary) tradeoffs to allow for wind power initiatives and we find that respondents require less compensation if provision is made for a community representative and setback distance is increased.

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1. Introduction

Onshore wind energy is often hailed as a benign form of clean energy that is increasingly necessary in the transition toward greater environmental sustainability and a lower carbon footprint. This is particularly true for countries such as Ireland, which experience high wind regimes, have set ambitious renewable electricity targets for 2020 and have witnessed a rapid development of onshore wind capacity (McCarthy, 2010). Energy supplied from Irish wind farms increased from 16 GWh (gigawatt hours) in 1995 to 4010 GWh by 2012 (Sustainable energy authority of Ireland, 2014) and presently 224 onshore turbines provide 16.3% of domestic electricity supply (Eirgrid, 2013). Expansion of onshore wind is expected to dominate the sector with a further 200 MW of new wind generation per annum by 2020 in order to meet the

compulsory target of 40% renewable electricity by 2020 (Department of Communications, Energy and Natural Resources, 2012). However, the proposed expansion of onshore wind is not without its critics.

Although there is evidence to suggest that consumers are willing to pay a premium for renewable energy (Longo et al., 2008; Zografakis et al., 2010) and there is widespread public support for renewable energy and onshore wind farms in Ireland and elsewhere (Warren et al., 2005; Eurobarometer, 2011; Hobman et al., 2012), individual wind farm projects across many jurisdictions, Ireland included, have faced significant local resistance (Wüstenhagen et al., 2007). Consequently substantial research has been devoted to questions regarding their social acceptability and the negative externalities associated with their operation (Groothuis et al., 2008; Heintzelman and Tuttle, 2012; Jensen et al., 2014). Localised negative externalities come in different forms and include landscape and biodiversity (Ladenburg, 2009), noise pollution and shadow flicker (Devine-Wright, 2005; Jensen et al., 2014) and declining residential property prices (Heintzelman and Tuttle, 2012; Jensen et al., 2014). These in turn frequently give rise

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to the NIMBYism syndrome. Economists argue that NIMBYism results in an inefficient allocation of resources since the external costs of a wind farm are borne locally by the community surrounding the development while the benefits are distributed at large throughout the economy (Krueger et al., 2011). However, a number of studies indicate that NIMBYism is too simplistic (Devine-Wright, 2005; Wolsink, 2007), and they suggest instead that local attitudes are affected by the use of more deliberative approaches to planning (Gross, 2007; Wüstenhagen et al., 2007; Eltham et al., 2008; Hall et al., 2013), early and increased community consultation (Gross, 2007; Ek and Persson, 2014) and by providing employment and local ownership (Christensen and Lund, 1998; Maruyama et al., 2007).

In our analysis we investigate whether enhanced community consultation between citizens and developers influences willingness to accept (WTA) for wind farms in Ireland. To our knowledge this is a novel exercise. Our analysis differs from the choice experiment literature on the visual and physical impact of wind farms (Alvarez-Farizo and Hanley, 2002; Bergmann et al., 2006; Ladenburg and Dubgaard, 2009; Ku and Yoo, 2010; Meyerhoff et al., 2010; Heintzelman and Tuttle, 2012; Jensen et al., 2014), and from studies that consider the importance of institutional and social aspects such as type of ownership (Ek and Persson, 2014) and whether locals are involved in the planning process (Dimitropoulos and Kontoleon, 2009). Our approach provides insights into how to address wind farm externalities through improved community consultation between wind farm developers and the Irish public. Implicit tradeoffs are probable between social and physical attributes and both will likely influence WTA values. Altering setback distance and community consultation may provide a means of addressing external effects associated with wind farms in Ireland and they both involve social and private costs. This research aims to: 1) establish if local communities are willing to accept compensation for wind farm production in their area; 2) identify factors that influence WTA compensation for wind farms in Ireland; 3) develop a framework to investigate tradeoffs between physical and social attributes that influence social acceptance of wind farms, and 4) identify efficient policy scenarios that internalize the social costs associated with Irish wind farms by combining social or institutional factors such as community consultation with alternative physical attribute levels (setback distance, number of turbines).

The paper proceeds as follows: First, a literature review and some background to the topic is given on wind farm externalities and approaches used to measure them. Next, a description of the survey instrument and methodological approach is provided. Then, the empirical strategy used to explore the relationship between wind farm externalities and compensation is presented and the results discussed. Final remarks and considerations are offered in the conclusions.

2. Literature review

Previous work on renewable energy from wind farms has focused on consumers' willingness to pay for renewables including environmental and physical impacts (Alvarez-Farizo and Hanley, 2002; Bergmann et al., 2006; Ladenburg and Dubgaard, 2009; Ku and Yoo, 2010; Meyerhoff et al., 2010; Heintzelman and Tuttle, 2012; Jensen et al., 2014), on social and institutional aspects (Christensen and Lund, 1998; Devine-Wright, 2005; Maruyama et al., 2007; Wolsink, 2007; Ek and Persson, 2014), on energy security (Eltham et al., 2008), on the spatial allocation of wind farms (Meyerhoff et al., 2010), the level of experience of wind farms (Eltham et al., 2008; Kaldellis et al., 2013), community consultation and information provision (Beddoe and Chamberlin, 2003;

Zarnikau, 2003; Gross, 2007; Hobman, 2012) and whether locals are involved in the planning process (Gross, 2007; Wüstenhagen et al., 2007; Eltham et al., 2008; Dimitropoulos, and Kontoleon, 2009; Hall et al., 2013; Ek and Persson, 2014). In the main this work has used the contingent valuation method (Koundouri et al., 2009; Yoo and Kwak, 2009; Kontogianni et al., 2013) and choice experiments (Bergmann et al., 2006; Meyerhoff et al., 2010; Ek and Persson, 2014).

Studies using choice experiments have focused on the externalities associated with the physical attributes of wind farms such as turbine height (Dimitropoulos and Kontoleon, 2009; Vecchiato, 2014), size (Alvarez-Farizo and Hanley, 2002; Dimitropoulos and Kontoleon, 2009; Vecchiato, 2014) and distance between wind farms and residential dwellings and towns or villages (Fimereli et al., 2008; Meyerhoff et al., 2010; Vecchiato, 2014). In general the literature indicates that individuals prefer to move onshore wind turbines further away from residential dwellings and settlements (Meyerhoff et al., 2010). Findings from the literature with respect to turbine height and size are more mixed. In Germany, Meyerhoff et al. (2010) report that turbine height does not affect individual choices and Navrud and Bråten (2007) indicate that fewer larger turbines are preferred whereas other studies (Ek, 2006; Bergmann et al., 2008) report that smaller wind farms are given preference. The choice experiment literature on the topic suggests that institutional, social and demographic factors may also play an important role in wind farm acceptance. With respect to institutional and social factors Ek and Persson (2014) report that Swedish consumers are WTP an increased renewable electricity fee provided that the wind farm is either owned partially or in whole by the local community and that local residents are involved in the planning process. Other studies suggest that being involved in wind farm ownership (Strazzera et al., 2012), employment (Alvarez-Farizo and Hanley, 2002; Bergmann et al., 2006) or other benefit sharing arrangements (Maruyama et al., 2007) represent important factors that influence local acceptance. In Greece, Dimitropoulos, and Kontoleon (2009) find that respondents value participation in the planning process more highly than the number of turbines or their height.

In relation to demographic factors respondent income (Ladenburg and Dubgaard, 2007; Groothuis et al., 2008) and gender (Wiser, 2007; Krueger et al., 2011; Susaeta et al., 2011; Ek and Persson, 2014) are also thought to influence the social acceptance of wind farms. Groothuis et al., (2008) find that respondents willingness to accept wind farm development decreases as income increases and Krueger et al., (2011) report that male respondents were less tolerant of offshore wind farms compared with their female counterparts due to the impact of wind farms on the environment.

To our knowledge, this paper is the first to put a value on community consultation between residents and the developer regarding a wind farm project. The willingness to accept format is employed in preference to WTP approach. Although it is customary to employ willingness to pay in choice experiments, the WTA framework is more appropriate considering the perceived property rights of individuals in this context. In circumstances when individuals perceive the status quo defines the property rights the WTA becomes the relevant measure for compensation. Choice experiments have been used successfully in the past to estimate WTA (Groothuis et al., 2008; Dimitropoulos and Kontoleon, 2009; Strazzera et al., 2012) in relation to wind farm externalities.

3. Methods and data

Choice experiments can be traced back to Lancaster's (1966) "characteristics theory of value" which claims that the utility

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